Joint Audit Oversight and Executive Committee

November 7, 2024

Click link to access the meeting:

https://www.zoomgov.com/j/1619530340

Zoom Meeting ID

Ways to Join

Computer: Click the link above. You will be prompted to run the Zoom browser or Zoom application. Once signed on to the meeting, you will have the option to join using your computer audio system or phone.

Webinar Features:

Raise Hand	▶	Use the **raise hand** feature every time you wish to make a public comment.
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	▶	This symbol shows you are **muted**, click this icon to unmute your microphone.
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	▶	The chat feature should be used by panelists and attendees solely for "housekeeping" matters as comments made through this feature will not be retained as part of the meeting record. See the **Live Verbal Public Comment** for instructions on how to make a public comment.

Smartphone or Tablet: Download the Zoom app and join the meeting by clicking the link or using the webinar ID (found in the link).

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1. If you are joining the meeting audio by phone and viewing the meeting on a device, dial the number provided in the 'join audio' phone call tab of the initial pop-up, and enter the Meeting ID (found in the link).
2. If you are joining by phone only, dial: **+1-669-900-9128** or **+1-253-215-8782** and type the meeting ID found in the link, press #. You will have access to the meeting audio, **but will NOT be able to view the PowerPoint presentations.**

Live Verbal Public Comments: Use the 'Raise Hand' icon every time you wish to make a public comment on an item. Raise your hand once the agenda item you wish to comment on has been called. In person public comments will be taken first, virtual attendees will be taken in the order in which they raise their hand. Requests to speak will not be taken after the public comment period ends, unless under the Chair's discretion. General Public Comment, at the beginning of the Board of Directors meeting only, will be limited to five speakers. Additional speakers with general public comments will be heard at the end of the meeting. Two-minutes of time is allotted per speaker, unless otherwise directed by the Chair.

Public Comments Made Via Zoom

1. Click the link found at the top of this instruction page
2. Click the raise hand icon located in the bottom center of the platform
3. The Clerk will announce your name when it is your turn to speak
4. Unmute yourself to speak

Public Comments Made by Phone Only

1. Dial **+1-669-900-9128**
2. Type in the zoom meeting ID found in the link and press #
3. Dial *9 to raise your hand via phone
4. The Clerk will call out the last 4 digits of your phone number to announce you are next to speak
5. Dial *6 to unmute yourself

Written Public Comments (before the meeting): Written public comments will be recorded in the public record and will be provided to MTS Board Members in advance of the meeting. Comments must be emailed or mailed to the Clerk of the Board* by 4:00pm the day prior to the meeting.

Translation Services: Requests for translation services can be made by contacting the Clerk of the Board* at least four working days in advance of the meeting.

In-Person Participation: In-person public comments will be heard first. Following in-person public comments, virtual attendees will be heard in the order in which they raise their hand via the Zoom platform. Speaking time will be limited to two minutes per person, unless specified by the Chairperson. Requests to speak will not be taken after the public comment period ends, unless under the Chair's discretion.

Instructions for providing in-person public comments:

1. Fill out a speaker slip located at the entrance of the Board Room;
2. Submit speaker slip to MTS staff seated at the entrance of the Board Room;
3. When your name is announced, please approach the podium located on the right side of the dais to make your public comments.

Members of the public are permitted to make general public comment at the beginning of the agenda or specific comments referencing items on the agenda during the public comment period. General Public Comment, at the beginning of the Board of Directors meeting only, will be limited to five speakers. Additional speakers with general public comments will be heard at the end of the meeting.

Assistive Listening Devices (ALDs): ALDs are available from the Clerk of the Board* prior to the meeting and are to be returned at the end of the meeting.

Reasonable Accommodations: As required by the Americans with Disabilities Act (ADA), requests for agenda information in an alternative format or to request reasonable accommodations to facilitate meeting participation, please contact the Clerk of the Board* at least two working days prior to the meeting.

***Contact Information:** Contact the Clerk of the Board via email at ClerkoftheBoard@sdmts.com, phone at **(619) 398-9561** or by mail at **1255 Imperial Ave. Suite 1000, San Diego CA 92101.**

Supervisión de Auditoría Conjunta y Comité Ejecutivo

November 7, 2024

Haga clic en el enlace para acceder a la reunión:

https://www.zoomgov.com/j/1619530340

ID de la reunión en Zoom

Formas de Participar

Computadora: Haga clic en el enlace más arriba. Recibirá instrucciones para operar el navegador de Zoom o la aplicación de Zoom. Una vez que haya iniciado sesión en la reunión, tendrá la opción de participar usando el sistema de audio de su computadora o teléfono.

Funciones del Seminario En Línea:

Levantar la mano	▶	Use la herramienta de **levantar la mano** cada vez que desee hacer un comentario público.
CC	▶	Los participantes pueden habilitar **el subtitulado** haciendo clic en el ícono CC. También puede ver la transcripción completa y cambiar el tamaño de letra haciendo clic en “configuración de subtítulos”. Estas herramientas no están disponibles por teléfono.
	▶	Este símbolo indica que usted se encuentra en **silencio**, haga clic en este ícono para quitar el silenciador de su micrófono.
	▶	Este símbolo indica que su micrófono se encuentra **encendido**. Haga clic en este símbolo para silenciar su micrófono.
	▶	La herramienta de chat deben usarla los panelistas y asistentes únicamente para asuntos “pertinentes a la reunión”, ya que comentarios realizados a través de esta herramienta no se conservarán como parte del registro de la reunión. Consulte el **Comentario público verbal** en vivo para obtener instrucciones sobre cómo hacer un comentario público.

Teléfono Inteligente o Tableta: Descargue la aplicación de Zoom y participe en la reunión haciendo clic en el enlace o usando el ID del seminario web (que se encuentra en el enlace).

Descarga en el App Store

Obténla en Google Play

Teléfono:

1. Si está participando en la reunión mediante audio de su teléfono y viendo la reunión en un dispositivo, marque el número indicado en la pestaña de llamada telefónica “unirse por audio” en la ventana emergente inicial e ingrese el ID de la reunión (que se encuentra en el enlace).
2. Si está participando solo por teléfono, marque: **+1-669-900-9128** o **+1-253-215-8782** e ingrese el ID de la reunión que se encuentra en el enlace, pulse #. Tendrá acceso al audio de la reunión, **pero NO podrá ver las presentaciones en PowerPoint.**

Comentarios Públicos Verbales en Vivo: Use la herramienta “levantar la mano” cada vez que desee hacer un comentario público sobre alguno de los artículos. Levante la mano una vez que el artículo de la agenda sobre el que desea comentar haya sido convocado. Los comentarios públicos en persona se escucharán primero, se escuchará a los asistentes virtuales en el orden en el que levanten la mano. No se aceptarán solicitudes para hablar después de que termine el periodo para hacer comentarios públicos, a menos de que el presidente determine de otra forma a su discreción. Comentarios públicos generales, únicamente al inicio de la reunión de la Junta de Directores, se limitarán a cinco personas que deseen hablar. Las personas adicionales que deseen aportar comentarios públicos generales podrán hacerlo al final de la reunión. Se otorga dos minutos de tiempo por persona que desee hablar, a menos de que el presidente instruya de otra forma. (*Consulte la página 2 para obtener instrucciones sobre cómo hacer un comentario público.*)

Comentarios Públicos a Través de Zoom

1. Haga clic en el enlace que se encuentra en la parte superior de esta página de instrucciones
2. Haga clic en el ícono de levantar la mano en el centro inferior de la plataforma
3. El secretario anunciará su nombre cuando sea su turno de hablar
4. Desactive el silenciador para que pueda hablar

Comentarios Públicos Realizados Únicamente por Teléfono

1. Marque el **+1-669-900-9128**
2. Ingrese el ID de la reunión en Zoom que se encuentra en el enlace y pulse #
3. Marque *9 para levantar la mano por teléfono
4. El secretario indicará los últimos 4 dígitos de su número de teléfono para anunciar que usted será el siguiente en hablar
5. Marque *6 para desactivar el silenciador

Comentarios Públicos por Escrito (Antes de la Reunión): Los comentarios públicos por escrito se registrarán en el registro público y se entregarán a los miembros de la Junta de MTS antes de la reunión. Los comentarios deben enviarse por correo electrónico o postal al secretario de la Junta* antes de las 4:00 p.m. el día anterior a la reunión.

Servicios de Traducción: Pueden solicitarse servicios de traducción comunicándose con el secretario de la Junta* por lo menos cuatro días hábiles antes de la reunión.

Participación en Persona: Los comentarios públicos en persona se escucharán primero. Después de los comentarios públicos en persona, se escuchará a los asistentes virtuales en el orden en el que levanten la mano a través de la plataforma de Zoom. El tiempo para hablar se limitará a dos minutos por persona, a menos de que el presidente especifique de otra forma. No se recibirán solicitudes para hablar después de que termine el periodo para hacer comentarios públicos, a menos de que el presidente determine de otra forma a su discreción.

Instrucciones para brindar comentarios públicos en persona:

1. Llene la boleta para personas que desean hablar que se encuentran en la entrada de la Sala de la Junta.
2. Entregue la boleta para personas que desean hablar al personal de MTS que se encuentra sentado en la entrada de la Sala de la Junta.
3. Cuando anuncien su nombre, por favor, acérquese al podio ubicado en el lado derecho de la tarima para hacer sus comentarios públicos.

Los miembros del público pueden hacer comentarios públicos generales al inicio de la agenda o comentarios específicos que hagan referencia a los puntos de la agenda durante el periodo de comentarios públicos. Los comentarios públicos generales únicamente al inicio de la reunión de la Junta de Directores, se limitarán a cinco personas que deseen hablar. Las personas adicionales que deseen aportar comentarios públicos generales podrán hacerlo al final de la reunión.

Dispositivos de Asistencia Auditiva (ALD, por sus siglas en inglés): Los ALD están disponibles con el secretario de la Junta* antes de la reunión y estos deberán ser devueltos al final de la reunión.

Facilidades Razonables: Según lo requerido por la Ley de Estadounidenses con Discapacidades (ADA, por sus siglas en inglés), para presentar solicitudes de información de la agenda en un formato alternativo o solicitar facilidades razonables para facilitar su participación en la reunión, por favor, comuníquese con el secretario de la Junta* por lo menos dos días hábiles antes de la reunión.

***Información de Contacto:** Comuníquese con el secretario de la Junta por correo electrónico en ClerkoftheBoard@sdmts.com, por teléfono al **(619) 398-9561** o por correo postal en **1255 Imperial Ave. Suite 1000, San Diego CA 92101.**

Metropolitan Transit System

Joint Audit Oversight and Executive Committee

Agenda

November 7, 2024 at 9:00 a.m.

In-Person Participation: James R. Mills Building, 1255 Imperial Avenue, 10th Floor Board Room, San Diego CA 92101

Teleconference Participation: (669) 254-5252; Webinar ID: 161 953 0340, https://www.zoomgov.com/j/1619530340

NO.	ITEM SUBJECT AND DESCRIPTION	ACTION
1.	**Roll Call**	
2.	**Public Comments** This item has a two minute per speaker time limit. If you have a report to present, please give your copies to the Clerk of the Board.	
3.	**Approval of Minutes** Action would approve the September 5, 2024 Executive Committee meeting Minutes.	Approve
	DISCUSSION ITEMS	
4.	**Audit Results and Draft of Fiscal Year 2024 Annual Comprehensive Financial Report (ACFR) (Erin Dunn with Coley Delaney of The Pun Group)** Action would receive a draft of the Fiscal Year (FY) 2024 ACFR for review and discussion.	Receive
5.	**Operations Budget Status Report for September 2024 (Gordon Meyer)**	Informational
6.	**Fiscal Year (FY) 2024 Final Operating Budget Results (Gordon Meyer)** Action would receive the MTS operations budget status report for FY 2024 and approve staff recommendations for programming excess revenues less expenses.	Approve
	OTHER ITEMS	
7.	**Review of Draft November 14, 2024 MTS Board Agenda**	
8.	**Staff Communications and Committee Member Communications**	

9. Next Meeting Date: December 12, 2024

10. Adjournment

Metropolitan Transit System

PUBLIC COMMENT
AI 2, 11/7/2024
No. in Queue:1

CALL – IN PUBLIC COMMENT

Alex Wong provided a public comment for agenda item #2. A paraphrased version of Alex's statement will be reflected in the minutes.

PUBLIC SPEAKER DISCLAIMER

INSTRUCTIONS

This meeting is offered both in an in-person and virtual format. In-person speaker requests will be taken first. Speaking time will be limited to two minutes per person, unless specified by the Chairperson. Members of the public are permitted to make general public comments at the beginning of the agenda or make specific comments on any item in the agenda at the time the Board/Committee is considering the item during the meeting. Requests to speak will not be taken after the public comment period ends, unless under the Chair's discretion.

BOARD OF DIRECTORS MEETING

General Public Comment at the beginning of the agenda will be limited to five speakers with the standard two-minute limit, unless otherwise directed by the Chair. Additional speakers with general public comments will be heard at the end of the meeting.

MEETING RECORD

A paraphrased version of this comment will be included in the minutes. The full comment can be heard by reviewing the recording posted on the respective meeting website: https://www.sdmts.com/about/meetings-and-agendas.

MINUTES

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM

EXECUTIVE COMMITTEE

September 5, 2024

[Clerk's note: Except where noted, public, staff and board member comments are paraphrased. The full comment can be heard by reviewing the recording at the MTS website.]

1. Roll Call

Chair Whitburn called the Executive Committee meeting to order at 9:22 a.m. A roll call sheet listing Executive Committee member attendance is attached as Attachment A.

2. Public Comment

Alex Wong – Provided a written and verbal statement to the Board both during and prior the meeting. Alex expressed support with 15-minute trolley frequencies and encouraged additional strides to 7.5-minute frequencies.

Sam Borinsky – Provided a written statement to the Board during the meeting. Sam expressed support with 15-minute trolley frequencies and encouraged additional strides to 7.5-minute frequencies.

Jack Moyle – Provided a written statement to the Board during the meeting. Jack expressed support with 15-minute trolley frequencies and encouraged additional strides to 7.5-minute frequencies.

3. Approval of Minutes

Board Member Moreno moved to approve the minutes of the June 13, 2024, MTS Joint Audit Oversight and Executive Committee meeting. Board Member Frank seconded the motion, and the vote was 6 to 0 in favor with Board Member Montgomery Steppe absent.

DISCUSSION ITEMS

4. Transit Amenities Study (Denis Desmond)

Denis Desmond, MTS Director of Planning, presented on the transit amenities study. He outlined: background, current overall amenities, current trolley and bus amenities, bus stop challenges, scope framework and staff's recommendation.

Public Comment

There were no Public Comments.

Committee Comment

Board Member Bush asked staff to re-explain the third-party amenities. He hoped to create partnerships with third parties to install additional infrastructure. He asked if there were any partnership limitations. Mr. Desmond referenced Task 5 to expand on any additional public or private partnerships. Mr. Desmond added that this requirement will be part of the Scope of Work for the project. He noted the digital billboard in Gaslamp as a prime example of this type of partnership. Sharon Cooney, MTS CEO, added that the agency is proactive in seeking grant opportunities with outside agencies. Board Member Bush expressed interest in the project and noted that he would like to coordinate with staff on possible MOU agreements with the City of National City. He advocated for amenities such as restrooms to be prioritized throughout the system. He suggested a partnership with a non-profit in Chula Vista that could re-purpose

shade structures into furniture to enhance sustainability efforts for the agency. He also advocated for mural vandalism maintenance.

Vice Chair Goble asked staff if public art was considered an amenity. Mr. Desmond suggested that staff could direct the contractor to make a public artwork assessment and an industry survey on the benefits. Vice Chair Goble encouraged public artwork to be included in the amenity policy. He also asked about the operations and maintenance plan. Mr. Desmond replied that operations and maintenance will be included in the costing proposal. Vice Chair Goble expressed particular interest in power washing services for the system.

Board Member Elo-Rivera asked staff to be extensive with outreach opportunities and asked that the inclusion of work already done by the Social Equity Listening Tour be included, along with amenities that mitigate the impact of heat. He believed there were opportunities to explore quick build options like large concrete planters as a heat mitigation strategy. Board Member Elo-Rivera hoped for a strategy to engage neighboring Universities to be involved in solution-based initiatives.

Board Member Moreno believed that it was up to the Board to create a policy on Public Artwork and asked why this Transit Amenities Study proposal would not be going to the Board. Mr. Desmond stated that the Executive Committee has been designated as the review body, rather than creating an additional separate subcommittee. Mr. Desmond noted that the approval of the contract would follow the typical Board approval process. Board Member Moreno expressed the benefits of presenting the item to the Board for additional feedback. Ms. Cooney added that the item could be added to the discussion calendar at next week's Board meeting. Board Member Moreno asked when the project was anticipated to be presented to the Board. Mr. Desmond anticipated late 2025 to early 2026 as a timeline. Board Member Moreno asked if other agencies were conducting a similar policy study. Mr. Desmond replied that it is a federal requirement that all agencies have a Transit Amenities Policy, and it was up to the agency to interpret how far they wanted to go beyond the requirements. Board Member Moreno encouraged the agency to communicate with each jurisdiction about their regional needs. She noted the importance of the transportation experience to attract additional riders. She encouraged an onboard validation system and shelters.

Board Member Elo-Rivera advocated for prefabricated restroom units throughout the system. He noted that units do not have to be connected to utilities to function.

Chair Whitburn encouraged the collaboration initiatives for this project, and asked staff to place the item on the Board agenda.

Action Taken

There were no Public Comments.

5. Real Estate and Joint Development Program Status Update (Sean Myott and Karen Landers)

Sean Myott, MTS Manager of Real Estate Assets, presented a status update on the real estate and joint development program. He presented on: the joint development overview, City of San Diego Transit Oriented Development (TOD) sites, South Bay TOD sites, East County TOD, funding challenges, publicly available data, residential home/unit totals data and real estate transaction benefits.

Public Comment

There were no Public Comments.

Committee Comment

Board Member Bush asked about the status update of the 24th Street Transit Station project. He noted that City Council recently approved a General Crime Update, where the consensus was to divert density away from the site. He noted that National City should have had better communication with MTS on this topic. Karen Landers, MTS General Counsel, replied that MTS had not started in depth negotiations. Under the Surplus Land Act, if a developer submits an interest notice within 60 days of an agency notice of availability, the agency has an obligation to negotiate with that developer first. National CORE triggered this process for the 24th Street site. MTS has acknowledged receipt of their interest notice. When MTS decides to move forward with a development at this location, National CORE will be negotiated with first. She advised Board Member Bush that the process has not started. Board Member Bush noted that he would connect a city representative with MTS. Ms. Cooney noted that there are significant transit needs at this location. She noted that MTS redeveloped the transit center during the trolley renewal process and highlighted the fact that there are other neighboring businesses and the school adjacent to the transit center. Board Member Bush asked about the project timeline staff anticipates for 24th Street. Ms. Landers replied that MTS would not begin conversations until 2025. Board Member Bush asked if the agency had an exclusive negotiating agreement with National CORE. Ms. Landers noted that the agency does not have an exclusive negotiating agreement, however, under the Surplus Land Act, the agency has a legal obligation to negotiate with National CORE first.

Board Member Moreno asked that park and ride options be added to the Transit Amenities Policy scope of work. She noted the importance of park and ride options on the system. Mr. Desmond replied that the agency did conduct the transit parking study to estimate future needs in 2035, and this study is the basis for negotiations with developers. Board Member Moreno asked that the study be referenced in the Transit Amenity Policy. Ms. Cooney noted that the Clairemont development was not included with the land acquisition for Mid Coast, because it is still under SANDAG's purview since they must build additional parking as part of their FTA full funding grant agreement. Ms. Landers talked about the balance of preserving and eliminating parking and the lessons learned so far will guide staff in advocating for parking and funding when appropriate in future developments. Board Member Moreno noted that Board Members and the agency can advocate for a County of San Diego carve out of additional funding. Ms. Landers stated that staff would need to work with current development partners to understand where they were looking for funds, where more options are now, and where programs are that would be available through advocacy. Ms. Cooney advised the Board that the agency is involved with the California Transit Association (CTA), which puts together its own legislative advocacy programs, along with housing advocacy groups. Board Member Moreno supported the advocacy efforts. Board Member Moreno asked how much revenue MTS receives through rent from market rate projects. Ms. Landers replied that it was approximately $600,000 to $700,000 per market rate project. Board Member Moreno stated that the agency was receiving under $5 million dollars. Ms. Landers noted that the agency is receiving nominal value for other developments since the agency is exchanging the land value rent in exchange for other requirements like replacement parking, prevailing wage, and restrooms. Board Member Moreno asked staff to provide how much revenue is made and whether those funds go to a general fund. Ms. Cooney replied that revenue is approximately $2 million per year.

Vice Chair Goble asked if developers pay development impact fees to their appropriate cities. Ms. Landers made it clear that staff is not aware of those details, since those conversations are directly between the developer and the City. She further explained that development partners go through controlling jurisdiction planning and permitting. She noted that MTS does not have special exemption capabilities. Vice Chair Goble emphasized the importance of development impact fee information, because each City may choose to waive fees that will help them develop that project. Ms. Cooney added that Cities could also offer to build utility services or public improvements to reduce development costs, however, recognizes that each jurisdiction also has their own funding challenges. Ms. Landers noted that MTS encourages problem-solving but acknowledges that the agency has not asked partner developers directly what costs Cities would be willing to compromise on. Vice Chair Goble expressed frustration that their current developer, Chelsea, does not value the fact that the City of El Cajon does not charge development impact fees. Vice Chair Goble noted the current Exclusive Negotiation Agreement (ENA) with Chelsea expires in May 2025 and questioned the wisdom of granting another ENA extension to Chelsea. Ms. Cooney added that MTS and El Cajon can revisit the development partner for the site. Ms. Landers noted that there were many budgetary uncertainties in March and June of 2024, but MTS can now ask the developers to propose and commit to a financing plan so that the two agencies can move forward with a better understanding of the limitations. Vice Chair Goble questioned Chelsea's commitment and effort to the project.

Chair Whitburn acknowledged the importance of parking ratios to make transit a feasible option for riders. Chair Whitburn asked about the E Street parking. Ms. Landers replied that that once the parking garage is developed, it would be turned over to MTS to own and operate. In a recent meeting with the developer, the developer will be seeking competitive grant opportunities from the federal government. Ms. Cooney also noted that MTS could charge parking rates but has yet to do so. Ms. Landers acknowledged that the agency will ultimately have to create a parking strategy to mitigate parking control costs.

Vice Chair Goble noted that driving deterrence for him would include cost and convenience.

Action Taken

No action taken. Informational item only.

OTHER ITEMS

6. Review of Draft September 12, 2024 Board Agenda

Recommended Consent Items

3. Approval of Minutes
Action would approve the July 18, 2024 Board of Directors meeting minutes.

4. Chief Executive Officer's (CEO) Report

5. Fiscal Year (FY) 2025 Transportation Development Act (TDA) Claim
Action would adopt Resolution Nos. 24-09, 24-10, and 24-11 approving FY 2025 TDA Article 4.0, 4.5, and 8.0 claims allocating $135,306,066 in TDA revenues for MTS.

6. **East County Division (ECD) Zero Emission Bus (ZEB) Overhead Charging System Layout and Design – Work Order Agreement**
Action would authorize the Chief Executive Officer (CEO) to execute Work Order WOA353-AE-26 under MTS Doc No. PWL353.0-22, with Dokken Engineering (Dokken), in the amount of $396,837.52 to provide engineering planning services for the ECD ZEB master planning.

7. **Blue Line Right of Way Retaining Wall – Construction Change Order**
Action would authorize the Chief Executive Officer (CEO) to execute Construction Change Order (CCO) 3 to Work Order No. MTSJOC348-01under Job Order Contract (JOC) MTS Doc. No. PWG348.0-22), with Veterans Engineering Inc. (Veterans), in the amount of $308,522.52 for unforeseen conditions discovered during the installation of the new sheet pile retaining wall near Switch 85 along the Blue Line Right of way.

8. **Clean Natural Gas (CNG) Fueling Station Equipment Replacement – Contract Amendment**
Action would authorize the Chief Executive Officer (CEO) to execute Amendment No. 4 to MTS Doc. No. B0729.4-21, with Trillium, for Imperial Avenue Division (IAD) CNG dryer replacement at $480,154.14; and South Bay Maintenance Facility (SBMF) CNG dryer B Replacement at $492,113.02, for a total of $972,267.16.

9. **Orange Line Variable Message Sign (VMS) Replacements – Contract Award**
Action would authorize the Chief Executive Officer (CEO) to execute MTS Doc. No. PWL393.0-24, with Balfour Beatty Infrastructure, Inc. (Balfour Beatty), for Orange Line VMS replacements in the amount of $237,200.00.

10. **Kearny Mesa Division (KMD) Administration Building Stucco Replacement – Work Order Agreement**
Action would authorize the Chief Executive Officer (CEO) to execute Work Order No. MTSJOC324-34 under MTS Doc. PWG324.0-21, with ABC General Contractor, Inc. (ABCGC), in the amount of $275,796.40 for the replacement and repair of the existing exterior stucco for the KMD Administrative Building.

11. **Imperial Avenue Division (IAD) Zero Emission Bus (ZEB) Overhead Charging Phase I – Work Order Amendment**
Action would 1) Ratify $50,226.85 that was added to Work Order Amendment WOA353-AE-01.02 under MTS Doc No. PWL353.0-22 with Dokken Engineering, Inc. (Dokken) following Board approval of Amendment No. 1 on January 26, 2023 (Agenda Item (AI) 14). The funds were added for professional services for Envision Verification; and 2) Authorize the Chief Executive Officer (CEO) to execute Work Order Amendment No. WOA353-AE-01.04 under MTS Doc. No. PWL353.0-22, with Dokken, to provide additional engineering and design support during construction services for Phase 1 of the IAD electric bus charging infrastructure project in the amount of $503,269.57.

12. **Social Equity Listening Tour (SELT) Orange Line Lighting Upgrades – Work Order Agreement**
Action would authorize the Chief Executive Officer (CEO) to execute Work Order No. MTSJOC324-42 under Job Order Contract (JOC) to MTS Doc. No. PWG324.0-21, with

ABC General Contractor, Inc. (ABCGC), in the amount of $801,575.13 for upgrades to lighting at various Orange Line Trolley Station platform and parking lot locations.

13. Proposed Revisions to MTS Board Policy No. 48 "Transit Service Discrimination Complaints Procedures"

Action would approve the proposed revisions to MTS Board Policy No. 48 "Transit Service Discrimination Complaint Procedures".

14. Kearny Mesa Division (KMD) HVAC Replacement – Work Order Agreement

Action would authorize the Chief Executive Officer (CEO) to execute Work Order No. MTSJOC324-57 under MTS Doc. No. PWG324.0-21, with ABC General Contractor, Inc. (ABCGC), in the amount of $684,882.39 for replacing all existing Heating, Ventilation, and Air Conditioning (HVAC) at the KMD bus maintenance and administration buildings.

15. Investment Report – Quarter Ending June 30, 2024

16. Central Control Heating, Ventilation and Air Conditioning (HVAC) Replacement – Award Work Order Under a Job Order Contract (JOC)

Action would authorize the Chief Executive Officer (CEO) to execute Work Order MTSJOC324-39 under JOC to MTS Doc. No. PWG324.0-21, with ABC General Contractor, Inc. (ABCGC), in the amount of $799,965.83 for the HVAC replacement in Building A at MTS Facilities.

17. Elevator Maintenance and As-Needed Repairs Contract No. PWG281.5-19 – Contract Amendment

Action would 1) Ratify Amendment No. 4 to MTS Doc No. PWG281.4-19, with KONE Inc. (KONE) Elevator Maintenance contract, for the addition of two elevators at the University Towne Center (UTC) station, a price reduction related to the Nobel Drive Station elevators, the addition of a subcontractor, and the addition of wireless emergency call monitoring services to the Fashion Valley Station in the amount of $56,157.69; and 2) Authorize the Chief Executive Officer (CEO) to execute Amendment No. 5 to MTS Doc. No. PWG281.5-19, with KONE, to add as-needed repair funds in the amount of $305,373.40.

18. Lemon Grove Depot Rehabilitation – Award Work Order Under a Job Order Contract (JOC)

Action would authorize the Chief Executive Officer (CEO) to execute Work Order No. MTSJOC324-52 under Job Order Contract (JOC) to MTS Doc. No. PWG324.0-21, with ABC General Contractor, Inc. (ABCGC), in the amount of $424,994.06 for the Lemon Grove Depot Rehabilitation.

19. E Street Chula Vista Murals – Contract Award

Action would: 1) Authorize the Chief Executive Officer (CEO) to execute MTS Doc. No. PWL386.0-24, with Michelle Guerrero, DBA Mr. B Baby, a Small Business (SB), for artistic services, inclusive of conceptualization, design and installation and an as-needed five-year maintenance plan for Mural 1 located on the retaining wall North of the E. Street Transit Center in Chula Vista in the amount of $207,575.25; and 2)

Authorize the CEO to execute MTS Doc. No. PWL416.0-24, with Farallon Design Inc., DBA Rainforest Art Project, for artistic services inclusive of conceptualization, design and installation and an as-needed five-year maintenance plan for Mural 2 located on the retaining wall of the Eastbound, Bayfront, E Street Transit Center platform in Chula Vista in the amount of $407,910.00.

20. Federal Transit Administration Section 5310 Grant Application

Action would 1) Adopt Resolution No. 24-12 agreeing to comply with all terms and conditions of the Federal Transit Administration (FTA) Section 5310 Enhanced Mobility for Seniors and Individuals with Disabilities program as set forth by the FTA and the San Diego Association of Governments (SANDAG); 2) Authorize the Chief Executive Officer (CEO) to submit the following applications and execute any grant agreements awarded by SANDAG: a) $600,000 in Federal Fiscal Year (FFY) 2023 FTA Section 5310 Enhanced Mobility for Seniors and Individuals with Disabilities funding for paratransit vehicle replacement; and b) $600,000 in FFY 2024 FTA Section 5310 Enhanced Mobility for Seniors and Individuals with Disabilities funding for paratransit vehicle replacement; and 3) Authorize the commitment of up to $300,000 in local matching funds to fully fund the purchase of seven (7) paratransit vehicles.

21. Fiscal Year (FY) 2023-2024 and FY 2024-2025 California Senate Bill (SB) 1 State of Good Repair (SGR) Funding

Action would approve Resolution No. 24-13 in order to: 1) Authorize the use of, and application for $5,815,604 in FY 2024-25 SGR funding to be used for the FY26 Bus Procurement Project; and 2) Approve the acceptance of additional $183,001 in FY 2023-24 SB1-SGR funding to bring the total FY 2023-24 allocation to $5,455,018.

22. Adoption of 2024 Conflict of Interest Code – Amendment

Action would 1) Adopt Resolution No. 24-14 amending the MTS Conflict of Interest Code pursuant to the Political Reform Act of 1974; 2) Adopt the amended 2024 MTS Conflict of Interest Code; and 3) Forward the amended 2024 MTS Conflict of Interest Code to the County of San Diego (the designated code-reviewing body).

23. Equity Statement and Policy Development – Contract Award

Action would authorize the Chief Executive officer (CEO) to: 1) Execute MTS Doc. G2900.0-24, with Keen Independent Research LLC (Keen), for Equity Statement and Policy Development for a two (2) year base period with three (3) 1-year options, for a total of five (5) years, at a cost of $829,274.50; and 2) Exercise the option years at the CEO's discretion.

7. Other Staff Communications and Business

Ms. Cooney invited the Committee to the Rail Safety Award celebration taking place after the meeting.

8. Committee Member Communications and Other Business

There was no Committee Member Communications and Other Business discussion.

9. Next Meeting Date

The next Executive Committee meeting is scheduled for October 10, 2024, at 9:00 a.m.

10. Adjournment

The meeting was adjourned at 11:10 a.m.

/S/ Stephen Whitburn	/S/ Dalia Gonzalez
Chairperson	Clerk of the Board
San Diego Metropolitan Transit System	San Diego Metropolitan Transit System

Attachment: A. Roll Call Sheet

SAN DIEGO METROPOLITAN TRANSIT SYSTEM
EXECUTIVE COMMITTEE

ROLL CALL

MEETING OF (DATE): September 5, 2024 CALL TO ORDER (TIME): 9:22 a.m.

RECESS: _____ RECONVENE: _____

CLOSED SESSION: _____ RECONVENE: _____

PUBLIC HEARING: _____ RECONVENE: _____

ORDINANCES ADOPTED: _____ ADJOURN: 11:10 a.m.

REPRESENTING	BOARD MEMBER		ALTERNATE		PRESENT (TIME ARRIVED)	ABSENT (TIME LEFT)
Chair	Whitburn	☒	No Alternate	☐	9:22 a.m.	11:10 a.m.
City of San Diego	Elo-Rivera	☒	Joe LaCava	☐	9:22 a.m.	11:10 a.m.
County of San Diego	Montgomery Steppe	☐	Vargas	☐	ABSENT	ABSENT
East County	Frank	☒	Hall	☐	9:22 a.m.	11:10 a.m.
SANDAG Transportation Committee	Moreno	☒	Bush	☐	9:22 a.m.	11:10 a.m.
South Bay	Bush	☒	Leyba-Gonzalez	☐	9:22 a.m.	11:10 a.m.
Vice Chair	Goble	☒	No Alternate	☐	9:22 a.m.	11:10 a.m.

SIGNED BY THE CLERK OF THE BOARD: /S/ Dalia Gonzalez

Metropolitan Transit System

Agenda Item No. 4

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
JOINT AUDIT OVERSIGHT AND EXECUTIVE COMMITTEE

November 7, 2024

SUBJECT:

Audit Results and Draft of Fiscal Year 2024 Annual Comprehensive Financial Report (ACFR) (Erin Dunn with Coley Delaney of The Pun Group)

RECOMMENDATION:

That the San Diego Metropolitan Transit System (MTS) Joint Audit Oversight Committee (AOC) & Executive Committee receive a draft of the Fiscal Year (FY) 2024 ACFR for review and discussion.

Budget Impact

None

DISCUSSION:

The Finance Department presents for review and discussion the FY 2024 ACFR.

Key financial highlights for the year can be found in the Management's Discussion and Analysis included in the ACFR.

Coley Delany from The Pun Group will be present to provide comments regarding the approach and results of the audit and the financial statements.

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachments: A. FY24 ACFR
B. Auditors Communication to Those Charged with Governance

Metropolitan Transit System

Annual Comprehensive Financial Report

for the Fiscal Years Ended June 30, 2024 and 2023

San Diego, California

San Diego
Metropolitan Transit System

San Diego, California

Annual Comprehensive Financial Report
and Independent Auditors' Report

For the Years Ended June 30, 2024 and 2023

PREPARED BY SAN DIEGO METROPOLITAN TRANSIT SYSTEM
FINANCE DEPARTMENT

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San Diego Metropolitan Transit System

Table of Contents

San Diego Metropolitan Transit System

Table of Contents (Continued)

INTRODUCTORY SECTION

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Metropolitan Transit System

Board of Directors and Transit Riders
San Diego Metropolitan Transit System

The annual comprehensive financial report of the San Diego Metropolitan Transit System (MTS) for the fiscal years ended June 30, 2024 and 2023 is hereby submitted. Responsibility for both the accuracy of the data, and the completeness and fairness of the presentation, including all disclosures, rests with management. The MTS Board of Directors has established an Audit Oversight Committee to provide an additional level of scrutiny to the preparation of the annual comprehensive financial report. Management of MTS is responsible for establishing and maintaining an internal control structure designed to ensure that the assets of MTS are protected from loss, theft, or misuse and to ensure that adequate accounting data are compiled to allow for preparation of financial statements in conformity with generally accepted accounting principles in the United States of America (U.S. GAAP). The internal control structure is designed to provide reasonable, but not absolute, assurance that these objectives are met. The concept of reasonable assurance recognizes that (1) the cost of a control should not exceed the benefits likely to be derived and (2) the valuation of costs and benefits requires estimates and judgments by management. As management, we assert that, to the best of our knowledge and belief, this financial report is complete and reliable in all material respects.

State statutes require an annual audit by independent certified public accountants. The Pun Group, LLP, Accountants and Advisors, has been retained to meet this requirement. The goal of the independent audit was to provide reasonable assurance that the financial statements of MTS for the fiscal years ended June 30, 2024 and 2023 are free of material misstatement. The independent audit involved examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements; assessing the accounting principles used and significant estimates made by management; and evaluating the overall financial statement presentation. The independent auditors concluded, based upon the audit, that there was a reasonable basis for rendering an unmodified opinion that MTS's financial statements for the fiscal years ended June 30, 2024 and 2023 are fairly presented, in all material respects, in conformity with U.S. GAAP. The independent auditors' report is presented as the first component of the financial section of this report.

The independent audit was also designed to meet the requirements of a broader, federally mandated "Single Audit" and to meet the special needs of federal grantor agencies. The standards governing Single Audit engagements required the independent auditor to report not only on the fair presentation of the financial statements, but also on the audited government's internal controls and compliance with legal requirements, with special emphasis on internal controls and legal requirements involving the administration of federal awards. The reports related specifically to the Single Audit are issued under separate cover.

U.S. GAAP requires that management provide a narrative introduction, overview, and analysis to accompany the financial statements in the form of Management’s Discussion and Analysis (MD&A). This letter of transmittal is designed to complement the MD&A and should be read in conjunction with it. The MD&A can be found immediately following the report of the independent auditors.

REPORTING ENTITY

The San Diego Metropolitan Transit System was created effective January 26, 1976 to provide the policy setting and overall management coordination of the public transportation system in the San Diego metropolitan service area. This service area encompasses approximately 3 million people residing in a 570 square mile area of San Diego County, including the cities of Chula Vista, Coronado, El Cajon, Imperial Beach, La Mesa, Lemon Grove, National City, Poway, Santee, and San Diego and the unincorporated area of the County of San Diego.

MTS's mission statement, adopted by the Board of Directors, is to enhance the personal mobility of San Diego metropolitan area residents and visitors by:

- Obtaining maximum benefit for every dollar spent.
- Being the community's major public transportation advocate.
- Increasing public transportation usage per capita.
- Taking a customer-oriented approach.
- Implementing capital projects on schedule and within budget.
- Offering high-quality public transportation services.
- Responding to the community's socioeconomic interests.

California law establishes the San Diego Association of Governments (SANDAG) as the planning agency for San Diego County. The responsibility and decision-making for all transportation-related planning, programming and development activities occurs within SANDAG's ten member Transportation Committee. Approved transportation plans and programs are subsequently executed by SANDAG staff. Within this structure, MTS and the North County Transit District (NCTD) focus primarily on operating activities.

MTS is effectively an umbrella agency. MTS owns the assets of San Diego Trolley, Inc. (SDTI) and San Diego Transit Corporation (SDTC), the area's two largest transit operators. These two transit units were formed under California law as not-for-profit public corporations and function as operating subsidiaries of MTS. SDTI and SDTC are considered component units and are blended component units for financial reporting purposes. SDTI operates five Light Rail Transit (LRT) routes: the UC San Diego Blue Line from the UTC Station to San Ysidro at the International Border, the Orange Line from the Courthouse station through Centre City and then east to El Cajon, the Green Line from the 12th and Imperial Transit Center Bayside platform to El Cajon, the Copper Line East County Connector that runs from Santee to El Cajon and the Silver Line that operates on select holidays making stops along the downtown loop using three restored vintage cars from the 1940's and 1981**.** SDTI operates on a total of 65 miles of track. SDTC operates 25 routes with an active fleet of 261 buses.

The relationship between MTS and the transit operating subsidiaries, SDTI and SDTC, is formally established through operating agreements and MTS-adopted corporate policies. These agreements and corporate policies specify the roles and responsibilities of each of the organizations and outline the procedures in numerous functional areas including accounting and budgeting, fare setting, marketing and public information, revenue-producing advertising, service contracts, and programming of federal, state and local subsidies. The MTS Board of Directors has the policy-setting responsibility for the operation and development of MTS's transit operating subsidiaries as well as for the planning and approval of capital expenditures by or on behalf of these entities. The day-to-day operating functions, labor matters and maintenance of facilities are managed by the individual transit operators. MTS has centralized and consolidated Security, Planning, Human Resources, Finance, Information Technology, Stores, and Purchasing for MTS and all subsidiaries.

In addition to the bus routes operated by SDTC, MTS is financially accountable for the operation of certain additional bus routes. MTS contracts with outside parties for the operation of 67 fixed-route bus lines and paratransit services with an active fleet of 481 buses. The contracts require full operation and maintenance of the bus services. Contract services are accounted for in the MTS - Contracted Services Fund for financial reporting purposes.

MTS owns the San Diego and Arizona Eastern Railway Company (SD&AE), a not-for-profit railroad holding company entrusted with assets which include 108 miles of rail line and over 2,000 acres of property. MTS has a contract with the San Diego and Imperial Valley Railway Co. (SDIV) for the operation of freight rail services over the UC San Diego Blue Line (downtown San Diego south to San Ysidro) and Orange Line (downtown San Diego east to El Cajon) trolley segments. MTS provides no subsidy to SDIV but does receive a portion of its gross revenue. SD&AE is considered a blended component unit for financial reporting purposes.

The For-Hire Vehicle Administration (FHV) licenses and regulates taxicabs, jitneys, nonemergency medical, charter, low speed vehicle, and sightseeing for-hire vehicles for the following cities San Diego, National City, El Cajon, Imperial Beach, La Mesa, Lemon Grove, Poway, Santee, Chula Vista and Oceanside. Although MTS is financially accountable for the operation of FHV, it is full cost recovery through FHV permit fees.

The MTS Board of Directors is comprised of 15 members with four appointed from the City of San Diego (the Mayor of San Diego and three San Diego City Council Members), two appointed from the City of Chula Vista (the Mayor of Chula Vista and a Chula Vista City Council Member), one appointed from each City Council of Coronado, El Cajon, Imperial Beach, La Mesa, Lemon Grove, National City, Poway, and Santee, and one appointed from the San Diego County Board of Supervisors.

ECONOMIC CONDITION AND OUTLOOK

San Diego's economy, along with the nation and California, showed signs of slowing in fiscal year 2024. Fortunately for San Diego, Tourism, Innovation, Military and Defense and the U.S.-Mexico border put the region in a position to fare better than other economies. According to the San Diego Tourism Authority (SDTA), San Diego concluded 2023 with 31.7 million visitors, which was up 10.1% from the previous year, and brought in $14.3 billion in visitor spending and $418 million in hotel tax revenue for the region. San Diego includes the largest concentration of U.S. military in the world, making the military presence an important driver of the region's economy. In addition, San Diego is a thriving hub for the life sciences/biomedical and technology-oriented industries, and is now the fifth largest venture capital hub in the country. The region's quality of life attracts a well-educated, talented workforce and well-off retirees which have contributed to local consumer spending. San Diego's Gross Domestic Product (GDP) was $257.3 billion in 2022 compared to $224.9 billion in 2021, which accounts for 8.1% of California's GDP. Over the past 12 months, energy prices did fall 11.6% due to the decrease in the price of natural gas service. However food is up 3.7% and all other items besides food and energy increased 5.0%. The unemployment rate was 4.5% in June 2024, up from 4.0% in June 2023 and 3.2% in 2022. San Diego compares favorably to the unemployment rate in California of 5.2% but slightly unfavorable to the nation's rate of 4.1% during the same period.

Long-term financial planning

The long-term goal of MTS is to fund operations solely with recurring revenues, but since the COVID-19 pandemic in 2020, as well as the next four years looking forward, that will not be the case. MTS ridership and the associated fare revenue continues to lag the pre-pandemic run rate. The approved FY2024 budget assumed a 19% reduction in fare revenues compared to FY2019, the last full fiscal year pre-pandemic, a drop from $92.2 million to $74.6 million. Overall, ridership increased by 10% in FY2024 compared to FY2023, growing to over 75 million passengers, and passenger fare revenue finished at $72.3 million, however both ridership and passenger fare revenue are still well below the pre-pandemic baselines. MTS does expect ridership and passenger fare revenues to continue to steadily grow over the next four years.

On the subsidy revenue side, regional sales tax receipts slowed in FY2024, with Transportation Development Act (TDA) receipts decreasing –0.4% versus the prior year and Transnet receipts decreasing by 0.7%. State Transit Assistance (STA), derived from the state sales tax on diesel fuel, decreased from $43.4 million in FY2023 to $38.2 million in FY2024, a 12.0% decrease. California Senate Bill (SB) 125 amended the Budget Act of 2023 to appropriate $4 billion of General Funds to the Transit and Intercity Rail Capital Program (TIRCP) over the next two fiscal years. SB125 also established a $1.1 billion Zero-Emission Transit Capital Program (ZETCP) over the next four fiscal years. MTS was estimated to receive approximately $284 million over the next four fiscal years per the original legislation, to be used for both capital and operations. However, the timing and amount of funds came into question during the state FY2025 budget process as the state faced a significant shortfall. Based on the final adopted state budget, MTS is expected to receive the whole $284 million included in the original legislation, but with payments spread over additional fiscal years. The FY2024 operating budget included $4.5 million in SB125 TIRCP funds, and MTS received the first cash payment of $135.8 million in September 2024. All SB125 funds in the FY2025 operating budget were removed as MTS was required to adopt the budget prior to the state budget being completed; however, based on the final budget appropriation, SB125 funds will be added back into the operating budget in the FY2025 midyear amendment for security enhancements, service enhancements, and structural deficit balancing.

On March 27, 2020, the President signed the Coronavirus Aid, Relief, and Economic Security (CARES) Act, which provided $25 billion to the transit industry nationwide. MTS was apportioned $220 million in CARES Act funding, which will be utilized over multiple fiscal years to supplement lost revenues and increased expenses related to the pandemic. MTS received $82.4 million in FY2024 and has drawn $172.6 million in total. On March 11, 2021, the President signed American Rescue Plan Act of 2021 (ARP) Act, which provided $30.5 billion to support the nation's public transportation systems as they continue to respond to the COVID-19 pandemic.

MTS was apportioned $140 million of ARP funding, of which MTS received $2.6 million in FY2024 and has drawn $140.0 million in total. The proposed FY2025 operating budget includes the final $47.0 million of available stimulus funds. In FY2025, all available stimulus funds will have been drawn, and MTS will utilize funds in the operating deficit reserve to balance the operating budget until depleted. Additionally, MTS has a contingency reserve balance of 12.5% of the operating budget at its disposal.

Major Initiatives

With all of San Diego in desperate need of more affordable housing, MTS continues to seek joint development projects across its system to repurpose its park and ride lots into affordable housing solutions across the county. Two of those developments were completed and opened in FY 2024, while another was approved by the Board and a fourth has started construction.

In August 2023, MTS and Greystar Real Estate celebrated the opening of a new housing complex at the Grantville Transit Center. The $106 million housing complex, named Union Grantville, is located between the new SDSU West site and SDSU main campus and features five floors of 250 market-rate and affordable units. This allows many SDSU students to take transit to campus in just one stop via the Trolley Green Line. MTS also has 100 free parking spaces on site specifically for transit riders.

In October 2023, the MTS Board approved a new transit-oriented housing development at the Spring Street Transit Center in La Mesa. The development will span 2.2 acres and feature 147 affordable housing units (30-60% of Area Median Income). Construction is anticipated to begin in February 2025 and take approximately two years.

In February 2024, MTS and Affirmed Housing, a leading provider of affordable, multifamily housing throughout California, celebrated the beginning of construction on the SkyLINE Apartments at the Rancho Bernardo Transit Station. The new seven-story mixed-use, transit-oriented, affordable housing development in San Diego's Rancho Bernardo neighborhood will include 100 apartment homes and roughly 14,000 square feet of commercial space that will be Affirmed Housing's new company headquarters. Apartments come in a mixture of one-, two- and three-bedrooms, ranging from roughly 557 square feet to approximately 1,113 square feet.

In April 2024, Affirmed Housing and MTS announced the completion of ShoreLINE, a new, 100% affordable, transit-oriented housing development. The new $62.6 million affordable housing community is located at the Grantville Transit Center on Alvarado Canyon Road. The new, seven-story building features 126 studio, one, two and three-bedroom apartment homes and a wide array of amenities.

Other properties MTS is in the process of redeveloping or actively looking to redevelop include:

- Palm Avenue Trolley Station – 500 estimated units
- Beyer Blvd Transit Center – 100 estimated units
- El Cajon Transit Center – 300 estimated units
- E Street Transit Center – 806 estimated units
- 12th & Imperial Transit Center – in partnership with the San Diego Foundation, looking to develop a high rise for affordable and market-rate housing

For the first time in agency history, MTS launched an electric Rapid service on October 15, 2023. Rapid 227 now serves the communities of Otay Mesa, Nestor and Imperial Beach. This new service features 12 60-foot electric buses, the first articulated electric vehicles in MTS' fleet. Thousands of daily pedestrians crossing from the Otay Mesa Port of Entry can now walk directly to the Otay Mesa Transit Center and travel to Imperial Beach on Rapid 227 in 40 minutes or less. The route features limited stops (10) and offers a connection from the border to the UC San Diego Blue Line via the Iris Avenue Transit Center in just 15 minutes. Service runs every 15 minutes or better throughout most of the day. The entire Rapid 227 project is expected to be fully completed by 2024, and will feature new stations and amenities, a traffic signal at Coronado Avenue/30th Street, and further improvements at Iris Avenue Transit Center.

Rapid 227 is also a major milestone in the agency's effort to transition to an all zero-emissions bus fleet in 2040. The Rapid 227 electric bus fleet is being charged by an $8.5 million overhead gantry charging system capable of charging 24 battery-electric buses at a time, and it is expandable to add more charging capacity as MTS transitions its fleet to all electric over the coming years. Buses are docked under the gantry in seconds and fully charged in just a few hours. This offers advantages for efficient operations for a clean energy fleet. MTS is the first transit agency to build this type of charging infrastructure in North America. MTS has also started designing similar overhead charging systems at its other bus facilities.

MTS currently has five bus divisions distributed throughout the service area but is at capacity at those divisions. Any service increases and the transition to zero-emission buses will require additional capacity, leading MTS to plan for a sixth division. The MTS Board of Directors approved a Federal Blvd. site as the final project site in October 2022. MTS and the SANDAG are working collaboratively on the development of the Clean Transit Advancement Campus (CTAC), which has received its federal and state environmental clearances. For the California Environmental Quality Act (CEQA), the MTS Board of Directors approved and adopted a Final Mitigated Negative Declaration on October 20, 2022. In July 2023, the project was approved by the Federal Transit Administration (FTA) for a Categorical Exclusion for the purpose of compliance with the National Environmental Policy Act (NEPA). MTS is in the process of acquiring the site parcels and is anticipated to commence project design activities in the next year.

The FY2025 CIP budget of $250.1 million will fund 66 different projects. Of that amount, 78% of the funding goes towards keeping the bus and rail systems in a state of good repair. The budget also includes significant funding for the zero-emission bus transition. Top funding allocations include:

- $69.5 million – Rail infrastructure improvements and maintenance.
- $61.3 million – 38 new buses including 10 battery-electric and 28 compressed natural gas.
- $40.5 million – Overhead charging infrastructure at each existing division to support conversion to an all-electric bus fleet.
- $21 million – 22 new Trolley vehicles. Funding will be added to the $71.7 million previously funded to replace aging vehicles in the fleet.
- $21.3 million – Trolley and bus facilities maintenance and construction, and construction projects for passenger facilities at transit centers.

MTS continues to look for new streams of non-fare revenue for the agency. One such project is the Gaslamp Quarter Digital Information Board, which is a new addition to the Gaslamp Quarter Trolley Station. The overall structure height is approximately 50 feet tall, with two displays that are about 20 x 30 feet. As part of a partnership with advertiser Big Outdoor, the Gaslamp Quarter Digital Information Board provides unique advertising and promotion opportunities for local businesses and conventioneers, as well as transit information. The digital information board will also host important wayfinding information, community event details, timely public safety or emergency alerts, and public service announcements.

Another non-fare revenue stream was approved by the MTS Board for station naming rights on the Green Line Trolley. MTS entered into an agreement with UC San Diego Health to rename the Green Line Trolley's Alvarado Station to UC San Diego Health East Campus Medical Center Station (UC San Diego Health East). Over the life of this contract, MTS would realize over $1.3 million in additional revenue.

The historic flooding on January 22, 2024, caused approximately $24 million in damage to the Trolley system. This included the closing of two stations on the Orange Line due to extensive damage to a retaining wall at the 65th Street and Imperial Ave. grade crossing. While those stations were closed, passengers had to deboard the Trolley at either Euclid Avenue Transit Center or Lemon Grove Transit Center and take a bus shuttle serving the two impacted stations. Extensive work by MTS employees and contractors enabled the full restoration of service along the Orange Line by February 16th, less than four weeks after the flood instead of the months that were expected when it first happened.

AWARDS AND ACKNOWLEDGMENTS

The Government Finance Officers Association of the United States and Canada (GFOA) awarded a Certificate of Achievement for Excellence in Financial Reporting to MTS for its Annual Comprehensive Financial Report for the fiscal year ended June 30, 2023. This was the eighteenth consecutive year and the twenty-eighth year overall that MTS has achieved this prestigious award.

To be awarded a Certificate of Achievement, MTS must publish an easily readable and efficiently organized Annual Comprehensive Financial Report. This report must satisfy both generally accepted accounting principles and applicable legal requirements.

The Certificate of Achievement is valid for a period of one year only. We believe that our current Annual Comprehensive Financial Report continues to meet the Certificate of Achievement Program's requirements and we are submitting it to the GFOA to determine its eligibility for another certificate.

Acknowledgments

The staff of the finance department is to be commended for their efficient and dedicated service to the production of this report. In addition, we express our appreciation for the assistance and cooperation provided by management and staff in all departments throughout the organization.

Sharon Cooney
Chief Executive Officer

Larry Marinesi
Chief Financial Officer

_____, 2024

San Diego Metropolitan Transit System

Listing of Board of Directors and Management

BOARD OF DIRECTORS

Members	Board position (elected position)
Stephen Whitburn	Chair, since 5/23; Board Member, since 12/20 (Councilmember, City of San Diego)
Steve Goble	Vice Chair, since 5/23; Board Member, since 1/17 (Councilmember, City of El Cajon)
Monica Montgomery Steppe	Chair Pro Tem since 1/23; Board Member, since 12/18 (Supervisor, County Board of Supervisors)
Marcus Bush	Board Member, since 12/20 (Councilmember, City of National City)
Patricia Dillard	Board Member, since 1/23 (Councilmember, City of La Mesa)
Mike Donovan	Board Member, since 1/23 (Councilmember, City of Coronado)
Sean Elo-Rivera	Board Member since 12/20 (Councilmember, City of San Diego)
Caylin Frank	Board Member since 12/18 (Councilmember, City of Poway)
George Gastil	Board Member, since 1/21 (Councilmember, City of Lemon Grove)
Todd Gloria	Board Member, since 12/20 (Mayor, City of San Diego)
Alonso Gonzalez	Board Member, since 12/23 (Councilmember, City of Chula Vista)
Ronn Hall	Board Member, since 5/17 (Councilmember, City of Santee)
Matthew Leyba-Gonzalez	Board Member, since 12/20 (Councilmember, City of Imperial Beach)
John McCann	Board Member, since 1/23 (Mayor, City of Chula Vista)
Vivian Moreno	Board Member since 12/18 (Councilmember, City of San Diego)

BOARD COMMITTEE MEMBERSHIP

Accessible Services Advisory Committee	Airport Authority Advisory Committee	Audit Oversight Committeee	Budget Development Committee
George Gastil, Chair	Mike Donovan	Stephen Whitburn, Chair Steve Goble, Vice Chair Marcus Bush Sean Elo-Rivera Caylin Frank Monica Montgomery Steppe Vivian Moreno	Vivian Moreno, Chair Steve Goble John McCann Monica Montgomery Steppe Stephen Whitburn

Executive Committee	Los Angeles-San Diego Rail Corridor Agency	Public Security Committee	SANDAG Board
Stephen Whitburn, Chair Steve Goble, Vice Chair Marcus Bush Sean Elo-Rivera Caylin Frank Monica Montgomery Steppe Vivian Moreno	Caylin Frank	Monica Montgomery Steppe, Chair Patricia Dillard Mike Donovan Alonso Gonzalez Ronn Hall Jose Rodriguez	Matthew Leyba-Gonzalez

SANDAG Regional Planning Committee	SANDAG Transportation Committee	San Diego Regional Building Authority	Taxicab Advisory Committee
Patricia Dillard	Vivian Moreno	John McCann	Sean Elo-Rivera, Chair

San Diego Metropolitan Transit System

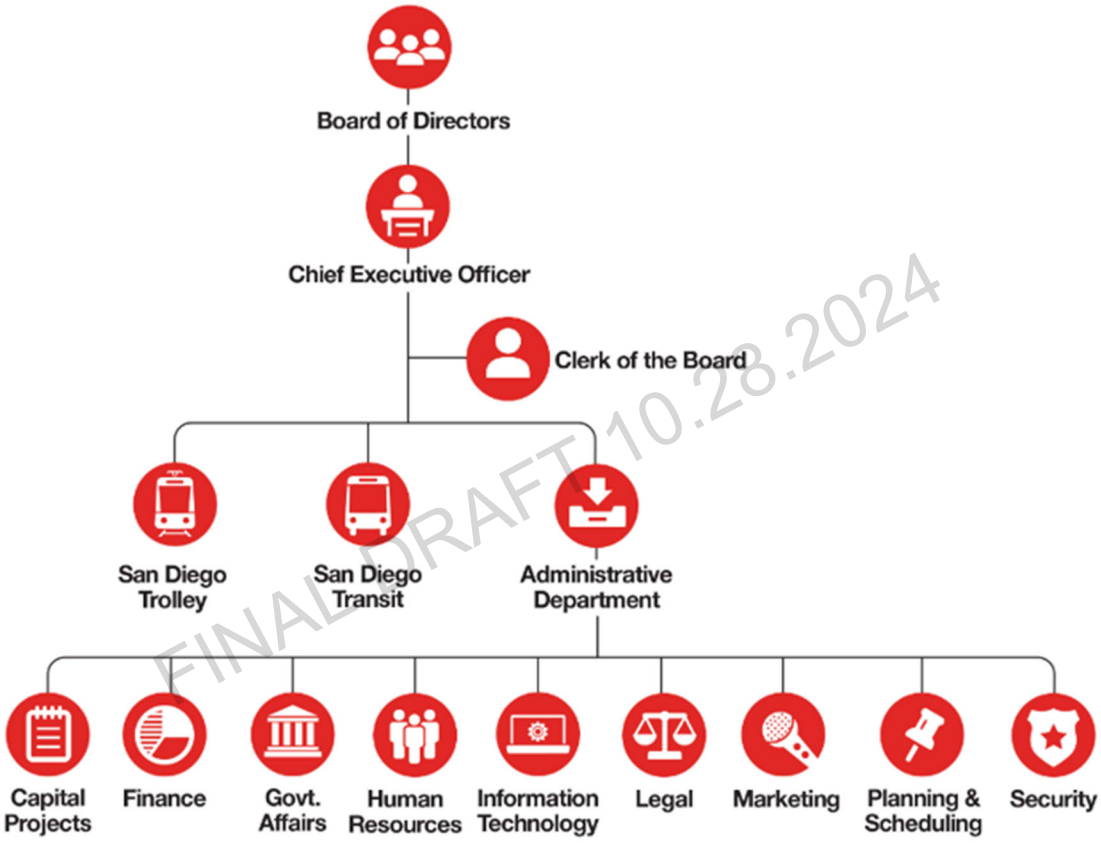
Listing of Board of Directors and Management (Continued)

MTS MANAGEMENT

Staff	Position
Sharon Cooney	Chief Executive Officer
Karen Landers	General Counsel
Larry Marinesi	Chief Financial Officer
Mike Wygant	Chief Operating Officer, Transit Systems
Brian Riley	Chief Operating Officer, Rail
Jeff Stumbo	Chief Human Resources Officer
Ernesto Garcia	Chief Information Officer
Denis Desmond	Director, Planning
Heather Furey	Director, Capital Projects
Mark Olson	Director, Marketing and Communications
Tim Curran	Director, Transit Enforcement & Passenger Safety
Julia Tuer	Manager of Government Affairs

San Diego Metropolitan Transit System

Executive Level Organization Chart



San Diego Metropolitan Transit System

Certificate of Achievement for Excellence in Financial Reporting - GFOA

Government Finance Officers Association

Certificate of Achievement for Excellence in Financial Reporting

Presented to

San Diego Metropolitan Transit System
California

For its Annual Comprehensive
Financial Report
For the Fiscal Year Ended

June 30, 2023

Christopher P. Morrill

Executive Director/CEO

FINANCIAL SECTION

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INDEPENDENT AUDITORS' REPORT

To the Board of Directors
of the San Diego Metropolitan Transit System
San Diego, California

Report on the Financial Statements

Opinions

We have audited the accompanying financial statements of the business–type activities and the aggregate remaining fund information of the San Diego Metropolitan Transit System ("MTS"), as of and for the years ended June 30, 2024 and 2023, and the related notes to the basic financial statements, which collectively comprise MTS's basic financial statements as listed in the table of contents.

In our opinion, the financial statements referred to above present fairly, in all material respects, the respective financial position of the business–type activities and the aggregate remaining fund information of the MTS, as of June 30, 2024 and 2023, and the respective changes in financial position and, where applicable, cash flows thereof for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Basis for Opinions

We conducted our audits in accordance with auditing standards generally accepted in the United States of America ("GAAS") and the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States ("*Government Auditing Standards*"). Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are required to be independent of MTS, and to meet our other ethical responsibilities, in accordance with the relevant ethical requirements relating to our audits. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinions.

Responsibilities of Management for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with accounting principles generally accepted in the United States of America, and for the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditors' report that includes our opinions. Reasonable assurance is a high level of assurance but is not absolute assurance and therefore is not a guarantee that an audit conducted in accordance with GAAS and *Government Auditing Standards* will always detect a material misstatement when it exists.

In preparing the financial statements, management is required to evaluate whether there are conditions or events, considered in the aggregate, that raise substantial doubt about MTS's ability to continue as a going concern for twelve months beyond the financial statement date, including any currently known information that may raise substantial doubt shortly thereafter.

The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control. Misstatements are considered material if there is a substantial likelihood that, individually or in the aggregate, they would influence the judgment made by a reasonable user based on the financial statements.

In performing an audit in accordance with generally accepted auditing standards, we:

- Exercise professional judgment and maintain professional skepticism throughout the audit.
- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of MTS's internal control. Accordingly, no such opinion is expressed.
- Evaluate the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluate the overall presentation of the financial statements.
- Conclude whether, in our judgment, there are conditions or events, considered in the aggregate, that raise substantial doubt about MTS's ability to continue as a going concern for a reasonable period of time.

We are required to communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit, significant audit findings, and certain internal control–related matters that we identified during the audit.

Required Supplementary Information

Accounting principles generally accepted in the United States of America require that the Management's Discussion and Analysis, the Schedule of Proportionate Share of the Net Pension Liability and Related Ratios, the Schedules of Changes in Net Pension Liability and Related Ratios, the Schedules of Contributions – Pension Plans, and the Schedules of Changes in Total OPEB Liability and Related Ratios be presented to supplement the basic financial statements. Such information is the responsibility of management and, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board, who considers it to be an essential part of financial reporting for placing the basic financial statements in an appropriate operational, economic, or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Supplementary Information

Our audits were conducted for the purpose of forming opinions on the financial statements that collectively comprise MTS's basic financial statements. The combining and individual fund financial statements are presented for purposes of additional analysis and are not a required part of the basic financial statements. Such information is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the basic financial statements. The information has been subjected to the auditing procedures applied in the audit of the basic financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the basic financial statements or to the basic financial statements themselves, and other additional procedures in accordance with GAAS and *Government Auditing Standards*. In our opinion, the combining and individual nonmajor fund financial statements are fairly stated, in all material respects, in relation to the basic financial statements as a whole.

Other Information

Management is responsible for the other information included in the annual report. The other information comprises the introductory and statistical sections but does not include the basic financial statements and our auditor's report thereon. Our opinions on the basic financial statements do not cover the other information, and we do not express an opinion or any form of assurance thereon.

In connection with our audits of the basic financial statements, our responsibility is to read the other information and consider whether a material inconsistency exists between the other information and the basic financial statements, or the other information otherwise appears to be materially misstated. If, based on the work performed, we conclude that an uncorrected material misstatement of the other information exists, we are required to describe it in our report.

Other Reporting Required by Government Auditing Standards

In accordance with *Government Auditing Standards*, we have also issued our report dated _____, 2024, on our consideration of MTS's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering MTS's internal control over financial reporting and compliance.

San Diego, California
_____, 2024

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San Diego Metropolitan Transit System
Management's Discussion and Analysis (Unaudited)
June 30, 2024 and 2023

The following discussion and analysis of the financial performance of the San Diego Metropolitan Transit System (MTS) is intended to provide an overview of MTS's financial activities for the fiscal years ended June 30, 2024 and 2023. This information should be used in conjunction with the Letter of Transmittal, which can be found on pages i through vi of this report.

Financial Highlights

- Net position, as reported in the statement of net position, totaled $3,379 million as of June 30, 2024, $3,459 million as of June 30, 2023 and $3,483 million as of June 30, 2022. Of this amount, $112 million was unrestricted as of June 30, 2024, $108 million was unrestricted as of June 30, 2023 and $9 million was unrestricted as of June 30, 2022. Total net position decreased by $(79.7) million in the current year and decreased by $(24.3) million in the prior year. The current year decrease is primarily due to a $84 million decrease in capital assets and a $16 million increase in unearned revenue, partially offset by a $34 million increase in cash. The prior year decrease was primary due to a $121 million decrease in capital assets, offset by a $107 million increase in cash and receivables.
- For the year ended June 30, 2024, the combined farebox recovery ratio (the measure of the ability to recover operating costs through fare revenue) for San Diego Trolley, Inc., San Diego Transit Corporation, and MTS - Contracted Services was 19.24%, compared to 19.59% for the year ended June 30, 2023 and 17.95% for the year ended June 30, 2022. The current year decrease is primarily due to an increase in personnel costs and outside services associated to increased revenue miles. The prior year increase was primarily due to increased passenger revenue from ridership continuing to rebound after the COVID-19 pandemic.

Overview of the Financial Statements

This discussion and analysis is intended to serve as an introduction to MTS's financial statements. The financial statements are comprised of two components: 1) financial statements and, 2) notes to financial statements. This report also contains other supplementary information in addition to the financial statements themselves.

Financial statements. The financial statements are designed to provide readers with a broad overview of MTS's finances, in a manner similar to a private-sector business.

The *statement of net position* presents information on all of MTS's assets, deferred outflow of resources, liabilities, and deferred inflow of resources with the difference between the four reported as net position. Over time, increases or decreases in net position may serve as a useful indicator of whether the financial position of MTS is improving or deteriorating.

The *statement of revenues, expenses and changes in net position* presents information showing how net position changed during the most recent fiscal year. All changes in net position are reported as soon as the underlying event giving rise to the change occurs, regardless of the timing of related cash flows. Thus, revenues and expenses are reported in this statement for some items that will only result in cash flows in future fiscal periods (e.g., earned but unused vacation leave).

The *statement of cash flows* presents information showing the sources and uses of cash related to operating activities, noncapital financing activities, capital and related financing activities and investing activities. In addition, the statement provides information about significant non-cash investing, capital and financing activities.

Since MTS's primary function is to provide transportation services to the region's citizens and recover costs through user fees and charges, the financial statements include business-type activities. In addition, the financial statements include not only MTS itself (*known as the primary government*), but also two legally separate transit operators and one legally separate freight railway, for which MTS is financially accountable: San Diego and Arizona Eastern Railway Company (SD&AE).

MTS has fiduciary responsibility over one private purpose trust fund, San Diego Transit Corporation Employee Retirement Plan, which we have also included financial statements for.

Notes to basic financial statements. The notes provide additional information that is essential to a full understanding of the data provided in the financial statements.

Other information. In addition to the financial statements and accompanying notes, this report also presents certain required supplementary information concerning MTS's net pension liability and net other post-employment benefits liability for its employees.

Financial Analysis

As noted earlier, net position may serve over time as a useful indicator of an entity's financial stability. In the case of MTS, net position was $3,379 million at the close of the most recent fiscal year and $3,459 million at the end of FY2023.

The largest portion of MTS's net position reflects the investment in capital assets, net of accumulated depreciation and amortization and reduced by any outstanding bonds or other borrowings and deferred inflows and outflows of resources (Net Investment in Capital Assets). Most of the investment in capital assets is comprised of trolley system assets, buses, and construction-in-progress totaling $95.0 million**,** of which the largest projects are the replacement of our SD100 Light Revenue Vehicles and the El Cajon Third Track Expansion Project, at $57.0 and $11.2 million respectively. Prior year construction-in-progress totaled $88.7 million, of which the largest projects were the replacement of our SD100 Light Revenue Vehicles and the Iris Rapid electric bus charging infrastructure project, at $48.9 and $7.5 million respectively. The capital assets that are represented by construction-in-progress will be used to provide services to citizens; consequently, these assets are not available for future spending. In FY2024, MTS transferred completed projects worth $140.5 million to SDTC, SDTI and MTS - Contracted Services compared to $106.6 million in FY2023.

The balance in the unrestricted component of net position increased by $5 million during the current year and $98 million in the prior year**.** Total assets decreased by $30 million, primarily due to a decrease in capital assets of $84 million, offset by an increase in cash $34 million. In FY2023, total assets decreased by $13 million primarily due to a decrease in capital assets of $121 million, offset by an increase in cash and receivables of $107 million. In the current fiscal year, total liabilities increased by $21 million primarily due to a $16 million increase in unearned revenue. The previous year increase of $68 million was primarily due to a $77 million increase in net pension liability partially offset by $11 million decrease in net OPEB liability.

	2024	2023	Change	2022	Change
Current and other assets	$ 469,991,704	$ 434,835,372	$ 35,156,332	$ 325,924,622	$ 108,910,750
Noncurrent assets	60,528,351	42,356,862	18,171,489	43,821,270	(1,464,408)
Capital assets, net	3,281,827,887	3,365,458,553	(83,630,666)	3,486,341,576	(120,883,023)
Total assets	3,812,347,942	3,842,650,787	(30,302,845)	3,856,087,468	(13,436,681)
Deferred outflows of resources	68,413,443	74,965,242	(6,551,799)	40,858,756	34,106,486
Current and other liabilities	112,127,617	94,986,635	17,140,982	89,154,122	5,832,513
Long-term liabilities outstanding	303,433,498	299,235,393	4,198,105	236,690,977	62,544,416
Total liabilities	415,561,115	394,222,028	21,339,087	325,845,099	68,376,929
Deferred inflows of resources	86,007,363	64,537,896	21,469,467	87,910,919	(23,373,023)
Net position:					
Net investment in capital assets	3,266,970,484	3,351,318,258	(84,347,774)	3,473,997,788	(122,679,530)
Unrestricted (deficit)	112,222,423	107,537,847	4,684,576	9,192,418	98,345,429
Total net position	$ 3,379,192,907	$ 3,458,856,105	$ (79,663,198)	$ 3,483,190,206	$ (24,334,101)

San Diego Metropolitan Transit System
Management's Discussion and Analysis (Unaudited) (Continued)
June 30, 2024 and 2023

The increase in operating revenue is attributable to $5 million in additional passenger revenue this year due to ridership continuing to recover from the COVID-19 pandemic and companies moving away from remote work and returning to the office. In the prior year, operating revenue was up $11 million in passenger revenue as ridership was continuing to rebound from the pandemic. Nonoperating revenues were consistent with prior year, increasing by a net $2 million. Nonoperating revenues increased by $91 million in the previous year, of which $52 million relates to Federal American Rescue Plan revenue, $15 million in STA funding and $10 million in State LCTOP and TIRCP revenue. The current year increase in operating expenses totaling 45 million, includes an increase in outside services of $29 million, with $16 million of that being associated with increased revenue hours for purchased transportation. Personnel expenses also increased by $16 million stemming from significant increases in insurance costs and wages. In FY2023 the increase in operating expenses totaled $81 million, which included a $30 million increase in personnel expenses, $12 million in energy costs and $33 million in depreciation expense.

	2024	2023	Change	2022	Change
Revenues:					
Operating revenues:					
Passenger revenue	$ 72,348,368	$ 67,481,023	$ 4,867,345	$ 56,076,882	$ 11,404,141
Other operating revenue	21,991,939	19,562,074	2,429,865	21,357,795	(1,795,721)
Nonoperating revenues:					
Federal revenue	185,787,042	191,051,771	(5,264,729)	141,982,464	49,069,307
Transportation Development Act	134,821,107	131,274,182	3,546,925	124,385,030	6,889,152
State Transit Assistance	38,466,309	50,133,029	(11,666,720)	34,878,787	15,254,242
State revenue - other	24,717,975	20,076,778	4,641,197	9,558,324	10,518,454
TransNet funds	72,661,542	68,040,812	4,620,730	61,651,134	6,389,678
Other nonoperating revenue	23,145,041	17,164,380	5,980,661	13,852,495	3,311,885
Total nonoperating revenue	479,599,016	477,740,952	1,858,064	386,308,234	91,432,718
Total revenues	573,939,323	564,784,049	9,155,274	463,742,911	101,041,138
Expenses:					
Operating expenses	631,839,511	587,320,838	44,518,673	505,979,472	81,341,366
Nonoperating expenses	41,993,489	25,418,049	16,575,440	551,231	24,866,818
Total expenses	673,833,000	612,738,887	61,094,113	506,530,703	106,208,184
Income (loss) before capital contributions	(99,893,677)	(47,954,838)	(51,938,839)	(42,787,792)	(5,167,046)
Capital contributions	20,230,479	23,620,737	(3,390,258)	1,607,049,523	(1,583,428,786)
Increase (decrease) in net position	(79,663,198)	(24,334,101)	(55,329,097)	1,564,261,731	(1,588,595,832)
Net position:					
Beginning of year	3,458,856,105	3,483,190,206	(24,334,101)	1,918,928,475	1,564,261,731
End of year	$ 3,379,192,907	$ 3,458,856,105	$ (79,663,198)	$ 3,483,190,206	$ (24,334,101)

Capital Assets and Debt Administration

Capital assets. MTS's investment in capital assets net of accumulated depreciation and amortization as of June 30, 2024 and 2023 amounted to $3,282 million and $3,365 million, respectively. This investment in capital assets includes land, buildings, vehicles, equipment, and construction-in-progress as well as leased and subscription based assets. Major capital asset events during the current fiscal year included the following:

- MTS continues to modernize the bus and rail fleet. In FY2024, MTS placed 36 new buses into service totaling $45.9 million, and 7 new trolleys totaling $30.6 million.
- MTS capitalized $21 million in land and buildings procured to build the Clean Transit Advancement Campus which will be a new bus division dedicated to zero emission buses. At the South Bay division, $10 million in charging infrastructure was capitalized to support the zero emission buses operating on the Iris Rapid route. On the rail side, double tracks were installed at the Green Line Imperial Terminal to provide more frequent and efficient trolley service totaling $11 million.
- SANDAG contributed an additional $18 million in assets in FY2024 related to the UCSD Midcoast Trolley Line Extension to MTS totaling $1.6 billion. The 11-mile extension features nine new stations from Old Town north to the UTC Transit Center. They also contributed $2 million in spare parts for the Midcoast trolleys.

CAPITAL ASSETS
(Net of Accumulated Depreciation and Amortization)

	2024	2023	2022
Land	$ 270,088,885	$ 252,472,813	$ 252,301,976
Buildings	2,200,710,591	2,316,479,580	2,433,107,094
Vehicles	614,084,664	596,660,980	591,175,323
Equipment & other	88,003,757	97,351,383	84,987,183
Lease assets	10,247,349	10,640,938	11,034,527
Subscription assets	3,693,011	3,141,582	1,756,621
Construction-in-progress	94,999,630	88,711,277	111,978,852
Total	$ 3,281,827,887	$ 3,365,458,553	$ 3,486,341,576

Additional information on MTS's capital, lease and subscription assets can be found in Note 5 to the financial statements.

Long-term debt. In the current fiscal year, MTS retired the finance obligation relating to Pension Obligation Bonds issued in fiscal year 2005. The final payment was for $1,845,000.

Additional information about MTS's long-term debt can be found in Note 8 to the financial statements.

Bond Ratings

With the Pension Obligation Bonds being retired in the current fiscal year, a new rating was not issued by Standard & Poor's Ratings Services. The most recent rating provided was "AA/Stable."

Requests for Information

This financial report is designed to provide a general overview of MTS's finances for all those with an interest in the government's finances. If you have questions concerning any of the information provided in this report or need additional financial information, visit our website at www.sdmts.com or direct inquiries to the Controller, MTS, 1255 Imperial Avenue, Suite 1000, San Diego, CA 92101.

BASIC FINANCIAL STATEMENTS

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PRIMARY GOVERNMENT

San Diego Metropolitan Transit System
Statements of Net Position
June 30, 2024 and 2023

	2024	2023
ASSETS		
Current assets:		
Cash, cash equivalents, and investments	$ 260,077,394	$ 232,978,456
Cash, cash equivalents, and investments restricted for capital support	34,148,777	27,346,537
Accounts and other receivables	16,418,481	13,898,759
Due from other governments	115,140,639	122,125,937
Lease receivable	2,181,156	1,553,167
Inventory	38,079,256	34,321,429
Prepaid items and other current assets	3,946,001	2,611,087
Total current assets	469,991,704	434,835,372
Noncurrent assets:		
Lease receivable, due in more than one year	60,528,351	42,356,862
Capital assets, net	3,281,827,887	3,365,458,553
Total noncurrent assets	3,342,356,238	3,407,815,415
Total assets	3,812,347,942	3,842,650,787
DEFERRED OUTFLOWS OF RESOURCES		
Pension-related deferred outflows of resources	62,168,457	69,069,675
OPEB-related deferred outflows of resources	6,244,986	5,895,567
Total deferred outflows of resources	68,413,443	74,965,242
LIABILITIES		
Current liabilities:		
Accounts payable	33,370,023	29,814,462
Due to other governments	2,428,106	2,163,046
Unearned revenue	47,651,499	31,419,216
Accrued expenses	4,502,975	3,205,753
Retentions payable	1,305,601	897,501
Retentions payable from restricted assets	3,031,659	8,531,874
Due within one year:		
Aggregate total OPEB liability	1,576,904	1,433,549
Lease liability	291,195	281,291
Subscription liability	714,597	555,733
Compensated absences	8,293,121	7,834,798
Accrued damage, injury, and employee claims	8,961,937	7,004,412
Long-term debt	-	1,845,000
Total current liabilities	112,127,617	94,986,635
Noncurrent liabilities:		
Due in more than one year:		
Lease liability	10,312,316	10,603,510
Subscription liability	2,233,694	1,802,260
Compensated absences	4,409,976	4,367,917
Accrued damage, injury, and employee claims	19,157,884	14,539,138
Aggregate net pension liabilities	229,244,379	226,747,327
Aggregate total OPEB liabilities	38,075,249	41,175,241
Total noncurrent liabilities	303,433,498	299,235,393
Total liabilities	415,561,115	394,222,028
DEFERRED INFLOWS OF RESOURCES		
Pension-related deferred inflows of resources	765,494	1,147,698
OPEB-related deferred inflows of resources	22,312,241	19,054,780
Lease-related deferred inflows of resources	62,929,628	44,335,418
Total deferred inflows of resources	86,007,363	64,537,896
NET POSITION		
Net investment in capital assets	3,266,970,484	3,351,318,258
Unrestricted	112,222,423	107,537,847
Total net position	$ 3,379,192,907	$ 3,458,856,105

See accompanying notes to basic financial statements.

San Diego Metropolitan Transit System
Statements of Revenues, Expenses, and Changes in Net Position
For the Years Ended June 30, 2024 and 2023

	2024	2023
Operating Revenues:		
Passenger revenue	$ 72,348,368	$ 67,481,023
Advertising	3,450,852	3,500,713
Miscellaneous	18,541,087	16,061,361
Total operating revenues	94,340,307	87,043,097
Operating Expenses:		
Personnel costs	189,649,892	173,772,575
Outside services	153,359,441	124,333,369
Transit operations funding	518,020	658,504
Materials and supplies	19,744,200	17,294,793
Energy costs	43,125,673	51,203,442
Risk management	9,575,414	6,399,111
Miscellaneous	8,518,116	8,167,128
Depreciation and amortization	207,348,755	205,491,916
Total operating expenses	631,839,511	587,320,838
Operating income (loss)	(537,499,204)	(500,277,741)
Public Support and Nonoperating Revenues (Expenses):		
Federal revenue	185,787,042	191,051,771
Transportation Development Act (TDA) funds	134,821,107	131,274,182
State Transit Assistance (STA) funds	38,466,309	43,066,262
STA State of Good Repair	-	7,066,767
State revenue - other	24,717,975	20,076,778
TransNet funds	72,661,542	68,040,812
Other local subsidies	12,661,090	12,212,978
Investment earnings	10,483,951	5,055,860
Interest expense	(344,476)	(442,068)
Gain (Loss) on disposal of assets	(16,919,976)	(104,458)
Reduction in contributed capital	(20,867,121)	(24,975,981)
Other non-operating expenses	(3,861,916)	-
Total public support and nonoperating revenues (expenses)	437,605,527	452,322,903
Income (loss) before capital contributions	(99,893,677)	(47,954,838)
Capital contributions, net	20,230,479	23,620,737
Change in net position	(79,663,198)	(24,334,101)
Net Position:		
Beginning of year	3,458,856,105	3,483,190,206
End of year	$ 3,379,192,907	$ 3,458,856,105

See accompanying notes to basic financial statements.

San Diego Metropolitan Transit System
Statements of Cash Flows
For the Years Ended June 30, 2024 and 2023

	2024	2023
Cash Flows From Operating Activities:		
Receipts from customers and users	$ 91,174,056	$ 97,388,609
Payments to suppliers	(223,039,140)	(208,065,124)
Payments to employees	(169,750,448)	(157,020,386)
Payments for damage and injury	(3,585,913)	(5,275,257)
Net cash (used in) operating activities	(305,201,445)	(272,972,158)
Cash Flows From Noncapital Financing Activities:		
Public support funds received	488,219,729	466,095,261
Net cash provided by noncapital financing activities	488,219,729	466,095,261
Cash Flows From Capital and Related Financing Activities:		
Debt service costs	(1,879,403)	(3,144,512)
Property acquisition	(161,527,937)	(69,969,339)
Proceeds from disposal of assets	5,629,276	217,143
Net cash (used in) capital and related financing activities	(157,778,064)	(72,896,708)
Cash Flows From Investing Activities:		
Interest received on investments	8,660,958	3,145,167
Net cash provided by investing activities	8,660,958	3,145,167
Net increase (decrease) in cash, cash equivalents, and investments	33,901,178	123,371,562
Cash, Cash Equivalents, and Investments:		
Beginning of year	260,324,993	136,953,431
End of year	$ 294,226,171	$ 260,324,993
Reconciliation of Cash, Cash Equivalents, and Investments to Statements of Net Position:		
Cash, cash equivalents, and investments	$ 260,077,394	$ 232,978,456
Cash, cash equivalents, and investments restricted for capital support	34,148,777	27,346,537
Total cash, cash equivalents, and investments	$ 294,226,171	$ 260,324,993

See accompanying notes to basic financial statements.

San Diego Metropolitan Transit System
Statements of Cash Flows (Continued)
For the Years Ended June 30, 2024 and 2023

	2024	2023
Reconciliation of Operating (Loss) to Net Cash (Used In) Operating Activities:		
Operating (loss)	$ (537,499,204)	$ (500,277,741)
Adjustments to reconcile operating (loss) to net cash (used in) operating activities:		
Depreciation and amortization	207,348,755	205,491,916
(Increase) decrease in:		
Accounts and other receivables	(2,519,722)	(5,482,474)
Due from other governments	(585,467)	15,126,257
Inventory	2,499,813	(177,606)
Prepaid items and other current assets	(1,334,914)	1,023,530
Increase (decrease) in:		
Accounts payable	8,066,729	423,319
Due to other governments	(193,627)	(647,239)
Accrued expenses	1,297,221	257,731
Unearned revenue	3,446,711	1,895,673
Aggregate net pension liability	9,016,066	8,805,922
Aggregate total OPEB liability	(48,595)	1,077,425
Compensated absences	500,382	551,314
Accrued damage, injury and employee claims	4,804,407	(1,040,185)
Total adjustments	232,297,759	227,305,583
Net cash (used in) operating activities	$ (305,201,445)	$ (272,972,158)
Noncash investing, capital, and financing activities:		
Contributions of capital assets and inventory parts	$ 20,230,479	$ 23,620,737
Increase (decrease) in fair value of investments	$ (247,055)	$ (667,909)

See accompanying notes to basic financial statements.

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FIDUCIARY FUND

San Diego Metropolitan Transit System
Statements of Fiduciary Net Position
June 30, 2024 and 2023

	San Diego Transit Corporation Employee Retirement Plan Pension Trust Fund	
ASSETS	**2024**	**2023**
Investments, at fair value:		
Common stocks	$ 66,949,764	$ 61,854,033
Mutual funds	45,478,416	59,799,632
Corporate debt / Bond funds	53,838,498	52,385,530
Closely held instruments	-	484
U.S. treasury inflation protected security funds	9,607,283	9,355,832
Short-term investment funds	17,671,846	601,832
Total investments	193,545,807	183,997,343
Receivables:		
Dividends and interest	78,434	3,495
Other receivables	27,842	31,825
Total receivables	106,276	35,320
Total assets	193,652,083	184,032,663
LIABILITIES		
Due to plan sponsor	600,842	634,237
Other payables	106,478	225,734
Total liabilities	707,320	859,971
NET POSITION		
Net position restricted for plan benefits	$ 192,944,763	$ 183,172,692

See accompanying Notes to the Financial Statements.

San Diego Metropolitan Transit System
Statements of Changes in Fiduciary Net Position
For the Years Ended June 30, 2024 and June 30, 2023

	San Diego Transit Corporation Employee Retirement Plan Pension Trust Fund	
ADDITIONS:	**2024**	**2023**
Contributions:		
Employer	$17,213,854	$ 16,157,770
Employee	1,712,165	1,719,444
Total contributions	18,926,019	17,877,214
Investment income (loss):		
Interest	128,205	38,083
Dividends	5,187,711	4,490,000
Net realized and unrealized gains (losses) on investments	9,207,890	7,074,461
Total investment income (loss)	14,523,806	11,602,544
Investment expense	(219,026)	(199,423)
Net investment income	14,304,780	11,403,121
Total additions to fiduciary net position	33,230,799	29,280,335
DEDUCTIONS:		
Distributions to participants	23,302,300	22,630,610
Administrative expenses	156,428	354,459
Total deductions from fiduciary net position	23,458,728	22,985,069
NET INCREASE IN FIDUCIARY NET POSITION	9,772,071	6,295,266
NET POSITION RESTRICTED FOR PLAN BENEFITS:		
Beginning of year	183,172,692	176,877,426
End of year	$ 192,944,763	$ 183,172,692

See accompanying Notes to the Financial Statements.

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NOTES TO THE BASIC FINANCIAL STATEMENTS

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San Diego Metropolitan Transit System
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For the Years Ended June 30, 2024 and 2023

San Diego Metropolitan Transit System
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For the Years Ended June 30, 2024 and 2023

San Diego Metropolitan Transit System
Notes to the Basic Financial Statements
For the Years Ended June 30, 2024 and 2023

Note 1 – Summary of Significant Accounting Policies

The accompanying basic financial statements of the San Diego Metropolitan Transit System (MTS) have been prepared in conformity with accounting principles generally accepted in the United States (U.S. GAAP) as applied to governmental units. The Governmental Accounting Standards Board (GASB) is the accepted standard–setting body for establishing governmental accounting and financial reporting standards. The more significant of MTS's accounting policies are described below.

A. Reporting Entity

Primary Government

MTS (also known as San Diego Metropolitan Transit Development Board) was formed on January 26, 1976 by passage of California Senate Bill 101 to plan, construct, and operate (or let contracts to operate) exclusive public mass transit guideways in the urbanized south coastal area of San Diego County. MTS has certain responsibilities for near-term transportation planning and administration of federal and state transportation funds within the area under its jurisdiction. The Board of Directors of MTS consists of 15 members composed of four appointees from the City of San Diego (the Mayor and three Council Members), two appointees from the City of Chula Vista (the Mayor and one Council Member), one appointee from the cities of Coronado, El Cajon, Imperial Beach, La Mesa, Lemon Grove, National City, Poway, and Santee, and one appointee from the San Diego County Board of Supervisors.

On January 1, 2003, California Senate Bill 1703 (SB 1703) became effective. SB 1703 required the consolidation of the planning and programming functions of MTS and the North County Transit District (NCTD) into the San Diego Association of Governments (SANDAG) in an initial transfer to take place prior to July 1, 2003. SB 1703 also required the consolidation of certain project development and construction functions of MTS and NCTD into SANDAG in a subsequent transfer to take place prior to January 30, 2004. The initial transfer occurred on July 1, 2003, and the subsequent transfer occurred on October 13, 2003. With these actions, employees were transferred from MTS and NCTD to SANDAG, and certain planning, development, and construction functions were also transferred. As a result, MTS's activities since the consolidation have been focused on operating public transit systems in the urbanized area identified above. In addition to the consolidation required by SB 1703, MTS dissolved the independent Board of Directors of San Diego Transit Corporation (SDTC) and Board of Directors of San Diego Trolley, Inc. (SDTI). MTS now acts as the Board of Directors for all three agencies: MTS, SDTC, and SDTI. Beginning in FY2004, SDTC and SDTI are presented as blended component units.

These basic financial statements present MTS and its legally separate component units, entities for which MTS is considered to be financially accountable. Because MTS appoints a majority of the component units' boards of directors, the boards are substantively the same, and MTS is able to impose its will on the component units, MTS presents blended component units. Blended component units, although legally separate entities, are, in substance, part of MTS's operations.

Included within the reporting entity as blended component units:

San Diego Transit Corporation: On July 1, 1985, MTS purchased the assets used by and acquired sole ownership of San Diego Transit Corporation (SDTC) from the City of San Diego for $1. SDTC has entered into an operating agreement with MTS to operate a public transportation bus system in the City of San Diego and certain regional routes within MTS's jurisdictions. The current agreement, which was approved in December 2006, was renewed on June 23, 2011, as an open–ended agreement terminable upon six months' notice by either party. SDTC continues to provide local service to a number of adjoining cities under pre–existing contracts. Purchases or construction of bus capital items are made by MTS, with whom title remains, and are contributed to SDTC upon completion of a project or when individually purchased by MTS. SDTC's assets, deferred outflows, liabilities, deferred inflows, net position, revenues, and expenses are included in MTS's financial statements as a blended component unit. This agency has the same governing board as MTS and provides services directly to the public.

Note 1 – Summary of Significant Accounting Policies (Continued)

A. Reporting Entity (Continued)

Primary Government (Continued)

San Diego Trolley, Inc.: San Diego Trolley, Inc. (SDTI) was organized by MTS in August 1980. SDTI was created to operate and maintain the Light Rail Transit (LRT) system pursuant to an operating agreement with MTS. The current agreement, which was approved in December 2006, was renewed on June 23, 2011, as an open–ended agreement terminable upon six months' notice by either party. Purchases or construction of LRT capital items are made by MTS, with whom title remains, and are contributed to SDTI upon completion of a project or when individually purchased by MTS. SDTI's assets, deferred outflows, liabilities, deferred inflows, net position, revenues, and expenses are included in MTS's financial statements as a blended component unit. This agency has the same governing board as MTS and provides services directly to the public.

San Diego and Arizona Eastern Railway Company: MTS purchased the San Diego and Arizona Eastern Railway Company (SD&AE) in 1979. SDTI operates on a portion of the line and private operators provide freight service on a portion of the line. Purchases of capital items are made by MTS, with whom title remains, and are contributed to SD&AE. Since SD&AE provides almost exclusive benefit to MTS, its assets, deferred outflows, liabilities, deferred inflows, net position, revenues, and expenses are included in MTS's financial statements as a blended component unit. Separate financial reports are not available.

Fiduciary Activities

MTS presents its fiduciary activity information for assessing its accountability and financial reporting in their role as fiduciaries. The definition of a "fiduciary" is:

- The organization acts on behalf of another person or persons to manage assets;
- Fiduciary responsibility refers to the obligation that one party has in relationship with another one to act entirely on the other party's behalf and best interest. It is considered to be the standard of the highest care.

Included within the reporting entity as fiduciary activities is the following:

San Diego Transit Corporation Employee Retirement Plan: The San Diego Transit Corporation Employees' Retirement Plan (the "Plan") is a defined benefit plan which provides retirement and disability benefits and annual cost–of–living adjustments for Plan members, as well as joint-survivor benefits to beneficiaries. Prior to May 1, 2011, all of San Diego Transit Corporation's ("SDTC") full–time employees and certain part–time noncontract employees who had completed one year of service in which they had worked at least 1,000 hours of service, and certain part–time contract employees participated in the Plan. Effective May 1, 2011, employees in the International Brotherhood of Electrical Workers, Local 465 (the "IBEW") bargaining unit hired after May 1, 2011 participate in a separate defined contribution 401(a) plan. Effective November 1, 2012, employees in the Amalgamated Transit Union, Local 1309 (the "ATU") bargaining unit hired after November 1, 2012 participate in a separate defined contribution 401(a) plan. Therefore, as of November 1, 2012 the Plan was closed to new ATU and IBEW entrants. Upon agreement between the employer and the Union, certain modifications can be made to the Plan.

The Plan is managed by Retirement Boards which have plenary authority and fiduciary responsibility for the investment of Plan assets and administration of the Plan. The IBEW Retirement Board consists of three members from the San Diego Metropolitan Transit System ("MTS") and three members from the IBEW. The ATU Retirement Board consists of three members from MTS and three members from the ATU. The Noncontract Retirement Board consists of three members from MTS.

Note 1 – Summary of Significant Accounting Policies (Continued)

A. Reporting Entity (Continued)

Fiduciary Activities (Continued)

SDTC is a component unit of MTS. The Plan is administered and sponsored by MTS. MTS also issued taxable Pension Obligation Bonds for the benefit of SDTC. See Note 8 for further details.

SDTC is required to contribute the difference between the actuarially determined rate and the contribution rate of plan members.

The Plan is funded entirely by SDTC for employees under the IBEW bargaining units who were hired prior to May 1, 2011 and the ATU bargaining units who were hired prior to November 1, 2012. IBEW employees are required to contribute, 3% of their covered payroll from March 31, 2013 through April 6, 2014, 4% of their covered payroll from April 6, 2014 through April 4, 2015, increasing to 6% from April 5, 2015 through April 2, 2016, and to 8% thereafter. ATU employees are required to contribute 3% after July 1, 2013 and 5% after July 1, 2014, 6% after May 17, 2015, 7% after July 1, 2016 and 8% after December 1, 2017.

B. Financial Statements

Primary Government – The Financial Statements (i.e., the statement of net position, the statement of revenues, expenses and changes in net position, and statement of cash flows) report information on all of the activities of the primary government and its component units. The statement of revenues, expenses, and changes in net position demonstrates the degree to which the direct expenses of a given function or segment are offset by program revenues. Direct expenses are those that are clearly identifiable with a specific function or segment.

Fiduciary Activities – The Fiduciary Fund Financial Statements (i.e., the statement of fiduciary net position and the statement and changes in fiduciary net position) report information on the activities of the San Diego Transit Corporation Employees Retirement Plan pension trust fund. The statement of changes in fiduciary net position demonstrates the degree to which the additions to net position restricted for plan benefits were sufficient to cover deductions for distributions to plan participants and administrative expenses.

C. Measurement Focus, Basis of Accounting, and Financial Statement Presentation

Primary Government – The Financial Statements are reported using the *"economic resources"* measurement focus and the accrual basis of accounting. Revenues are recorded when earned and expenses are recorded when a liability is incurred, regardless of the timing of related cash flows. Grants and similar items are recognized as revenue as all eligibility requirements have been met. Interest associated with the current fiscal period is considered to be susceptible to accrual and so has been recognized as revenue of the current fiscal period.

Fiduciary Activities – This fiduciary pension trust fund is a defined benefit plan which provides retirement and disability benefits and annual cost–of–living adjustments for Plan members and joint-survivor benefits to beneficiaries. The Plan's financial statements are prepared using the accrual basis of accounting. Employer contributions are recognized in the period in which the contributions are due and when the employer has made a formal commitment to provide the contributions. Investment income is recognized as earned. Benefits are recognized when due and payable in accordance with the terms of the Plan.

Note 1 – Summary of Significant Accounting Policies (Continued)

C. Measurement Focus, Basis of Accounting, and Financial Statement Presentation (Continued)

In accordance with GASB Statement No. 63, *Financial Reporting of Deferred Outflows of Resources, Deferred Inflows of Resources, and Net Position*, the Statement of Net Position reports separate sections for Deferred Outflows of Resources, and Deferred Inflows of Resources, when applicable.

Deferred Outflows of Resources represent a consumption of net assets that applies to future periods and that, therefore, will not be recognized as an expense until that time.

Deferred Inflows of Resources represent an acquisition of net assets that applies to future periods and that, therefore, will not be recognized as revenue until that time.

MTS receives funding primarily from the following revenue sources:

Passenger Revenue
Passenger fares comprised approximately 17 percent and 18 percent of MTS's $413.9 million and $380.2 million operating budget for FY2024 and FY2023 respectively.

Other Operating Revenues
MTS receives a variety of operating revenues that are not received directly from passenger fares. The sources of these revenues are advertising, naming rights, interest income, energy credits, rental and land management income, income related to For Hire Vehicle administration, income from the SD&AE Railway Company, and other miscellaneous income.

Non–Operating Revenues
MTS receives subsidies that are derived from federal, state and local tax revenues. MTS does not levy or collect any tax funds, but receives allocated portions of tax funds through federal, state and local granting agencies.

Federal Transit Administration (FTA)
FTA revenues are funded by a federal gas tax and revenues of the federal general fund. On November 15, 2021, the Bipartisan Infrastructure Law was signed, reauthorizing surface transportation programs through Federal FY (FFY) 2026. The legislation establishes the legal authority to commence and continue Federal Transit Administration (FTA) programs. Each reauthorization amends the Federal Transit Laws codified in 49 USC Chapter 53. FTA funding is structured on a reimbursement basis (after expenses are incurred), and funds both the CIP and operating budgets. The reauthorization provides for the following funding streams MTS commonly receives:

- 5307 Urban Area Formula Grants for capital improvements and preventive maintenance
- 5311 Formula Grants for Rural Areas for capital improvements and to supplement operating costs
- 5337 State of Good Repair Funding for capital improvements and preventive maintenance
- 5339 Bus and Bus Facilities Funding for capital improvements
- 5311 Formula Grants for Rural Areas Funding for rural service operations
- 5311(f) Inter–City Bus Program Funding for rural service operations connecting to inter–city network

On March 27, 2020, the President signed the Coronavirus Aid, Relief, and Economic Security (CARES) Act, which provided $25 billion to the transit industry nationwide. MTS was apportioned $220 million in CARES Act funding, which continues to supplement lost revenues and increased expenses related to the pandemic. MTS received $82.4 million in FY2024 and has received $172.6 million in total.

Note 1 – Summary of Significant Accounting Policies (Continued)

C. Measurement Focus, Basis of Accounting, and Financial Statement Presentation (Continued)

Federal Transit Administration (FTA) (Continued)
On March 11, 2021, the President signed The American Rescue Plan Act of 2021 (ARP), which provided $30.5 billion to support the nation's public transportation systems. MTS was apportioned $140 million in ARP Act funding which MTS continues to utilize in addressing the structural deficit in the operating budget. MTS received $2.6 million in FY2024 and $140 million in total.

On March 16, 2023, the MTS Board of Directors directed staff to draw federal stimulus funds as fast as possible based on eligible expenses (versus budgetary need) and to keep excess funds in the operating deficit reserve until needed to address the structural deficit in current and future fiscal years. As of June 30, 2024, MTS has drawn $312.6 million of the $360 million in total apportioned stimulus funds, leaving $47.4 million in remaining funds to be drawn in future fiscal years.

Transportation Development Act (TDA)
TDA provides funding for public transit operators. This state fund is one quarter of a percent of the 7.75 percent sales tax assessed in the region. SANDAG is responsible for apportionment of these funds within the San Diego region.

State Transit Assistance (STA)
STA funding comes from the Public Transportation Act (PTA) which derives its revenue from the state sales tax on diesel fuels. These funds are appropriated by the legislature with a formula based upon population and local revenue generated. This funding was augmented by the Road Repair and Accountability Act of 2017, or SB1, which was signed by the Governor on April 28, 2017.

STA State of Good Repair Program (SGR)
The SGR Program is a supplemental STA funding source as a result of SB 1 and is funded from a portion of a new Transportation Improvement Fee on vehicle registrations due on or after January 1, 2018. The funds are allocated with the same STA Program formula.

TransNet
TransNet funds are derived from the Proposition A one-half cent local transportation sales tax that was approved by area voters in November 1987. The original ordinance expired in 2008, but has since been extended to 2048 by subsequent voter approval. The ordinance allocated one-third of the sales tax proceeds for transit purposes, which are further divided between MTS and NCTD based on the proportion of the population within the area of each jurisdiction. The *TransNet* Program also reimburses MTS for the net operating cost of the MidCoast Trolley Extension, Bus Rapid Transit and Superloop projects that were approved as part of the extension. These costs are billed to SANDAG on a monthly basis. *TransNet* funds are also apportioned by SANDAG.

SB 125 Formula-Based Transit and Intercity Rail Capital Program (TIRCP) & Zero-Emission Transit Capital Program (ZETCP)
SB125 amended the Budget Act of 2023 to appropriate $4 billion of General Funds to TIRCP. The original legislation approved funding over two fiscal years, but the State of California FY2025 budget amended that to FY2024-2026. SB 125 also establishes a $1.1 billion Zero-Emission Transit Capital Program (ZETCP) over four fiscal years, FY2024-2027. MTS is estimated to receive $284 million over the next four fiscal years.

Note 1 – Summary of Significant Accounting Policies (Continued)

C. Measurement Focus, Basis of Accounting, and Financial Statement Presentation (Continued)

Transit and Intercity Rail Capital Program (TIRCP)
The TIRCP is a discretionary program that was created by SB 862 (Chapter 36, Statutes of 2014) and modified by SB 9 (Chapter 710, Statutes of 2015) to provide grants from the Greenhouse Gas Reduction Fund to fund transformative capital improvements that will modernize California's intercity, commuter, and urban rail systems, and bus and ferry transit systems to reduce emissions of greenhouse gases by reducing congestion and vehicle miles traveled throughout California. In FY2022, MTS was awarded a total of $33.5 million for Orange Line Rail Signals, Orange Line Variable Message Signs, Imperial Ave Transit Center Improvements, and the Kearny Mesa Division Battery Electric Bus Charging Infrastructure projects. In FY2023, MTS was awarded an additional $60.4 million for Orange Line Rail Improvements and Electrification of the Kearny Mesa Division.

Low Carbon Transit Operations Program (LCTOP)
The Low Carbon Transit Operations Program (LCTOP) is one of several programs that are part of the Transit, Affordable Housing, and Sustainable Communities Program established by the California Legislature in 2014 by SB 862. The LCTOP was created to provide operating and capital assistance for transit agencies to reduce greenhouse gas emission and improve mobility, with a priority on serving disadvantaged communities.

Approved projects in LCTOP will support new or expanded bus or rail services, expand intermodal transit facilities, and may include equipment acquisition, fueling, maintenance and other costs to operate those services or facilities, with each project reducing greenhouse gas emissions. SB 862 continuously appropriates five percent of the annual auction proceeds in the Greenhouse Gas Reduction Fund for LCTOP.

Other State Revenue
MediCal provides further funding support specifically tied to several ADA Paratransit routes to aid patients in their transportation to medical appointments.

Compressed Natural Gas Rebate
Alternative fuel credits are issued by the IRS to MTS for utilizing compressed natural gas to power its vehicles. This rebate program has expired and then been reauthorized multiple times over the years, most recently being extended through the calendar year 2024. MTS has included $3.9 million in revenues for the year ended June 30, 2024 and is currently authorized to receive funds through December 31, 2024.

Other Local Subsidies
The City of San Diego provides Maintenance of Effort funds to aid ADA efforts. SANDAG provides funding, funded through FasTrak tolls, to operate services along the Interstate 15 corridor. NCTD provided partial subsidy for the Sorrento Valley Coaster Connection. The University of California, San Diego (UCSD) provides funding for shuttle services that expand frequency and span on MTS routes 201 and 202 between the La Jolla Colony area and the Gilman Transit Center on the UCSD campus.

D. Use of Restricted/Unrestricted Assets

When both restricted and unrestricted resources are available for use, it is MTS's policy to use restricted resources first, then unrestricted resources as they are needed.

Note 1 – Summary of Significant Accounting Policies (Continued)

E. Cash, Cash Equivalents, and Investments

Investments of pooled cash consist primarily of pooled investment funds, liquidity funds and governmental bonds. Investments are stated at fair value, which is based on quoted market price. Money market investments and participating interest earning investment contracts that have a remaining maturity at the time of purchase of one year or less are reported at amortized cost, which approximates fair value.

For purposes of the statement of cash flows, all highly liquid temporary investments purchased with a maturity of three months or less are considered cash equivalents.

MTS participates in an investment pool managed by the State of California titled Local Agency Investment Fund (LAIF), which has invested a portion of the pool funds in structured notes and asset–backed securities. LAIF's investments are subject to credit risk with the full faith and credit of the State of California collateralizing these investments. In addition, these structured notes and asset–backed securities are subject to market risk and to change in interest rates. The reported value of the pool is the same as the fair value of the pool shares. MTS also participates in the San Diego County Treasurer's Pooled Money Fund, which is a local government investment pool managed by the County Treasurer's Office on behalf of the Investment Pool participants.

Certain disclosure requirements, if applicable for deposit and investment risk, are specified for the following areas:

- Interest Rate Risk
- Credit Risk
  - Overall
  - Custodial Credit Risk
  - Concentration of Credit Risk
- Foreign Currency Risk

GASB Statement No. 72, *Fair Value Measurement and Application*, defined fair value, established a framework for measuring fair value and established disclosures about fair value measurement. Investments, unless otherwise specified, recorded at fair value in the Statements of Net Position, are categorized based upon the level of judgement associated with the inputs used to measure their fair value. Levels of inputs are as follows:

Level 1 – Inputs are unadjusted, quoted prices for identical assets and liabilities in active markets at the measurement date.

Level 2 – Inputs, other than quoted prices included in Level 1, that are observable for the asset or liability through corroboration with market data at the measurement date.

Level 3 – Unobservable inputs that reflect management's best estimate of what market participants would use in pricing the asset or liability at the measurement date.

F. Inventory

Inventories are valued at the weighted average unit cost.

G. Prepaid Items and Other Assets

Payments made to vendors for services that will benefit periods beyond the fiscal year ended are recorded as prepaid items.

Note 1 – Summary of Significant Accounting Policies (Continued)

H. Leases

Lessee

MTS has a policy to recognize a lease liability and a right-to-use lease asset (lease asset) in our financial statements with an initial, individual value of $10,000 or more with a lease term greater than one year. Variable payments based on future performance or usage of the underlying assets are not included in the measurement of the lease liability.

At the commencement of a lease, the lease liability is measured at the present value of payments expected to be made during the lease term. Subsequently, the lease liability is reduced by the principal portion of lease payments made.

Lease assets are recorded at the amount of the initial measurement of the lease liabilities and modified by any lease payments made to the lessor at or before the commencement of the lease term, less any lease incentives received from the lessor at or before the commencement of the lease term along with any initial direct costs that are ancillary charges necessary to place the lease assets into service. Lease assets are amortized using the straight–line method over the shorter of the lease term or the useful life of the underlying asset, unless the lease contains a purchase option that MTS has determined is reasonably certain of being exercised. In this case, the lease asset is amortized over the useful life of the underlying asset.

Key estimates and judgments related to leases include how MTS determines (1) the discount rate it uses to discount the expected lease payments to present value, (2) lease term, and (3) lease payments.

- MTS uses the interest rate charged by the lessor as the discount rate. When the interest rate charged by the lessor is not provided, MTS generally uses its estimated incremental borrowing rate as the discount rate for leases.
- The lease term includes the noncancelable period of the lease, plus any option periods that are reasonably certain to be exercised.
- Lease payments included in the measurement of the lease liability are composed of fixed payments and purchase option price that MTS is reasonably certain to exercise. MTS monitors changes in circumstances that would require a remeasurement of a lease and will remeasure any lease asset and liability if certain changes occur that are expected to significantly affect the amount of the lease liability.

Lease assets are reported as right-to-use along with other capital assets and lease liabilities are reported on the statement of net position.

Lessor

MTS is a lessor for leases of buildings, billboards, and land and recognizes leases receivable and deferred inflows of resources in the financial statements. Variable payments based on future performance or usage of the underlying asset are not included in the measurement of the lease receivable.

At the commencement of a lease, the lease receivable is measured at the present value of payments expected to be received during the lease term. Subsequently, the lease receivable is reduced by the principal portion of lease payments received. The deferred inflows of resources are initially measured as the initial amount of the lease receivable, adjusted for lease payments received at or before the lease commencement date. Subsequently, the deferred inflows of resources are recognized as revenue over the life of the lease term in a systematic and rational method.

Note 1 – Summary of Significant Accounting Policies (Continued)

H. Leases (Continued)

Lessor (Continued)

Key estimates and judgments include how MTS determines (1) the discount rate it uses to discount the expected lease receipts to present value, (2) lease term, and (3) lease receipts.

- MTS uses the incremental borrowing rate (IBR) provided by our financial institution at the time a new lease is executed. If the IBR exceeds the LAIF rate, an average of the IBR and LAIF rate will be used. Leases executed prior to July 1, 2021 used the IBR provided by our financial institutions as of that date.
- The lease term includes the noncancelable period of the lease plus any option periods that are likely to be exercised.
- Lease receipts included in the measurement of the lease receivable is composed of fixed payments from the lessee.

MTS monitors changes in circumstances that would require a remeasurement of its lease and will remeasure the lease receivable and deferred inflows of resources if certain changes occur that are expected to significantly affect the amount of the lease receivable.

I. Subscription-Based Information Technology Arrangements (SBITAs)

MTS has a policy to recognize a SBITA liability and a right-to-use subscription asset (SBITA asset) in our financial statements with an initial, individual value of $50,000 or more with a subscription term greater than one year.

At the commencement of a subscription, when the subscription asset is placed into service, the SBITA liability is measured at the present value of payments expected to be made during the subscription term. Future subscription payments are discounted using MTS's incremental borrowing rate and MTS recognizes amortization of the discount on the subscription liability as interest expense in subsequent financial reporting periods.

SBITA assets are measured as the sum of the initial subscription liability, payments made to the SBITA vendor before the commencement of the lease term, and capitalizable implementation costs less any incentives received from the SBITA vendor at or before the commencement of the subscription term. Subscription assets are amortized using the straight-line method over the subscription term.

Key estimates and judgments related to SBITAs include how MTS determines (1) the discount rate it uses to discount the expected subscription payments to present value, (2) subscription term, and (3) subscription payments.

- MTS uses the interest rate charged by the SBITA vendor as the discount rate. When the interest rate charged by the SBITA vendor is not provided, MTS generally uses its estimated incremental borrowing rate as the discount rate for SBITAs.
- The subscription term includes the period during which MTS has a noncancelable right to use the underlying IT asset. The subscription term also includes periods covered by an option to extend if it is reasonably certain to be exercised.
- Subscription payments included in the measurement of the subscription liability are composed of fixed payments and purchase option years that MTS is reasonably certain to exercise. MTS monitors changes in circumstances that would require a remeasurement of a subscription and will remeasure any subscription asset and liability if certain changes occur that are expected to significantly affect the amount of the subscription liability.

Note 1 – Summary of Significant Accounting Policies (Continued)

I. Subscription-Based Information Technology Arrangements (SBITAs) (Continued)

Right-to-use subscription assets are reported along with other capital assets and subscription liabilities are reported on the statement of net position.

J. Capital Assets

Capital, lease, and subscription assets include land and right–of–way, buildings and infrastructure assets, vehicles, equipment, and "right-to-use" assets. These capital and right-to-use assets are included on the financial statements and throughout this report as "Capital Assets." Capital and right-to-use assets are defined by the government as assets with an initial, individual cost of more than $5,000. Such assets are recorded at historical cost or estimated historical cost if purchased or constructed. Donated capital assets, donated works of art and similar items, and capital assets received in a service concession arrangement are recorded at acquisition value. The costs of normal maintenance and repairs that do not add to the value of the asset or materially extend the asset's life are not capitalized. Major outlays for capital asset improvements are recorded as assets.

Under the operating agreements between MTS and SDTC and SDTI, SDTC and SDTI are required to pay a license fee to MTS for the use of certain capital assets. Due to SDTC's and SDTI's continued shortage of operating funds sufficient to cover recurring expenditures, the payment of these fees is considered remote, and therefore, these amounts were not recorded in the accompanying basic financial statements. Buildings, vehicles, and equipment of the primary government, as well as the component units, are depreciated using the straight–line method over the following estimated useful lives:

Assets	Years
Building and structures	20 to 30
Vehicles and buses	5 to 25
Equipment and other capital assets	3 to 10
Right-to-use assets	3 to 40

K. Construction–in–Progress

Costs incurred for construction associated with the bus and trolley systems are capitalized as construction–in-progress until such time as they are complete and operational. Upon completion, they are contributed to SDTC, SDTI and MTS – Contracted Services to reflect their custodial accountability for the assets. Depreciation commences at the time of contribution.

L. Compensated Absences

It is MTS's policy to permit employees to accumulate earned but unused personal leave time up to a maximum of 500 hours, which includes both vacation and sick pay benefits. All personal leave time is accrued when incurred.

M. Pension

For purposes of measuring the net pension liability and deferred outflows/inflows of resources related to pensions and pension expense, information about the fiduciary net position of MTS, SDTC and SDTI's pension plans and additions to/deductions from the Plans' fiduciary net position have been determined on the same basis as they are reported by CalPERS. For this purpose, benefit payments (including refunds of employee contributions) are recognized when due and payable in accordance with benefit terms. The valuation dates, measurement dates, and measurement periods vary by pension plan. See Note 12 for details.

Note 1 – Summary of Significant Accounting Policies (Continued)

N. Other Postemployment Benefits

For purposes of measuring the total OPEB liability, deferred outflows of resources and deferred inflows of resources related to OPEB, and OPEB expense, of the MTS, SDTC, and SDTI's OPEB Plan ("OPEB Plan") have been determined on the same basis as they are reported by the Plan (Note 11). For this purpose, the OPEB Plan recognizes benefit payments when due and payable in accordance with the benefits terms.

O. Net Position

Net Position is classified as follows:

Net Investment in Capital Assets – This component of net position consists of capital assets, lease and subscription assets, net of accumulated depreciation and amortization, reduced by the outstanding balances of debt and deferred inflows and outflows of resources that are attributable to the acquisition, construction, or improvement of those assets.

Restricted – This component of net position consists of restricted assets reduced by liabilities and deferred inflows of resources related to those assets.

Unrestricted – This component of net position is the amount of the assets, deferred outflows of resources, liabilities, and deferred inflows of resources that are not included in the determination of net investment in capital assets or the restricted component of net position.

P. Use of Estimates

The preparation of the basic financial statements in conformity with U.S. GAAP requires management to make estimates and assumptions that affect certain reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements, and the reported amounts of revenues and expenditures during the reported period. Actual results could differ from these estimates.

Q. Implementation of New GASB Pronouncements for the Year Ended June 30, 2024

During fiscal year ended June 30, 2024, MTS has implemented the following new GASB Pronouncements:

GASB Statement No. 100 – In June 2022, GASB issued Statement No. 100, *Accounting Changes and Error Corrections – an Amendment of GASB Statement No. 62*. The primary objective of this Statement is to enhance accounting and financial reporting requirements for accounting changes and error corrections to provide more understandable, reliable, relevant, consistent, and comparable information for making decisions or assessing accountability. Application of this statement did not have a significant effect on MTS's fiscal year ending June 30, 2024.

Note 1 – Summary of Significant Accounting Policies (Continued)

R. Upcoming Government Accounting Standards Implementation

In the next two years, MTS will implement the following GASB Pronouncements:

GASB Statement No. 101 – In June 2022, GASB issued Statement No. 101, *Compensated Absences*. The objective of this Statement is to better meet the information needs of financial statement users by updating the recognition and measurement guidance for compensated absences. That objective is achieved by aligning the recognition and measurement guidance under a unified model and by amending certain previously required disclosures. Application of this statement is effective for MTS's fiscal year ending June 30, 2025.

GASB Statement No. 102 - In December 2023, GASB issued Statement No. 102, *Certain Risk Disclosures*. The objective of this Statement is to provide users of government financial statements with essential information about risks related to a government's vulnerabilities due to certain concentrations or constraints which may limit a government's ability to acquire resources or control spending. Application of this statement is effective for MTS's fiscal year ending June 30, 2025.

GASB Statement No. 103 – In December 2023, GASB issued Statement No. 103, *Financial Reporting Model Improvements*. The objective of this Statement is to improve key components of the financial reporting model to enhance its effectiveness in providing information that is essential for decision making and assessing a government's accountability. Application of this statement is effective for MTS's fiscal year ending June 30, 2026.

Note 2 – Cash, Cash Equivalents, and Investments

A. Primary Government

Cash, cash equivalents, and investments are reported in the accompanying statements of net position as follows on June 30, 2024 and 2023:

	2024	2023
Cash, cash equivalents, and investments	$ 260,077,394	$ 232,978,456
Cash, cash equivalents, and investments restricted for capital support	34,148,777	27,346,537
Total cash, cash equivalents, and investments	$ 294,226,171	$ 260,324,993

Cash, cash equivalents, and investments consisted as follows on June 30, 2024 and 2023:

Investment Type	Measurement Input	Fair Value 2024	Fair Value 2023
Cash, cash equivalents, and investments:			
Demand deposits	N/A	$ 31,040,360	$ 29,468,237
Retention trust account	N/A	3,031,659	8,531,874
San Diego County Treasurer's Pooled Money Fund	Uncategorized	193,338,700	178,968,838
State of California - Local Agency Investment Fund	Uncategorized	66,815,452	43,356,044
Total cash, cash equivalents, and investments		$ 294,226,171	$ 260,324,993

Note 2 – Cash, Cash Equivalents, and Investments (Continued)

A. Primary Government (Continued)

Demand Deposits

As of June 30, 2024, the carrying amount of demand deposits was $31,040,360 and the bank balance was $33,363,400 compared to $29,468,237 and $32,646,644 at June 30, 2023, of which the total amount was collateralized or insured with securities held by the pledging financial institutions in MTS's name as discussed below.

All cash accounts are pooled and swept nightly to a concentration account. Funds required to be held by fiscal agents under the provisions of bond indentures are not included in the pooled cash account.

Investments

Under the provisions of MTS's investment policy and in accordance with California Government Code, MTS is authorized to invest or deposit in the following:

- United States Treasury bills, notes, bonds, or strips.
- Federal Agency or U.S. government–sponsored enterprise obligations, participations, or other instruments, including those issued by or fully guaranteed as to principal and interest by Federal agencies or U.S. government–sponsored enterprises.
- Eligible Banker's Acceptances.
- Prime Commercial Paper issued by a U.S. organization with a rating category of "A" or "A–1", its equivalent or higher.
- Non–negotiable certificates of deposit that meet the requirements for deposit under California Government Code Section 53630.
- Negotiable Certificates of Deposit with issuers rated in a rating category of "A", its equivalent or higher.
- Repurchase Agreements collateralized by U.S. Treasury obligations, Federal Agency securities, or Federal Instrumentality securities.
- Reverse Repurchase Agreements.
- State of California's Local Agency Investment Fund (LAIF)
- The San Diego County Treasurer's Pooled Money Fund
- A Joint Powers Authority Pool rated among the top two rating categories by a nationally recognized statistical rating organization (NRSRO)
- Medium Term Notes issued by corporations organized and operating within the U.S. with issuers rated in a rating category of "A", its equivalent, or higher by a NRSRO
- Money Market Funds registered under the Investment Company Act of 1940
- Municipal bonds as listed below with a rating "A", its equivalent, or higher and a final maturity not exceeding five years from the date of trade settlement:
  - Municipal bonds issued by MTS
  - Registered State warrants or treasury notes or bonds of the State of California
  - Bonds, notes, warrants, or other evidences of indebtedness of a local agency within California
  - Registered treasury notes or bonds of any of the other 49 states in addition to California

Note 2 – Cash, Cash Equivalents, and Investments (Continued)

A. Primary Government (Continued)

Investments (Continued)

- Supranational obligations
- Mortgage pass–through securities, collateralized mortgage obligations, mortgage–backed or other pay–through bonds, equipment lease–backed certificates, consumer receivable pass–through certificates, or consumer receivable–backed bonds
- Commercial paper, debt securities, or other obligations of a public bank, as defined in Section 57600 of the California Government Code

For full details on the authorized investments and associated limitations, please refer to MTS Board Policy 30 on our website. **https://www.sdmts.com/about–mts–reports–records–and–policies/policies–and–procedures**

Local Agency Investment Funds

MTS's investments with Local Agency Investment Fund (LAIF) include a portion of the pool funds invested in structured notes and asset–backed securities. These investments include the following:

- Structured Notes – debt securities (other than asset–backed securities) whose cash flow characteristics (coupon rate, redemption amount, or stated maturity) depend upon one or more indices and/or that have embedded forwards or options. They are issued by corporations and by government–sponsored enterprises.

- Asset–Backed Securities – entitle their purchaser to receive a share of the cash flows from a pool of assets such as principal and interest repayments from a pool of mortgages (such as CMO's), small business loans or credit card receivables.

LAIF is overseen by the Local Investment Advisory Board, which consists of five members, in accordance with State statute. The fair value of our position in the pool is the same as the value of the pool shares.

As of June 30, 2024, MTS had $66,815,452 invested in LAIF, which had invested 3.00% of the pool investment funds in structured notes and asset–backed securities compared to $43,356,044 and 2.78% at June 30, 2023.

San Diego County Treasurer's Pooled Money Fund

The San Diego County Treasurer's Pooled Money Fund is a local government investment pool managed by the County Treasurer's Office on behalf of Investment Pool participants. Depositors in the Investment Pool include both mandatory participants, those agencies required by law to deposit their funds with the County Treasurer's Office, and voluntary participants, agencies that place their funds in the Investment Pool as an investment option. Voluntary participants, including cities, fire districts, and various special districts accounted for approximately 5.02% and 6.90% of the Investment Pool as of June 30, 2024 and 2023, respectively. At June 30, 2024 and 2023, the fair value of our position in the pool is 100.84% and 99.53%, respectively, of the value of the pool shares.

Note 2 – Cash, Cash Equivalents, and Investments (Continued)

A. Primary Government (Continued)

San Diego County Treasurer's Pooled Money Fund (Continued)

Pursuant to Sections 27130-27137 of the California Government Code, the County Board of Supervisors has established the Treasury Oversight Committee (TOC) that monitors and reviews the Investment Policy. The TOC consists of three Ex-officio positions of the County, a Board representative, and five members of the public, representing a City Official, a Special District Official, a School Official, and two members of the public having expertise in public finance per Government Code. The Investment Policy requires a financial audit to be conducted annually on a fiscal year basis, which includes limited tests of compliance with laws and regulations, with the duty of the TOC to review the audit. The Pool is not registered with the Securities and Exchange Commission (SEC) as an investment company. The Pool does not have any legally binding guarantees of share values.

To mitigate credit risk, the Investment Pool's Investment Policy, which is more restrictive than the Government Code, places a minimum standard on the ratings of investments held in the Investment Pool. Investments in securities other than those guaranteed by the U.S. Treasury or Government Sponsored Enterprises must have a credit rating of no less than "A" for long-term or "F1" for short-term. Non-rated securities include sweep accounts and repurchase agreements. Sweep accounts and collateralized certificates of deposit must be FDIC insured and collateralized with securities held by a named agent of the depository. Repurchase agreements are collateralized by securities, authorized by the California Government Code Section 53601, having fair value of at least 102% of the amount of the repurchase agreement. The Pool did not have any repurchase agreements in its portfolio as of June 30, 2024 and 2023.

MTS's investments with the County Treasurer's Office include a portion of the pool funds invested in asset–backed securities as defined in the preceding section for LAIF investments. As of June 30, 2024, MTS had $193,338,700 invested with the San Diego County Treasurer's Pooled Money Fund, which had invested 6.78% of the pool investment funds in asset–backed securities compared to $178,968,838 and 5.37% at June 30, 2023.

Disclosures Relating to Interest Rate Risk

As a means of limiting its exposure to market value losses arising from rising interest rates, MTS's investment policy limits investments to maturities dependent on the investment vehicle.

Disclosures Relating to Credit Risk

MTS's investment policy limits investments in commercial paper to instruments rated "A", its equivalent, or better by a NRSRO, and negotiable certificates of deposit to instruments rated "A", its equivalent, or better by two NRSROs. In the current year, MTS does not hold investments in commercial paper or certificates of deposit. MTS investment instruments include deposits in LAIF and the San Diego County Treasurer's Pooled Money Fund which are not rated and do not require ratings.

Disclosures Relating to Concentration of Credit Risk

The investment policy limits the amount of the percentage of the portfolio that can be invested by the type of investment for certain types of investments. MTS is in compliance with investment type percentages of the total portfolio of the investment policy.

Note 2 – Cash, Cash Equivalents, and Investments (Continued)

A. Primary Government (Continued)

Disclosures Relating to Custodial Credit Risk

Custodial credit risk for deposits is the risk that, in the event of the failure of a depository financial institution, a government will not be able to recover collateral securities that are in the possession of an outside party. The custodial credit risk for investments is the risk that, in the event of the failure of the broker or dealer to a transaction, a government will not be able to recover the value of its investments or collateral securities that are in the possession of another party. The California Government Code requires California banks and savings and loan associations to secure MTS's cash deposits by pledging securities as collateral. This Code states that collateral pledged in this manner shall have the effect of perfecting a security interest in such collateral superior to those of a general creditor. Thus, collateral for cash deposits is considered to be held in MTS's name.

The fair value of pledged securities must equal at least 110% of MTS's cash deposits. California law also allows institutions to secure MTS deposits by pledging first trust deed mortgage notes having a value of 150% of MTS's total cash deposits and letters of credit issued by the Federal Home Loan Bank of San Francisco having a value of 105% of MTS's cash deposits. MTS may waive collateral requirements for cash deposits which are fully insured up to $250,000 by the Federal Deposit Insurance Corporation. MTS has waived the collateralization requirements.

Summary of Cash, Cash Equivalents, and Investments to Maturity

Cash, cash equivalents, and investments held by MTS grouped by maturity date at June 30, 2024 and 2023, are shown below:

Maturity	2024	2023
Current to one year	$ 294,226,171	$ 260,324,993
Total	$ 294,226,171	$ 260,324,993

Note 2 – Cash, Cash Equivalents, and Investments (Continued)

B. Fiduciary Fund

Investments

The fair value, net asset value and the percentage of the investments at June 30, 2024 and 2023 were as follows:

	Fair Value June 30, 2024	Quoted Prices in Active Markets for Identical Assets (Level 1)
Investments by Fair Value Level:		
Common Stocks:		
PIMCO Research Affiliates Equity (RAE) Fund	$ 20,482,628	$ 19,055,735
Total Common Stocks	20,482,628	19,055,735
Mutual Funds:		
Fidelity U.S. Sustainability Index Fund	4,554,620	4,554,620
Vanguard Treasury Fund	20,475,886	-
PIMCO All Asset All Authority Fund	-	19,311,293
Total Mutual Funds	25,030,506	23,865,913
Corporate Bond Funds:		
Vanguard Total Bond Fund	53,838,498	52,385,530
Total Corporate Bond Funds	53,838,498	52,385,530
U.S. Treasury Inflation Protected Security Funds:		
Vanguard Fund	9,607,283	9,355,832
Total U.S. Treasury Inflation Protected Security Funds	9,607,283	9,355,832
Short-Term Investment Funds:		
First American Prime Obligations Fund	17,671,846	601,832
Total Short-Term Investment Funds	17,671,846	601,832
Total Investments by Fair Value Level	126,630,761	$ 105,264,842
Investments Measured at NAV:		
Common Stocks:		
Systematic Edge U.S. Low Vol	20,385,310	
BNYM Newton Small-Mid Cap Growth	5,737,435	
MFS Investment Management	20,344,391	
Total Common Stocks	46,467,136	
Mutual Funds:		
Westwood Trust Large Cap Equity EB Fund	20,447,910	
Total Mutual Funds	20,447,910	
Total Investments Measured at NAV	66,915,046	
Total Investments	$ 193,545,807	

Note 2 – Cash, Cash Equivalents, and Investments (Continued)

B. Fiduciary Fund (Continued)

Investments (Continued)

	Fair Value June 30, 2023	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Unobservable Inputs (Level 3)
Investments by Fair Value Level:			
Common Stocks:			
PIMCO Research Affiliates Equity (RAE) Fund	$ 19,055,735	$ 19,055,735	$ -
Total Common Stocks	19,055,735	19,055,735	-
Mutual Funds:			
GMO Benchmark Free Allocation Fund	17,070,830	17,070,830	-
Fidelity U.S. Sustainability Index Fund	3,582,321	3,582,321	-
PIMCO All Asset All Authority Fund	19,311,293	19,311,293	-
Total Mutual Funds	39,964,444	39,964,444	-
Corporate Bond Funds:			
Vanguard Total Bond Fund	52,385,530	52,385,530	-
Total Corporate Bond Funds	52,385,530	52,385,530	-
U.S. Treasury Inflation Protected Security Funds:			
Vanguard Fund	9,355,832	9,355,832	-
Total U.S. Treasury Inflation Protected Security Funds	9,355,832	9,355,832	-
Short-Term Investment Funds:			
First American Prime Obligations Fund	601,832	601,832	-
Total Short-Term Investment Funds	601,832	601,832	-
Closely Held Instruments:			
Pacific Hedge Strategies, LLC	484	-	484
Total Closely Held Instruments	484	-	484
Total Investments by Fair Value Level	121,363,857	$ 121,363,373	$ 484
Investments Measured at NAV:			
Common Stocks:			
Systematic Edge U.S. Low Vol	18,505,388		
BNYM Newton Small-Mid Cap Growth	5,575,879		
MFS Investment Management	18,717,031		
Total Common Stocks	42,798,298		
Mutual Funds:			
Westwood Trust Large Cap Equity EB Fund	19,835,188		
Total Mutual Funds	19,835,188		
Total Investments Measured at NAV	62,633,486		
Total Investments	$ 183,997,343		

Note 2 – Cash, Cash Equivalents, and Investments (Continued)

B. Fiduciary Fund (Continued)

Investments (Continued)

Fair Value Measurement – Investment Valuation

Investments are reported at fair value. Quoted market value (Level 1) and fair value per share (Level 2) in an active market are used to value investments, except for shares in the short–term investment funds, which trade and are reported at par value as reported by the investment custodian. Investment securities classified in Level 2 of the fair value hierarchy are valued using prices determined by the use of matrix pricing techniques maintained by the pricing vendors for these securities. Matrix pricing is used to value securities based on the securities' relationship to benchmark quoted prices. The calculation of realized gains and losses is independent of the calculation of the change in the fair value of investments, and realized gains and losses of the current period include unrealized amounts from prior periods.

Investments in closely held instruments (hedge funds) are reported under Level 3 under fair value measurement input hierarchy. The underlying hedge fund values are estimated by the hedge fund managers in the absence of readily ascertainable market values. In accordance with the investment manager's Valuation Policy and *Fair Value Measurements and Disclosure*, the investment manager has the right, in its discretion and in good faith, to deviate from valuation information provided by the managers of the investment vehicles when the investment manager deems it appropriate. Because of the inherent uncertainty of valuations in the investment vehicles, values may differ significantly from the values that would have been used had a ready market for these investments existed, and the differences could be material.

The following tables summarize investments, excluding cash and cash equivalents, measured at fair value based on NAV per share as of June 30, 2024 and 2023, respectively:

June 30, 2024	Fair Value	Unfunded Commitments	Redemption Frequency (if currently available)	Redemption Notice Period
Systematic Edge U.S. Low Vol	$ 20,385,310	N/A	Monthly	5 days
BNYM Newton Small-Mid Cap Growth	5,737,435	N/A	Daily	Daily
MFS Investment Management	20,344,391	N/A	Daily	Daily
Westwood Trust Large Cap Equity EB Fund	20,447,910	N/A	Daily	Daily
Total	$ 66,915,046			

June 30, 2023	Fair Value	Unfunded Commitments	Redemption Frequency (if currently available)	Redemption Notice Period
Systematic Edge U.S. Low Vol	$ 18,505,388	N/A	Monthly	5 days
BNYM Newton Small-Mid Cap Growth	5,575,879	N/A	Daily	Daily
MFS Investment Management	18,717,031	N/A	Daily	Daily
Westwood Trust Large Cap Equity EB Fund	19,835,188	N/A	Daily	Daily
Total	$ 62,633,486			

Note 2 – Cash, Cash Equivalents, and Investments (Continued)

B. Fiduciary Fund (Continued)

Investments (Continued)

Fair Value Measurement – Investment Valuation (Continued)

During the Plan years, investments, including realized gains and losses on investments and unrealized appreciation (depreciation) on investments held, appreciated (depreciated) in value as follows:

	2024	2023
Unrealized appreciation (depreciation) on investments held	$ 14,882,966	$ 4,007,454
Realized gain on investments	(5,675,076)	3,067,007
Net realized and unrealized investment gains (losses)	$ 9,207,890	$ 7,074,461

The Plan's investment policy was approved by the SDTC Pension Trustee Investment Committee. The Plan's investment policy allows investments in the following asset classes and sets forth the target allocations and allocation ranges.

Asset Class	Target Allocation	Allocation Range
Equity		
United States	25.0%	
International	20.0%	
Subtotal	45.0%	30% - 60%
Fixed Income	55.0%	40% - 70%
Total	100.0%	

Concentrations of Investments

The Plan has invested in certain organizations in excess of 5% of the Fiduciary Net Position. The concentrated investments are as follows:

	2024		2023	
	Fair Value	%	Fair Value	%
Common Stocks:				
PIMCO Research Affiliates Equity (RAE) Fund	$ 20,482,628	10.6%	$ 19,055,735	10.4%
MFS Investment Management	20,344,391	10.5%	18,717,031	10.2%
Systematic Edge U.S. Low Vol	20,385,310	10.5%	18,505,388	10.1%
Mutual Funds:				
Westwood Trust Large Cap Equity EB Fund	20,447,910	10.6%	19,835,188	10.8%
Vanguard Treasury Fund	20,475,886	10.6%	-	-
PIMCO All Asset All Authority Fund	-	-	19,311,293	10.5%
GMO Benchmark Free Allocation Fund	-	-	17,070,830	9.3%
Corporate Bond Funds:				
Vanguard Total Bond Fund	53,838,498	27.8%	52,385,530	28.5%
Short-Term Investment Funds:				
First American Prime Obligations Fund	17,671,846	9.1%	-	-
U.S. Treasury Inflation Protected Security Funds:				
Vanguard Fund	9,607,283	5.0%	9,355,832	5.1%

Note 2 – Cash, Cash Equivalents, and Investments (Continued)

B. Fiduciary Fund (Continued)

Investments (Continued)

Rate of return

For the years ended June 30, 2024 and 2023, the annual money–weighted rate of return on pension plan investments, net of pension plan investment expense, was 4.98 percent and 3.98 percent, respectively. The money–weighted rate of return express investment performance, net of investment expense, adjusted for the changing amount actually invested.

Concentration of Credit Risk

The Plan's investment policy limits the amount of the percentage of the portfolio that can be invested by type of investment. The Plan mitigates credit risk in its portfolio by allocating funds among various investment managers and limiting the concentration of investments within these managers. The individual investments in excess of 5% identified in the fair value of the investments table are, in turn, funds with diversified portfolios.

	June 30, 2024					
	Not Rated	AAA	AA	A	BBB	Total
Corporate Bond Funds:						
Vanguard Total Bond Fund (VBTIX)	$ -	$ 38,494,526	$ 1,615,155	$ 6,729,812	$ 6,999,005	$ 53,838,498
U.S. Treasury Inflation Protected Security Fund:						
Vanguard Infl-Prot;Inst (VIPIX)	-	9,607,283	-	-	-	9,607,283
All Other Investments	130,100,026	-	-	-	-	130,100,026
Total	$ 130,100,026	$ 48,101,809	$ 1,615,155	$ 6,729,812	$ 6,999,005	$ 193,545,807

	June 30, 2023					
	Not Rated	AAA	AA	A	BBB	Total
Corporate Bond Funds:						
Vanguard Total Bond Fund (VBTIX)	$ -	$ 37,036,570	$ 1,519,180	$ 6,600,577	$ 7,229,203	$ 52,385,530
U.S. Treasury Inflation Protected Security Fund:						
Vanguard Infl-Prot;Inst (VIPIX)	-	9,355,832	-	-	-	9,355,832
All Other Investments	122,255,981	-	-	-	-	122,255,981
Total	$ 122,255,981	$ 46,392,402	$ 1,519,180	$ 6,600,577	$ 7,229,203	$ 183,997,343

Interest Rate Risk

Interest rate risk is the risk that inversely affects the value of fixed income bond portfolio holdings. The Plan's investment policy endorses a long–term approach to manage the portfolio but not to expose the portfolio to levels of volatility that might significantly affect the principal value of the Plan.

The purpose of equity (both U.S. and International) investments is primarily to provide capital appreciation. It is recognized that this requires the assumption of greater market variability and risk than is the case with fixed income investment. The purpose of international, non-U.S. dollar-denominated investments is primarily to provide capital appreciation through participation in major non-U.S. financial markets and, secondarily, to enhance portfolio diversification. It is recognized that this required the assumption of greater market variability and risk than was the case with U.S. investments, and the assumption of foreign currency risk. The purpose of fixed income investments is to provide stability and generate income. The purpose of cash equivalents is to provide liquidity, stability and a vehicle for defensive positioning of the portfolio.

The use of short to intermediate maturity bonds (ten years, or less, to maturity) as temporary instruments is permitted by the Plan's investment policy but not to be employed to the extent that such holding might limit the ability to achieve the basic long-term-capital appreciation objective for the portfolio.

Note 2 – Cash, Cash Equivalents, and Investments (Continued)

B. Fiduciary Fund (Continued)

Investments (Continued)

Custodial Risk

For an investment, custodial credit risk is the risk that, in the event of the failure of the counterparty, the Plan will not be able to recover the value of its investments. All securities are held by a third–party custodian, U.S. Bank, National Association (U.S. Bank). U.S. Bank is a registered member of the Federal Reserve Bank. The securities held by U.S. Bank are in their street name, and an account number assigned to the Plan identifies ownership.

Note 3 – Accounts Receivable

A. Accounts and Other Receivables

At June 30, 2024 and 2023, the net accounts and other receivables consisted of the following:

	2024	2023
Energy credits and rebate revenue	$ 7,467,243	$ 5,080,889
Other trade receivables	6,915,401	3,865,720
Passenger revenue - general public	1,434,995	3,020,093
Pension plan receivable	600,842	1,932,057
Total accounts and other receivables	$ 16,418,481	$ 13,898,759

B. Due from Other Governments

At June 30, 2024 and 2023, amounts due from other governments consisted of the following:

	2024	2023
FTA Grant Funds	$ 78,797,137	$ 81,982,076
STA Funds	11,736,753	11,824,248
SANDAG - TransNet	10,835,227	9,163,306
State of California	8,240,620	9,800,512
US Treasury	4,062,968	5,606,285
North County Transit District - passenger revenue and shared costs	690,385	863,891
Passenger Revenue - Other Governments	463,199	1,328,140
SANDAG - Project/Route reimbursement	189,906	681,361
County of San Diego	72,653	140,010
Department of Homeland Security	51,791	45,655
UCSD Route Reimbursement	-	690,453
Total due from other governments	$ 115,140,639	$ 122,125,937

Note 3 – Accounts Receivable (Continued)

C. Lease Receivable and Related Deferred Inflows of Resources

MTS leases various types of property including land, buildings and easements. Lease receivable consists of agreements with others for the right–to–use of the underlying assets at various locations owned by MTS. The remaining terms of the agreements range from 6 to 42 years. The calculated interest rates used vary depending on the length of the lease.

For the fiscal year ended June 30, 2024, MTS recognized $1,994,826 in lease revenue and $681,049 in interest revenue, and the outstanding receivable amount is $62,709,507. For the fiscal year ended June 30, 2023, MTS recognized $1,883,472 in lease revenue and $488,660 in interest revenue and the receivable amount was $43,910,029.

A summary of changes in lease receivable for the fiscal year ended June 30, 2024 is as follows:

Balance July 1, 2023	Additions	Reductions	Balance June 30, 2024	Amounts due within one year	Amounts due in more than one year
$ 43,910,029	$ 20,589,036	$ (1,789,558)	$ 62,709,507	$ 2,181,156	$ 60,528,351

A summary of changes in lease receivable for the fiscal year ended June 30, 2023 is as follows:

Balance July 1, 2022	Additions	Reductions	Balance June 30, 2023	Amounts due within one year	Amounts due in more than one year
$ 45,446,703	$ 88,759	$ (1,625,433)	$ 43,910,029	$ 1,553,167	$ 42,356,862

As of June 30, 2024, the required payments for these leases, including interest, are:

Year Ending June 30	Lease Receivable	Interest	Total
2025	$ 2,181,156	$ 937,641	$ 3,118,797
2026	2,233,480	905,870	3,139,350
2027	2,290,153	873,048	3,163,201
2028	2,349,945	839,066	3,189,011
2029	2,411,539	803,878	3,215,417
2030-2034	12,579,846	3,451,595	16,031,441
2035-2039	14,459,730	2,382,118	16,841,848
2040-2044	13,386,739	1,137,387	14,524,126
2045-2049	2,676,106	528,234	3,204,340
2050-2054	3,074,391	370,489	3,444,880
2055-2059	3,526,067	189,423	3,715,490
2060-2064	1,223,966	56,034	1,280,000
2065-2069	316,389	3,612	320,001
Total	$ 62,709,507	$ 12,478,395	$ 75,187,902

Note 3 – Accounts Receivable (Continued)

C. Lease Receivable and Related Deferred Inflows of Resources (Continued)

As of June 30, 2024, the amounts reported as deferred inflows of resources will be recognized as lease revenue as follows:

Year Ending June 30	Total
2025	$2,928,540
2026	2,928,540
2027	2,928,540
2028	2,928,540
2029	2,928,540
2030-2034	14,150,281
2035-2039	13,941,159
2040-2044	11,114,058
2045-2049	2,424,277
2050-2054	2,424,277
2055-2059	2,424,277
2060-2064	1,232,421
2065-2069	494,469
2070-2074	81,709
Total	$ 62,929,628

In addition to the leases reported above, MTS has one additional ground lease to Union Grantville, LLC. The amount due each month, in arrears, is based on seven percent (7%) of the lessees' gross collections from the residential apartments. Since these amounts are variable, they are not included in the lease receivable and deferred inflow schedules. For fiscal year 2024, total lease revenue was $642,945. There was no revenue to report for fiscal year 2023 as the building was not occupied until August 2023.

Note 4 – Inventory

At June 30, 2024 and 2023, inventory consisted of the following repair and maintenance parts and administrative supplies:

	2024	2023
San Diego Transit Corporation	$ 4,695,813	$ 4,362,288
San Diego Trolley, Inc.	33,383,443	29,959,141
Total inventory	$ 38,079,256	$ 34,321,429

San Diego Metropolitan Transit System
Notes to the Basic Financial Statements (Continued)
For the Years Ended June 30, 2024 and 2023

Note 5 – Capital Assets

A summary of changes in capital assets for the year ended June 30, 2024 is as follows:

	Balance July 1, 2023	Additions	Deletions	Adjustments & Remeasurements	Balance June 30, 2024
Capital assets, not depreciated:					
Land and right-of-way	$ 252,472,813	$ 20,709,963	$ (3,393,891)	$ 300,000	$ 270,088,885
Construction-in-progress	88,711,277	147,918,417	(141,630,064)	-	94,999,630
Total capital assets, not depreciated	341,184,090	168,628,380	(145,023,955)	300,000	365,088,515
Capital assets, depreciated:					
Buildings and structures	3,745,185,660	55,458,798	(61,050,367)	(34,950,258)	$ 3,704,643,833
Buses and vehicles	1,025,484,871	76,458,251	(29,861,094)	-	1,072,082,028
Equipment and other capital assets	165,270,367	6,733,717	(6,684,654)	4,756,720	170,076,150
Total capital assets, depreciated	4,935,940,898	138,650,766	(97,596,115)	(30,193,538)	4,946,802,011
Less accumulated depreciation for:					
Buildings and structures	(1,428,706,080)	(133,479,428)	54,058,235	4,194,031	(1,503,933,242)
Buses and vehicles	(428,823,891)	(55,649,178)	26,475,705	-	(457,997,364)
Equipment and other capital assets	(67,918,984)	(16,471,755)	5,968,541	(3,650,195)	(82,072,393)
Total accumulated depreciation	(1,925,448,955)	(205,600,361)	86,502,481	543,836	(2,044,002,999)
Lease assets:					
Land and land improvements	9,656,946	-	-	-	9,656,946
Buildings and structures	14,256,740	-	-	-	14,256,740
Total lease assets	23,913,686	-	-		23,913,686
Less accumulated amortization for:					
Land and land improvements	(715,329)	(238,443)	-	-	(953,772)
Buildings and structures	(12,557,419)	(155,146)	-	-	(12,712,565)
Total accumulated amortization	(13,272,748)	(393,589)	-		(13,666,337)
Subscription assets:	4,230,065	1,420,387	(315,929)	523,710	5,858,233
Less: accumulated amortization	(1,088,483)	(1,354,805)	278,066		(2,165,222)
Total capital assets, depreciated/amortized, net	3,024,274,463	(67,277,602)	(11,131,497)	(29,125,992)	2,916,739,372
Total capital assets, net	$ 3,365,458,553	$ 101,350,778	$ (156,155,452)	$ (28,825,992)	$ 3,281,827,887

Note to Schedule:

Adjustment: MTS hired a consultant to review the contributed capital provided by SANDAG for the Mid City and Centerline BRT stations. It was determined that of the $88 million contributed for these two projects, $30 million actually belonged to City of San Diego and Caltrans based on a joint use and maintenance agreement outlining the maintenance responsibilities of each agency. Additionally, $5 million was reclassed from buildings to equipment and assigned a shorter useful life.

Note 5 – Capital Assets (Continued)

A summary of changes in capital assets for the year ended June 30, 2023 is as follows:

	Balance July 1, 2022	Additions	Deletions	Balance June 30, 2023
Capital assets, not depreciated:				
Land and right-of-way	$ 252,301,976	$ 170,837	$ -	$ 252,472,813
Construction-in-progress	111,978,852	85,021,312	(108,288,887)	88,711,277
Total capital assets, not depreciated	364,280,828	85,192,149	(108,288,887)	341,184,090
Capital assets, depreciated:				
Buildings and structures	3,727,938,690	44,055,150	(26,808,180)	3,745,185,660
Buses and vehicles	992,282,997	59,536,329	(26,334,455)	1,025,484,871
Equipment and other capital assets	141,047,046	27,518,583	(3,295,262)	165,270,367
Total capital assets, depreciated	4,861,268,733	131,110,062	(56,437,897)	4,935,940,898
Less accumulated depreciation:				
Buildings and structures	(1,294,831,596)	(135,217,192)	1,342,708	(1,428,706,080)
Buses and vehicles	(401,107,674)	(54,034,240)	26,318,023	(428,823,891)
Equipment and other capital assets	(56,059,863)	(14,758,279)	2,899,158	(67,918,984)
Total accumulated depreciation	(1,751,999,133)	(204,009,711)	30,559,889	(1,925,448,955)
Total capital assets, depreciated, net	3,109,269,600	(72,899,649)	(25,878,008)	3,010,491,943
Lease assets:				
Land and land improvements	9,656,946	-	-	9,656,946
Buildings and structures	14,256,740	-	-	14,256,740
Total lease assets	23,913,686	-	-	23,913,686
Less accumulated amortization:				
Land and land improvements	(476,886)	(238,443)	-	(715,329)
Buildings and structures	(12,402,273)	(155,146)	-	(12,557,419)
Total accumulated amortization	(12,879,159)	(393,589)	-	(13,272,748)
Subscription assets:	2,462,798	2,473,577	(706,310)	4,230,065
Less: accumulated amortization	(706,177)	(1,088,616)	706,310	(1,088,483)
Total capital assets, depreciated/amortized, net	3,122,060,748	(71,908,277)	(25,878,008)	3,024,274,463
Total capital assets, net	$ 3,486,341,576	$ 13,283,872	$ (134,166,895)	$ 3,365,458,553

Construction in Progress

MTS converted $141.6 million in capital assets from construction-in-progress (CIP) to assets in service in FY2024 compared to $108.3 million in FY2023. A summary of capital asset additions transferred from CIP to depreciable assets by MTS is as follows:

	2024	2023
MTS - General Operations	$ 1,136,341	$ 1,684,907
MTS - Contracted Services	32,801,165	29,562,856
San Diego Transit Corporation	54,929,222	16,206,714
San Diego Trolley, Inc.	52,763,336	60,834,410
Total	$ 141,630,064	$ 108,288,887

Note 5 – Capital Assets (Continued)

Capital Contributions

Capital asset additions totaling $17.7 million were contributed by SANDAG in FY2024 compared to $22.2 million in FY2023, due to the new UCSD Midcoast Trolley Line extension in the previous years. SANDAG also contributed spare parts for the new LRVs to SDTI. A summary of capital contributions is as follows:

	2024	2023
San Diego Trolley, Inc.	$ 17,730,666	$ 22,178,220
San Diego Trolley, Inc - LRV Spare Parts Inventory	2,499,813	1,442,517
Total capital contributions	$ 20,230,479	$ 23,620,737

Depreciation and Amortization

Depreciation and amortization expense for capital assets for the years ended June 30, 2024 and 2023 were comprised of the following:

	2024	2023
MTS - General Operations	$ 5,041,520	$ 4,564,044
MTS - Contracted Services	28,183,822	27,651,292
San Diego Transit Corporation	26,784,533	29,086,910
San Diego Trolley, Inc.	147,338,880	144,189,670
Total	$ 207,348,755	$ 205,491,916

Note 6 – Due to Other Governments

At June 30, 2024 and 2023, amounts due to other governments consisted of the following:

	2024	2023
North County Transit District - passenger revenue	$ 920,392	$ 398,647
State of California - miscellaneous	575,737	522,498
City of San Diego - miscellaneous	309,033	374,392
City of Lemon Grove - TDA funds	184,677	178,951
City of El Cajon - TDA funds	138,518	134,223
City of La Mesa - TDA funds	78,488	76,054
County of San Diego - miscellaneous	65,377	64,449
City of Chula Vista - miscellaneous	46,856	40,343
City of Coronado - TDA funds	39,736	30,423
City of Poway - TDA funds	29,633	88,654
SANDAG - project reimbursements	22,554	128,906
Other Governments - miscellaneous	17,105	75,839
Federal Transit Administration - miscellaneous	-	49,667
Total due to other governments	$ 2,428,106	$ 2,163,046

Note 7 – Unearned Revenue

At June 30, 2024 and 2023, unearned revenue consisted of the following:

	2024	2023
Caltrans LCTOP funds received in advance	$ 21,819,817	$ 14,655,273
Fare media payments received in advance	13,272,609	10,039,345
STA State of Good Repair funds received in advance	10,798,050	5,177,022
Naming rights payment received in advance	1,123,781	1,088,935
Other reimbursements received in advance	637,242	458,641
Total unearned revenue	$ 47,651,499	$ 31,419,216

Note 8 – Long–Term Liabilities

A. Summary

A summary of changes in long–term obligations for the year ended June 30, 2024 is as follows:

	Balance July 1, 2023	Additions	Reductions	Balance June 30, 2024	Amounts due within one year	Amounts due in more than one year
MTS:						
Compensated absences	$ 1,598,030	$ 1,393,955	$ (1,264,472)	$ 1,727,513	$ 1,264,472	$ 463,041
Accrued damage, injury, and employee claims	1,467,376	1,286,454	(400,522)	2,353,308	808,727	1,544,581
Subscription liability	2,357,993	1,644,733	(1,054,435)	2,948,291	714,597	2,233,694
Aggregate net pension liability	17,754,063	4,803,999	(3,225,245)	19,332,817	-	19,332,817
Aggregate total OPEB liability	6,743,351	752,993	(1,037,246)	6,459,098	137,235	6,321,863
Total MTS	29,920,813	9,882,134	(6,981,920)	32,821,027	2,925,031	29,895,996
MTS Contracted Services:						
Lease liability	9,030,480	-	(168,544)	8,861,936	171,843	8,690,093
Total MTS Contracted Services	9,030,480	-	(168,544)	8,861,936	171,843	8,690,093
San Diego Transit Corporation:						
Pension Obligation Bonds - public offering	1,845,000	-	(1,845,000)	-	-	-
Compensated absences	6,746,263	3,850,100	(3,698,724)	6,897,639	3,698,724	3,198,915
Accrued damage, injury, and employee claims	12,952,177	8,361,262	(4,457,378)	16,856,061	5,435,943	11,420,118
Lease liability	479,415	-	(92,446)	386,969	96,294	290,675
Aggregate net pension liability	160,271,145	28,689,366	(29,280,335)	159,680,176	-	159,680,176
Aggregate total OPEB liability	24,968,955	2,490,182	(6,510,857)	20,948,280	1,179,053	19,769,227
Total San Diego Transit Corporation	207,262,955	43,390,910	(45,884,740)	204,769,125	10,410,014	194,359,111
San Diego Trolley, Inc.:						
Compensated absences	3,858,422	3,549,448	(3,329,925)	4,077,945	3,329,925	748,020
Accrued damage, injury, and employee claims	7,123,997	4,652,562	(2,866,107)	8,910,452	2,717,267	6,193,185
Lease liability	1,374,906	-	(20,300)	1,354,606	23,058	1,331,548
Aggregate net pension liability	48,722,119	21,008,619	(19,499,352)	50,231,386	-	50,231,386
Aggregate total OPEB liability	10,896,484	2,041,777	(693,486)	12,244,775	260,616	11,984,159
Total San Diego Trolley, Inc.	71,975,928	31,252,406	(26,409,170)	76,819,164	6,330,866	70,488,298
Total	$ 318,190,176	$ 84,525,450	$ (79,444,374)	$ 323,271,252	$ 19,837,754	$ 303,433,498

Note 8 – Long–Term Liabilities (Continued)

A. Summary (Continued)

A summary of changes in long–term obligations for the year ended June 30, 2023 is as follows:

	Balance July 1, 2022	Additions	Reductions	Balance June 30, 2023	Amounts due within one year	Amounts due in more than one year
MTS:						
Compensated absences	$ 1,546,793	$ 1,238,149	$ (1,186,912)	$ 1,598,030	$ 1,186,912	$ 411,118
Accrued damage, injury, and employee claims	942,163	1,123,749	(598,536)	1,467,376	517,040	950,336
Subscription liability	1,179,045	2,524,531	(1,345,583)	2,357,993	555,733	1,802,260
Aggregate net pension liability	8,178,565	13,132,471	(3,556,973)	17,754,063	-	17,754,063
Aggregate total OPEB liability	8,548,040	914,802	(2,719,491)	6,743,351	124,759	6,618,592
Total MTS	20,394,606	18,933,702	(9,407,495)	29,920,813	2,384,444	27,536,369
MTS Contracted Services:						
Lease liability	9,195,788	-	(165,308)	9,030,480	168,544	8,861,936
Total MTS Contracted Services	9,195,788	-	(165,308)	9,030,480	168,544	8,861,936
San Diego Transit Corporation:						
Pension Obligation Bonds - public offering	4,830,000	-	(2,985,000)	1,845,000	1,845,000	-
Compensated absences	6,416,469	3,888,049	(3,558,255)	6,746,263	3,558,255	3,188,008
Accrued damage, injury, and employee claims	13,880,206	10,200,000	(11,128,029)	12,952,177	4,115,645	8,836,532
Lease liability	567,299	-	(87,884)	479,415	92,447	386,968
Aggregate net pension liability	126,795,212	50,935,669	(17,459,736)	160,271,145	-	160,271,145
Aggregate total OPEB liability	31,328,053	2,967,352	(9,326,450)	24,968,955	1,071,866	23,897,089
Total San Diego Transit Corporation	183,817,239	67,991,070	(44,545,354)	207,262,955	10,683,213	196,579,742
San Diego Trolley, Inc.:						
Compensated absences	3,688,139	3,259,914	(3,089,631)	3,858,422	3,089,631	768,791
Accrued damage, injury, and employee claims	6,710,940	4,015,244	(3,602,187)	7,123,997	2,371,727	4,752,270
Lease liability	1,392,613	-	(17,707)	1,374,906	20,300	1,354,606
Aggregate net pension liability	15,146,923	42,453,131	(8,877,935)	48,722,119	-	48,722,119
Aggregate total OPEB liability	13,879,939	1,066,992	(4,050,447)	10,896,484	236,924	10,659,560
Total San Diego Trolley, Inc.	40,818,554	50,795,281	(19,637,907)	71,975,928	5,718,582	66,257,346
Total	$ 254,226,187	$ 137,720,053	$ (73,756,064)	$ 318,190,176	$ 18,954,783	$ 299,235,393

Long–term debt is reported in the accompanying statement of net position as follows:

	2024		2023	
	Due Within One Year	Noncurrent Liabilities	Due Within One Year	Noncurrent Liabilities
Long-Term Liabilities:				
Compensated absences	$ 8,293,121	$ 4,409,976	$ 7,834,798	$ 4,367,917
Accrued damage, injury, and employee claims	8,961,937	19,157,884	7,004,412	14,539,138
Lease liability	291,195	10,312,316	281,291	10,603,510
Subscription liability	714,597	2,233,694	555,733	1,802,260
Long-term debt	-	-	1,845,000	-
Aggregate net pension liability	-	229,244,379	-	226,747,327
Aggregate total OPEB liability	1,576,904	38,075,249	1,433,549	41,175,241
Total long-term liabilities	$ 19,837,754	$ 303,433,498	$ 18,954,783	$ 299,235,393

Note 8 – Long–Term Liabilities (Continued)

B. Pension Obligation Bonds

In October 2004, MTS issued $77,490,000 of Taxable Pension Obligation Bonds (POBs) for the benefit of SDTC. The purpose of the bonds was to make contributions to the San Diego Transit Corporation Retirement Plan and reduce its unfunded liability. This is in essence a hedge versus the assumed investment rate of 6.00% used by the actuary to determine the Actuarial Accrued Liability. The proceeds less fees were invested into the retirement plan. The bonds are secured by a pledge of farebox revenues and, in the event of default, MTS shall cause the transfer of farebox revenues to be maintained and controlled by the bond trustee until the amounts deposited are sufficient to pay all debt service payments owed plus default interest at a rate of the non–default interest rate plus 3% from the date the event of default occurred. The bonds consist of the following:

Series A Bonds of $38,690,000 are fixed rate bonds that mature in annual installments between 2006 and 2024 and bear an interest rate from 2.58% to 5.15% increasing progressively over the maturities. Interest is due and payable semi–annually on June 1 and December 1. Principal is due and payable each year on December 1.

As of June 30, 2024, MTS had paid the final principal and interest installments. As of June 30, 2023, the outstanding balance of the Pension Obligation Bonds was $1,845,000.

C. Lease Liability

MTS has entered into leases for land and building use. The remaining terms on the leases range from four months to 37 years. The calculated interest rates used range between 0.86% and 1.94% depending on the length of the lease.

At June 30, 2024 and 2023, the outstanding balance of the leases is $10,603,511 and $10,884,801, respectively**.**

Principal and interest payments to maturity as of June 30, 2024 are as follows:

Year ending June 30	Principal	Interest	Total
2025	$ 291,195	$ 201,163	$ 492,358
2026	266,501	196,376	462,877
2027	274,896	191,535	466,431
2028	283,598	186,540	470,138
2029	292,627	181,384	474,011
2030-2034	1,242,487	834,868	2,077,355
2035-2039	1,449,226	705,679	2,154,905
2040-2044	1,724,672	552,428	2,277,100
2045-2049	1,390,681	396,442	1,787,123
2050-2054	1,450,659	261,961	1,712,620
2055-2059	1,598,298	114,322	1,712,620
2060-2061	338,671	3,851	342,522
Total	$ 10,603,511	$ 3,826,549	$ 14,430,060

Note 8 – Long–Term Liabilities (Continued)

C. Lease Liability (Continued)

In addition to the lease obligations reported above, MTS has one additional sublease with the County of San Diego. The amount due each year is based on actual operating and capital costs. Since these amounts can vary significantly year over year, they are not included in the lease liability calculations. For fiscal years 2024 and 2023, total lease payments for the sublease were $1,666,626 and $1,651,509, respectively.

D. Subscription Liability

MTS has entered into subscription-based information technology arrangements (SBITAs) for services related to cloud-based software applications, data storage and management services. Under the terms of these arrangements, MTS does not take possession of the software at any time and the vendor provides ongoing services for the software's operation. The subscription periods vary, with initial non-cancellable terms ranging from 2 to 10 years. The calculated interest rate used ranges between 0.86% and 4.04%, depending on the length of the SBITA and date of the agreement.

As of June 30, 2024, the capitalized right-to-use assets related to SBITAs were $5,858,233 and the total subscription liability was $2,948,291, of which $714,597 is reported as a current liability representing the amount due within the next fiscal year. As of June 30, 2023, the right to use asset was $4,230,065, the total subscription liability was $2,357,993 with the short term subscription payable being $555,733.

Principal and interest payments to maturity as of June 30, 2024 are as follows:

Year ending June 30	Principal	Interest	Total
2025	$ 714,597	$ 75,153	$ 789,750
2026	638,350	53,881	692,231
2027	468,527	40,004	508,531
2028	325,597	30,000	355,597
2029	293,641	20,788	314,429
2030-2034	507,579	25,907	533,486
Total	$ 2,948,291	$ 245,733	$ 3,194,024

Note 9 – Risk Management

MTS (including SDTC, SDTI, and MTS – Contracted Services) is self–insured for third party liability claims to a maximum of $7,500,000 per occurrence. Amounts in excess of the self–insured retention limits for public liability are covered through commercial insurance carriers up to $75,000,000. No stop loss or cap coverage is purchased above the $75,000,000 limits. MTS, SDTC, and SDTI purchase all–risk (excluding earthquake) insurance coverage for property damage up to $600,000,000 per occurrence with deductibles ranging from $50,000 to $500,000, depending on the type of property and peril involved. In addition, MTS, SDTC, and SDTI are self–insured for costs arising from employee workers' compensation act benefit claims including employer's liability to a retained limit of $1,000,000 per occurrence. Amounts in excess of $1,000,000 are insured up to statutory limits. MTS, SDTC, and SDTI all finance their respective unemployment insurance liabilities. MTS, SDTC and SDTI have policies for crime coverage through commercial insurance as well as cyber liability insurance to protect the agencies from third party claims alleging computer security breaches. The crime coverage policy has a limit of $3,000,000 subject to a $25,000 deductible and the cyber liability policy had a limit of $16,000,000 subject to a $250,000 deductible as of June 30th. Effective July 1, 2024, the limit increased to $18,000,000.

Note 9 – Risk Management (Continued)

These policies protect against theft, loss or unauthorized disclosure of personally identifiable information. SDTC purchases fiduciary liability coverage through commercial insurance to protect the agency from claims alleging mismanagement of the SDTC Employees' Retirement Plan. The fiduciary liability coverage policy has a limit of $2,000,000 subject to a $25,000 deductible.

Claim expenditures and liabilities in connection with these self–insurance programs are reported when it is probable that a loss has occurred and the amount of that loss can be reasonably estimated. These losses include an estimate of claims that have been incurred but not reported based upon past experience, modified for current trends and information. Claim payments up to $7,500,000 per incident are recorded as risk management expenses in the statements of revenues, expenses, and changes in net position. Claim payments did not exceed insurance coverage in any of the past three years.

	Beginning of fiscal year	Current year claims and changes in estimates	Claims payments	End of fiscal year
2022	$ 16,519,293	$ 10,914,016	$ (5,900,000)	$ 21,533,309
2023	21,533,309	7,410,241	(7,400,000)	21,543,550
2023	21,543,550	11,976,271	(5,400,000)	28,119,821

Following is a summary of accrued damage, injury, and employee claims for fiscal years 2024 and 2023:

	2024	2023
Current portion	$ 8,961,937	$ 7,004,412
Non-current portion	19,157,884	14,539,138
Total	$ 28,119,821	$ 21,543,550

MTS has established a policy to consolidate the minimum balances required in the liability claims reserve accounts of SDTC and SDTI to be held by MTS. The policy also established eligible uses for the MTS reserve account, which included the reimbursement to SDTC and SDTI of awards/settlements of individual liability claims for personal injury and/or property damage in excess of $300,000, but within the self–insurance retention at SDTC and SDTI. In connection with these self–insurance programs, liabilities for MTS, SDTC and SDTI were $28,119,821 at June 30, 2024 and $21,543,550 at June 30, 2023.

The Board has designated $5,000,000 for the purposes of funding the future claims liabilities of MTS, SDTC, and SDTI as of June 30, 2024. MTS, with approval of the Board, intends to increase this amount to $7,500,000 in FY25.

Note 10 – Commitments and Contingencies

Pending legal actions. MTS, SDTC and SDTI have been named in certain legal actions pending at June 30, 2024. While the outcome of these lawsuits is not presently determinable, in the opinion of management of MTS, SDTC and SDTI, based in part on the advice of counsel, the resolution of these matters is not expected to have a material adverse effect on the financial position or results of operations of MTS, SDTC, or SDTI, or is adequately covered by insurance.

Note 11 – Other Postemployment Benefits

Generally accepted accounting policies require that the reported results for total OPEB liability, deferred outflows of resources and deferred inflows of resources related to OPEB, and OPEB expense must pertain to certain defined timeframes. For this report, the following timeframes are used:

Valuation Date	June 30, 2023
Measurement Date	June 30, 2023
Measurement Period	July 1, 2022 - June 30, 2023

***Plan Description*:** MTS funds a Health Reimbursement Arrangement (HRA) account for MTS retirees, SDTI retirees and SDTC Management retirees to help offset the cost of the individual healthcare plan they purchase. The amount of the HRA contribution is based on the retiree's years of service/former position/Medicare eligibility and ranges between $100 and $1,400 per month. SDTC offers non-management retirees the opportunity to participate in a Kaiser HMO plan and an out–of–area reimbursement stipend which is available only to those grandfathered in to receive such benefit

Eligibility. Employees are eligible after attaining age/service years of 55/10 for MTS and SDTI management, 55/15 for SDTI union, 55/10 for SDTC management, and 55/5 for SDTC unions.

Plan Funding: MTS does not have any assets accumulated in a trust to pay related benefits for the OPEB plan. Benefits are paid to the retirees on a "Pay-As-You-Go" approach.

Employees Covered

As of the June 30, 2024 (measurement date 2023), the following current and former employees were covered by the benefit terms:

	MTS	SDTI	SDTC
Active employees	168	663	762
Inactive employees or beneficiaries currently receiving benefits	31	65	246
Inactive employees entitled to but not yet receiving benefits	-	-	-
Total	199	728	1,008

As of the June 30, 2023 (measurement date 2022), the following current and former employees were covered by the benefit terms:

	MTS	SDTI	SDTC
Active employees	160	542	753
Inactive employees or beneficiaries currently receiving benefits	30	58	231
Inactive employees entitled to but not yet receiving benefits	-	-	-
Total	190	600	984

Note 11 – Other Postemployment Benefits (Continued)

Actuarial Assumptions

The total OPEB liability, as of June 30, 2024 (measurement date 2023), was determined using the following actuarial assumptions:

	MTS	SDTI	SDTC
Actuarial Cost Method	Entry Age Cost Method (level percentage of pay)		
Valuation Date	June 30, 2023		
Measurement Date	June 30, 2023		
Actuarial Assumptions:			
Discount Rate	4.13% per annum		
Inflation	2.75% per annum		
Salary Increases	Varies by service		
Investment Rate of Return	N/A		
HAR Contrbution Inflation	3.0% per year		
Mortality Rate	Healthy Lives: Pub2010 General, combined healthy, with generational moratlity improvements with Scale MP-2021 Disabled Lives: Pub2010 General, disabled retirees, with generational mortality improvements with Scale MP-2021		

Discount Rate

The discount rate used to measure the total OPEB liability was 4.13% percent as of the measurement date June 30, 2023 and 4.09% as of the measurement date June 30, 2022. The high–quality municipal bond rate was based on the S&P Municipal Bond 20 Year High Grade Rate Index as published by S&P Dow Jones Indices as of June 30, 2023. The S&P Municipal 20 Year High Grade Rate Index consists of bonds in the S&P Municipal Bond Index with a maturity of 20 years. Eligible bonds must be rated at least AA by Standard and Poor's Ratings Services, Aa2 by Moody's or AA by Fitch. If there are multiple ratings, the lowest rating is used.

Sensitivity of the Total OPEB Liability to Changes in the Discount Rate

The following presents the total OPEB liability of MTS, SDTI and SDTC, as well as what the total OPEB liability would be if it were calculated using a discount rate that is one percentage point lower or one percentage point higher than the current rate, for year ended June 30, 2024 (measurement date 2023):

	MTS	SDTI	SDTC	Aggregate
1% Decrease	3.13%	3.13%	3.13%	3.13%
Total OPEB Liability	$ 7,567,070	$ 14,269,247	$ 24,615,100	$ 46,451,417
Current Discount Rate	4.13%	4.13%	4.13%	4.13%
Total OPEB Liability	$ 6,459,098	$ 12,244,775	$ 20,948,280	$ 39,652,153
1% Increase	5.13%	5.13%	5.13%	5.13%
Total OPEB Liability	$ 5,562,346	$ 10,599,419	$ 18,003,107	$ 34,164,872

Note 11 – Other Postemployment Benefits (Continued)

Sensitivity of the Total OPEB Liability to Changes in the Discount Rate (Continued)

The following presents the total OPEB liability of MTS, SDTI and SDTC, as well as what the total OPEB liability would be if it were calculated using a discount rate that is one percentage point lower or one percentage point higher than the current rate, for the year ended June 30, 2023 (measurement date 2022):

	MTS	SDTI	SDTC	Aggregate
1% Decrease	3.09%	3.09%	3.09%	3.09%
Total OPEB Liability	$ 7,954,909	$ 12,700,698	$ 29,053,087	$ 49,708,694
Current Discount Rate	4.09%	4.09%	4.09%	4.09%
Total OPEB Liability	$ 6,743,351	$ 10,896,484	$ 24,968,955	$ 42,608,790
1% Increase	5.09%	5.09%	5.09%	5.09%
Total OPEB Liability	$ 5,766,833	$ 9,427,183	$ 21,668,039	$ 36,862,055

Sensitivity of the Total OPEB Liability to Changes in Healthcare Cost Trend Rates

The following presents the total OPEB liability of MTS, SDTI and SDTC, as well as what the total OPEB liability would be if it were calculated using a health care cost trend rates that are one percentage point lower or one percentage point higher than the current rates, for the year ended June 30, 2024 (measurement date 2023):

	MTS	SDTI	SDTC	Aggregate
1% Decrease in Healthcare Cost Trend Rate	2.0% HRA Contribution Increase		6.00% HMO/PPO decreasing to 3.00% HMO/PPO	
Total OPEB Liability	$ 5,371,113	$ 10,280,097	$ 17,756,351	$ 33,407,561
Current Healthcare Cost Trend Rate	3.0% HRA Contribution Increase		7.0% HMO decreasing to 4.00% HMO	
Total OPEB Liability	$ 6,459,098	$ 12,244,775	$ 20,948,280	$ 39,652,153
1% Increase in Healthcare Cost Trend Rate	4.0% HRA Contribution Increase		8.0% HMO decreasing to 5.00% HMO	
Total OPEB Liability	$ 7,882,581	$ 14,791,561	$ 25,061,434	$ 47,735,576

Note 11 – Other Postemployment Benefits (Continued)

Sensitivity of the Total OPEB Liability to Changes in Healthcare Cost Trend Rates (Continued)

The following presents the total OPEB liability of MTS, SDTI and SDTC, as well as what the total OPEB liability would be if it were calculated using a health care cost trend rates that are one percentage point lower or one percentage point higher than the current rates, for the year ended June 30, 2023 (measurement date 2022):

	MTS	SDTI	SDTC	Aggregate
1% Decrease in Healthcare Cost Trend Rate	2.0% HRA Contribution Increase		6.50% HMO/PPO decreasing to 3.00% HMO/PPO	
Total OPEB Liability	$ 5,484,266	$ 9,056,498	$ 21,002,716	$ 35,543,480
Current Healthcare Cost Trend Rate	3.0% HRA Contribution Increase		7.50% HMO/PPO decreasing to 4.00% HMO/PPO	
Total OPEB Liability	$ 6,743,351	$ 10,896,484	$ 24,968,955	$ 42,608,790
1% Increase in Healthcare Cost Trend Rate	4.0% HRA Contribution Increase		8.50% HMO/PPO decreasing to 5.00% HMO/PPO	
Total OPEB Liability	$ 8,416,294	$ 13,284,149	$ 30,096,024	$ 51,796,467

Change in Total OPEB Liability

At June 30, 2024, the change in the Total OPEB liability is as follows:

	MTS	SDTI	SDTC	Aggregate
Balance at June 30, 2023	$ 6,743,351	$ 10,896,484	$ 24,968,955	$ 42,608,790
Changes Recognized for the Measurement Period:				
Service Cost	461,314	467,782	1,433,157	2,362,253
Interest on the total OPEB liability	291,679	460,997	1,057,025	1,809,701
Difference between expected and actual experience	(668,252)	1,112,998	(1,968,176)	(1,523,430)
Changes in assumptions	(221,195)	(505,754)	(3,415,439)	(4,142,388)
Benefit payments	(147,799)	(187,732)	(1,127,242)	(1,462,773)
Net Changes	(284,253)	1,348,291	(4,020,675)	(2,956,637)
Balance at June 30, 2024	$ 6,459,098	$ 12,244,775	$ 20,948,280	$ 39,652,153

At June 30, 2023, the change in the Total OPEB liability is as follows:

	MTS	SDTI	SDTC	Aggregate
Balance at June 30, 2022	$ 8,548,040	$ 13,879,939	$ 31,328,053	$ 53,756,032
Changes Recognized for the Measurement Period:				
Service Cost	714,088	749,568	2,246,032	3,709,688
Interest on the total OPEB liability	200,714	317,424	721,320	1,239,458
Difference between expected and actual experience	-	-	-	-
Changes in assumptions	(2,608,790)	(3,912,097)	(8,349,207)	(14,870,094)
Benefit payments	(110,701)	(138,350)	(977,243)	(1,226,294)
Net Changes	(1,804,689)	(2,983,455)	(6,359,098)	(11,147,242)
Balance at June 30, 2023	$ 6,743,351	$ 10,896,484	$ 24,968,955	$ 42,608,790

Note 11 – Other Postemployment Benefits (Continued)

Contributions

The contribution requirements of plan members and MTS, SDTI and SDTC are established and may be amended by MTS Management or the Board of Directors. The contribution required to be made is based on a pay–as–you–go basis (i.e., as medical insurance premiums become due).

For fiscal years 2024 and 2023, the following contributions were made:

	MTS	SDTI	SDTC	Aggregate
2024 Contributions	$ 117,417	$ 259,545	$ 1,138,087	$ 1,515,049
2023 Contributions	$ 147,799	$ 187,732	$ 1,127,242	$ 1,462,773

OPEB Expense and Deferred Outflows/Inflows of Resources Related to OPEB

For the year ended June 30, 2024 and 2023, OPEB expense is included in the accompanying statement of revenues, expenses, and changes in net position as follows:

	MTS	SDTI	SDTC	Aggregate
2024 OPEB Expense	$ 464,374	$ 552,197	$ 449,883	$ 1,466,454
2023 OPEB Expense	$ 700,304	$ 639,806	$ 1,200,089	$ 2,540,199

At June 30, 2024, (measurement date 2023) MTS, SDTI and SDTC reported deferred outflows of resources and deferred inflows of resources related to OPEB from the following sources:

	MTS		SDTI	
	Deferred Outflows of Resources	Deferred Inflows of Resources	Deferred Outflows of Resources	Deferred Inflows of Resources
Contributions made after measurement date	$ 117,417	$ -	$ 259,545	$ -
Difference between expected and actual experience	-	(945,333)	1,145,948	(1,546,636)
Changes in assumptions	822,568	(2,621,883)	1,389,414	(3,992,258)
Total	$ 939,985	$ (3,567,216)	$ 2,794,907	$ (5,538,894)

	SDTC		Aggregate	
	Deferred Outflows of Resources	Deferred Inflows of Resources	Deferred Outflows of Resources	Deferred Inflows of Resources
Contributions made after measurement date	$ 1,138,087	$ -	$ 1,515,049	$ -
Difference between expected and actual experience	-	(3,388,225)	1,145,948	(5,880,194)
Changes in assumptions	1,372,007	(9,817,906)	3,583,989	(16,432,047)
Total	$ 2,510,094	$ (13,206,131)	$ 6,244,986	$ (22,312,241)

Note 11 – Other Postemployment Benefits (Continued)

OPEB Expense and Deferred Outflows/Inflows of Resources Related to OPEB (Continued)

At June 30, 2023, (measurement date 2022) MTS, SDTI and SDTC reported deferred outflows of resources and deferred inflows of resources related to OPEB from the following sources:

	MTS		SDTI	
	Deferred Outflows of Resources	Deferred Inflows of Resources	Deferred Outflows of Resources	Deferred Inflows of Resources
Contributions made after measurement date	$ 147,799	$ -	$ 187,732	$ -
Difference between expected and actual experience	-	(383,480)	146,650	(1,725,583)
Changes in assumptions	926,537	(2,686,877)	1,571,172	(3,979,597)
Total	$ 1,074,336	$ (3,070,357)	$ 1,905,554	$ (5,705,180)

	SDTC		Aggregate	
	Deferred Outflows of Resources	Deferred Inflows of Resources	Deferred Outflows of Resources	Deferred Inflows of Resources
Contributions made after measurement date	$ 1,127,242	$ -	$ 1,462,773	$ -
Difference between expected and actual experience	-	(2,222,375)	146,650	(4,331,438)
Changes in assumptions	1,788,435	(8,056,868)	4,286,144	(14,723,342)
Total	$ 2,915,677	$ (10,279,243)	$ 5,895,567	$ (19,054,780)

The combined $1,515,049 reported as deferred outflows of resources related to contributions subsequent to the measurement date will be recognized as a reduction of the total OPEB liability in the year ended June 30, 2025 compared to the combined $1,462,773 reported this year.

As of June 30, 2024 (measurement date 2023), other amounts reported as deferred inflows of resources related to OPEB will be recognized as OPEB expense as follows:

Year Ended June 30,	MTS	SDTI	SDTC	Aggregate
2025	$ (288,619)	$ (376,582)	$ (1,969,977)	$ (2,635,178)
2026	(288,619)	(376,586)	(1,969,972)	(2,635,177)
2027	(288,619)	(270,330)	(1,762,698)	(2,321,647)
2028	(231,982)	(251,643)	(1,762,697)	(2,246,322)
2029	(221,539)	(251,643)	(1,979,227)	(2,452,409)
Thereafter	(1,425,270)	(1,476,748)	(2,389,553)	(5,291,571)
Total	$ (2,744,648)	$ (3,003,532)	$ (11,834,124)	$ (17,582,304)

As of June 30, 2023 (measurement date 2022), other amounts reported as deferred inflows of resources related to OPEB will be recognized as OPEB expense as follows:

Year Ended June 30,	MTS	SDTI	SDTC	Aggregate
2024	$ (214,498)	$ (427,186)	$ (1,367,347)	$ (2,009,031)
2025	(214,498)	(427,186)	(1,297,025)	(1,938,709)
2026	(214,498)	(427,190)	(1,297,020)	(1,938,708)
2027	(214,498)	(320,934)	(1,089,746)	(1,625,178)
2028	(157,861)	(302,247)	(1,089,745)	(1,549,853)
Thereafter	(1,127,967)	(2,082,615)	(2,349,925)	(5,560,507)
Total	$ (2,143,820)	$ (3,987,358)	$ (8,490,808)	$ (14,621,986)

Note 12 – Employee Retirement Systems

A. Summary

Aggregate Net Pension Liability

Aggregate net pension liability is reported in the accompanying statements of net position as follows:

	2024	2023
MTS CalPERS Plans	$ 19,332,817	$ 17,754,063
SDTI CalPERS Plans	47,942,045	46,298,914
SDTI PARS Plan	2,289,341	2,423,205
SDTC Retirement Plan	159,680,176	160,271,145
Total	$ 229,244,379	$ 226,747,327

Deferred Outflows of Resources

Deferred outflows of resources at June 30, 2024 are reported in the accompanying statement of net position as follows:

	Contributions Made After Measurement Date	Difference Between Expected and Actual Experience	Difference Between Projected and Actual Earnings on Pension Plan Investments	Changes in Assumptions	Changes in Employer's Proportion	Difference Between Employer's Contributions and Proportionate Share of Contributions	Total
MTS CalPERS Plans	$ 3,117,363	$ 987,625	$ 3,130,157	$ 1,167,210	$ 206,500	$ 430,669	$ 9,039,524
SDTI CalPERS Plans	7,016,748	110,231	7,545,077	4,726,630	-	-	19,398,686
SDTI PARS Plan	300,463	41,026	464,523	127,594	-	-	933,606
SDTC Retirement Plan	17,217,837	2,471,542	13,107,262	-	-	-	32,796,641
Total	$ 27,652,411	$ 3,610,424	$ 24,247,019	$ 6,021,434	$ 206,500	$ 430,669	$ 62,168,457

Deferred outflows of resources at June 30, 2023 are reported in the accompanying statement of net position as follows:

	Contributions Made After Measurement Date	Difference Between Expected and Actual Experience	Difference Between Projected and Actual Earnings on Pension Plan Investments	Changes in Assumptions	Changes in Employer's Proportion	Difference Between Employer's Contributions and Proportionate Share of Contributions	Total
MTS CalPERS Plans	$ 2,960,147	$ 356,536	$ 3,252,073	$ 1,819,275	$ 97,187	$ 206,793	$ 8,692,011
SDTI CalPERS Plans	6,229,147	667,417	8,051,866	6,302,174	-	-	21,250,604
SDTI PARS Plan	318,025	109,403	758,452	340,249	-	-	1,526,129
SDTC Retirement Plan	16,125,384	2,428,401	19,047,146	-	-	-	37,600,931
Total	$ 25,632,703	$ 3,561,757	$ 31,109,537	$ 8,461,698	$ 97,187	$ 206,793	$ 69,069,675

Note 12 – Employee Retirement Systems (Continued)

A. Summary (Continued)

Deferred Inflows of Resources

Deferred inflows of resources at June 30, 2024 are reported in the accompanying statement of net position as follows:

	Difference Between Expected and Actual Experience	Difference Between Projected and Actual Earnings on Pension Plan Investments	Changes in Assumptions	Changes in Employer's Proportion	Difference Between Employer's Contributions and Proportionate Share of Contributions	Total
MTS CalPERS Plans	$ 153,205	$ -	$ -	$ 226,182	$ 43,684	$ 423,071
SDTI CalPERS Plans	342,423	-	-	-	-	342,423
SDTI PARS Plan	-	-	-	-	-	-
SDTC Retirement Plan	-	-	-	-	-	-
Total	$ 495,628	$ -	$ -	$ 226,182	$ 43,684	$ 765,494

Deferred inflows of resources at June 30, 2023 are reported in the accompanying statement of net position as follows:

	Difference Between Expected and Actual Experience	Difference Between Projected and Actual Earnings on Pension Plan Investments	Changes in Assumptions	Changes in Employer's Proportion	Difference Between Employer's Contributions and Proportionate Share of Contributions	Total
MTS CalPERS Plans	$ 238,793	$ -	$ -	$ 359,230	$ 69,381	$ 667,404
SDTI CalPERS Plans	480,294	-	-	-	-	480,294
SDTI PARS Plan	-	-	-	-	-	-
SDTC Retirement Plan	-	-	-	-	-	-
Total	$ 719,087	$ -	$ -	$ 359,230	$ 69,381	$ 1,147,698

Pension Expense

Pension expense is included in the accompanying statements of revenues, expenses, and changes in net position as follows:

	2024	2023
MTS CalPERS Plans	$ 4,104,272	$ 1,734,279
SDTI CalPERS Plans	10,373,926	7,592,651
SDTI PARS Plan	759,123	561,012
SDTC Retirement Plan	21,463,544	24,550,685
Total	$ 36,700,865	$ 34,438,627

Note 12 – Employee Retirement Systems (Continued)

B. MTS

General Information about the Pension Plans

Plan Description – All MTS management employees working the equivalent of 1,000 hours per fiscal year are eligible to participate in the MTS Miscellaneous, MTS Miscellaneous PEPRA, or MTS Miscellaneous Second Tier cost–sharing multiple–employer defined benefit pension plans administered by California Public Employees' Retirement System (CalPERS), which acts as a common investment and administrative agent for its participating member employers. Benefit Provisions under the Plans are established by State statutes within the Public Employee's Retirement Law. CalPERS issues publicly available reports that include a full description of the pension plans regarding benefit provisions, assumptions and membership information that can be found on the CalPERS website. Copies of the CalPERS annual financial report may be obtained from the CalPERS Executive Office – 400 P Street, Sacramento, CA 95814.

Benefits Provided – CalPERS provides service retirement and disability benefits, annual cost–of–living adjustments, and death benefits to plan members and beneficiaries. Benefits are based on years of credited service, equal to one year of full–time employment and can only be amended by the MTS Board of Directors.

The Plan's provisions and benefits in effect as of June 30, 2024 are summarized as follows:

MTS Miscellaneous Plan–1223
CLOSED TO NEW MEMBERS

Hire date	Prior to December 24, 2012
Benefit formula	2.7% @ 55
Benefit vesting schedule	5 years service
Benefit payments	Monthly for life
Final Average Compensation Period	12 months
Retirement age	50–55
Monthly benefits, as a % of eligible compensation	2.0%–2.7%
Required employee contribution rates	8.00%
Required employer contribution rates	42.00%
Pre–Retirement Death Benefit	Optional Settlement 2W
Post–Retirement Death Benefit	$500 Lump Sum
Non–Industrial Standard Disability	1.8% of final compensation multiplied by service
Cost of Living Adjustments	2.00%

Note 12 – Employee Retirement Systems (Continued)

B. MTS (Continued)

General Information about the Pension Plans (Continued)

MTS Miscellaneous Second Tier Plan – 30134

Hire date	On or Between December 24 and 31, 2012 or Grandfathered classic members
Benefit formula	2.0% @ 60
Benefit vesting schedule	5 years service
Benefit payments	Monthly for life
Final Average Compensation Period	12 months
Retirement age	50–63
Monthly benefits, as a % of eligible compensation	1.092%–2.418%
Required employee contribution rates	7.00%
Required employer contribution rates	10.66%
Pre–Retirement Death Benefit	Optional Settlement 2W
Post–Retirement Death Benefit	$500 Lump Sum
Non–Industrial Standard Disability	1.8% of final compensation multiplied by service
Cost of living adjustments	2.00%

MTS PEPRA Miscellaneous Plan – 26789

Hire date	On or after January 1, 2013
Benefit formula	2.0% @ 62
Benefit vesting schedule	5 years service
Benefit payments	Monthly for life
Final Average Compensation Period	36 months
Retirement age	52–67
Monthly benefits, as a % of eligible compensation	1.0–2.5%
Required employee contribution rates	7.75%
Required employer contribution rates	7.68%
Pre–Retirement Death Benefit	Optional Settlement 2W
Post–Retirement Death Benefit	$500 Lump Sum
Non–Industrial Standard Disability	1.8% of final compensation multiplied by service
Cost of living adjustments	2.00%

Note 12 – Employee Retirement Systems (Continued)

B. MTS (Continued)

Employees Covered – At June 30, 2024 (measurement date 2023) and June 30, 2023 (measurement date 2022), the following employees were covered by the benefit terms:

	2024	2023
Inactive employees or beneficiaries currently receiving benefits	162	160
Inactive employees entitled to but not yet receiving benefits	60	58
Active employees	179	165
Total	401	383

Contributions – Section 20814(c) of the California Public Employees' Retirement Law (PERL) requires that the employer contribution rates for all public employers be determined on an annual basis by the actuary and shall be effective on the July 1 following notice of a change in the rate. The total plan contributions are determined through the CalPERS' annual actuarial valuation process. For public agency cost–sharing plans, the Plan's actuarially determined rate is based on the estimated amount necessary to pay the Plan's allocated share of the risk pool's costs of benefits earned by employees during the year, and any unfunded accrued liability. The employer is required to contribute the difference between the actuarially determined rate and the contribution rate of employees.

For the years ended June 30, 2024 and 2023 (measurement date 2023 and 2022), the active employee contribution rates and average employer contribution rates were as follows:

	2024		2023	
	Employee Contribution Rate	Employer Contribution Rate	Employee Contribution Rate	Employer Contribution Rate
MTS - Miscellaneous Plan-1223	8.00%	42.00%	8.00%	39.23%
MTS Miscellaneous Second Tier Plan - 30134	7.00%	10.66%	7.00%	9.91%
MTS PEPRA Miscellaneous Plan - 26789	7.75%	7.68%	6.75%	8.03%

For the years ended June 30, 2024 and 2023 (measurement date 2023 and 2022), the plan's proportionate share of aggregate contributions recognized as part of pension expense were:

	2024	2023
Contributions - employer	$ 2,456,504	$ 2,867,564
Contributions - employee	768,741	689,408

Note 12 – Employee Retirement Systems (Continued)

B. MTS (Continued)

Pension Liabilities, Pension Expenses and Deferred Outflows/Inflows of Resources Related to Pensions

As of June 30, 2024 and 2023 (measurement dates 2023 and 2022), MTS reported $19,332,817 and $17,754,063 net pension liabilities for its proportionate share of the aggregate net pension liability.

MTS Plans' net pension liability is measured as the proportionate share of the net pension liability. The net pension liability of the Plan is measured as of June 30, 2023, and the total pension liability used to calculate the net pension liability was determined by an actuarial valuation as of June 30, 2022 rolled forward to June 30, 2023 using standard update procedures. MTS's proportion of the net pension liability was based on a projection of the MTS's long–term share of contributions to the pension plans relative to the projected contributions of all participating employers, actuarially determined.

The following is the approach established by the plan actuary to allocate the net pension liability and pension expense to the individual employers within the risk pool:

(1) In determining a cost–sharing plan's proportionate share, total amounts of liabilities and assets are first calculated for the risk pool as a whole on the valuation date (June 30, 2022). The risk pool's fiduciary net position ("FNP") subtracted from its total pension liability ("TPL") determines the net pension liability ("NPL") at the valuation date.

(2) Using standard actuarial roll forward methods, the risk pool TPL is then computed at the measurement date (June 30, 2023). Risk pool FNP at the measurement date is then subtracted from this number to compute the NPL for the risk pool at the measurement date. For purposes of FNP in this step and any later reference thereto, the risk pool's FNP at the measurement date denotes the aggregate risk pool's FNP at June 30, 2023 less the sum of all additional side fund (or unfunded liability) contributions made by all employers during the measurement period (FY2023).

(3) The individual plan's TPL, FNP, and NPL are also calculated at the valuation date.

(4) Two ratios are created by dividing the plan's individual TPL and FNP as of the valuation date from step (3) by the amounts in step (1), the risk pool's total TPL and FNP, respectively.

(5) The plan's TPL as of the measurement date is equal to the risk pool TPL generated in step (2) multiplied by the TPL ratio generated in step (4). The plan's FNP as of the measurement date is equal to the FNP generated in step (2) multiplied by the FNP ratio generated in step (4) plus any additional side fund (or unfunded liability) contributions made by the employer on behalf of the plan during the measurement period.

(6) The plan's NPL at the measurement date is the difference between the TPL and FNP calculated in step (5).

Note 12 – Employee Retirement Systems (Continued)

B. MTS (Continued)

Pension Liabilities, Pension Expenses and Deferred Outflows/Inflows of Resources Related to Pensions (Continued)

MTS's proportionate share of the net pension liability as of June 30, 2023, 2022, and 2021 (measurement dates) were as follows:

Proportion June 30, 2021	0.430720%
Proportion June 30, 2022	0.379420%
Change - Increase (Decrease)	-0.051300%
Proportion June 30, 2023	0.386620%
Change - Increase (Decrease)	0.007200%

For the years ended June 30, 2024 and 2023, MTS recognized pension expense of $4,104,272 and $1,734,279, respectively. At June 30, 2024 and 2023, MTS reported deferred outflows of resources and deferred inflows of resources related to pensions from the following sources:

	2024		2023	
	Deferred Outflows of Resources	Deferred Inflows of Resources	Deferred Outflows of Resources	Deferred Inflows of Resources
Contributions made after measurement date	$ 3,117,363	$ -	$ 2,960,147	$ -
Difference between expected and actual experience	987,625	(153,205)	356,536	(238,793)
Changes in assumptions	1,167,210	-	1,819,275	-
Change in employer's proportion	206,500	(226,182)	97,187	(359,230)
Difference between actual and proportionate share of employer contributions	430,669	(43,684)	206,793	(69,381)
Net difference between projected and actual earnings on pension plan investments	3,130,157	-	3,252,073	-
Total	$ 9,039,524	$ (423,071)	$ 8,692,011	$ (667,404)

The $3,117,363 reported as deferred outflows of resources related to contributions subsequent to the measurement date will be recognized as a reduction of the net pension liability in the year ended June 30, 2025.

As of the measurement date June 30, 2023, other amounts reported as deferred outflows of resources and deferred inflows of resources related to pensions will be recognized as pension expense as follows:

Year Ended June 30	Amounts
2025	$ 1,721,844
2026	1,162,469
2027	2,524,960
2028	89,817
2029	-
Total	$ 5,499,090

Note 12 – Employee Retirement Systems (Continued)

B. MTS (Continued)

Pension Liabilities, Pension Expenses and Deferred Outflows/Inflows of Resources Related to Pensions (Continued)

In the previous year, other amounts reported as deferred outflows of resources and deferred inflows of resources related to pensions will be recognized as pension expense as follows:

Year Ended June 30	Amounts
2024	$ 1,426,535
2025	1,099,129
2026	549,718
2027	1,989,078
2028	-
Total	$ 5,064,460

Actuarial Assumptions – The total pension liability in the June 30, 2022 actuarial valuation was determined using the actuarial assumptions:

Valuation Date	June 30, 2022
Measurement Date	June 30, 2023
Actuarial Cost Method	Entry Age Normal
Actuarial Assumptions:	
Discount Rate	6.90%
Inflation	2.30%
Projected Salary Increase	varies by entry age and service
Payroll Growth	2.80%
Investment Rate of Return	6.90% (1)
Mortality	derived using CalPERS membership data for all funds (2)

(1) Net of pension plan investment expenses.
(2) The mortality table used was developed based on CalPERS specific data. The table includes 15 years of mortality improvements using Society of Actuaries Scales 80% of scale MP 2020.

Change in Assumptions – In the current year, the actuarial report did not have any changes in assumptions. The discount rate lowered from 7.15% in 2022 to 6.90% in 2023. The inflation rate lowered from 2.50% in 2022 to 2.30% in 2023. The payroll growth increased from 2.75% in 2022 to 2.80% in 2023. The investment rate of return lowered from 7.15% in 2022 to 6.90% in 2023.

Note 12 – Employee Retirement Systems (Continued)

B. MTS (Continued)

Pension Liabilities, Pension Expenses and Deferred Outflows/Inflows of Resources Related to Pensions (Continued)

Discount Rate – The discount rate used to measure the total pension liability was 6.90 percent. The projection of cash flows used to determine the discount rate assumed that contributions from plan members will be made at the current member contribution rates and that contributions from employers will be made at statutorily required rates, actuarially determined. Based on those assumptions, the Plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Therefore, the long-term expected rate of return on plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

Long-Term Expected Rate of Return - The long-term expected rate of return on pension plan investments was determined using a building-block method in which expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class.

In determining the long-term expected rate of return, CalPERS took into account both short-term and long-term market return expectations. Using historical returns of all the funds' asset classes, expected compound (geometric) returns were calculated over the next 20 years using a building block approach. The expected rate of return was then adjusted to account for assumed administrative expenses of 10 Basis points.

The expected real rates of return by asset class are as follows:

Asset Class	New Strategic Allocation	Real Return (a)
Global equity - cap-weighted	30.00%	4.54%
Global equity - non-cap-weighted	12.00%	3.84%
Private equity	13.00%	7.28%
Treasury	5.00%	0.27%
Mortgage-backed securities	5.00%	0.50%
Investment-grade corporates	10.00%	1.56%
High yield	5.00%	2.27%
Emerging market debt	5.00%	2.48%
Private debt	5.00%	3.57%
Real assets	15.00%	3.21%
Leverage	-5.00%	-0.59%

(a) an expected inflation of 2.30% was assumed for this period

Note 12 – Employee Retirement Systems (Continued)

B. MTS (Continued)

Sensitivity of the Proportionate Share of the Net Pension Liability to Changes in the Discount Rate

The following presents MTS's proportionate share of the net pension liability as of June 30, 2024 and 2023, calculated using the discount rate, as well as what MTS's proportionate share of the net pension liability would be if it were calculated using a discount rate that is one percentage point lower or one percentage point higher than the current rate:

	2024	2023
1% Decrease	5.90%	5.90%
Net Pension Liability	$ 29,939,269	$ 27,710,310
Current Discount Rate	6.90%	6.90%
Net Pension Liability	$ 19,332,817	$ 17,754,063
1% Increase	7.90%	7.90%
Net Pension Liability	$ 10,602,797	$ 9,562,543

Pension Plan Fiduciary Net Position – Detailed information about MTS's pension plan's fiduciary net position is available in the separately issued CalPERS financial reports.

Payable to the Pension Plan – At June 30, 2024, MTS reported a payable of $71,663 for the outstanding amount of contributions to the pension plan required for the current year compared to $42,955 for the year ended June 30, 2023.

C. SDTI

1.CalPERS Plans

Plan Description – All SDTI employees working the equivalent of 1,000 hours per fiscal year are eligible to participate in the SDTI Miscellaneous or PEPRA Miscellaneous Plan, Agent Multiple–Employer defined benefit plans administered by California Public Employees' Retirement System (CalPERS), which acts as a common investment and administrative agent for its participating member employers. Benefit Provisions under the Plans are established by State statutes within the Public Employee's Retirement Law. CalPERS issues publicly available reports that include a full description of the pension plans regarding benefit provisions, assumptions and membership information that can be found on the CalPERS website. Copies of the CalPERS annual financial report may be obtained from the CalPERS Executive Office – 400 P Street, Sacramento, CA 95814.

Benefits Provided – CalPERS provides service retirement and disability benefits, annual cost–of–living adjustments, and death benefits to plan members and beneficiaries. Plan members include both contract and non–contract employees. Benefits are based on years of credited service, equal to one year of full–time employment and can only be amended by the MTS Board of Directors.

Note 12 – Employee Retirement Systems (Continued)

C. SDTI (Continued)

1. CalPERS Plans (Continued)

The Plans' provisions and benefits in effect as of June 30, 2024 are summarized as follows:

San Diego Trolley Miscellaneous Plan – 1406
Closed to New Members

	Management Employees	Union Employees
Hire date	Prior to January 1, 2013	Prior to January 1, 2013
Benefit formula	2.0% @ 55	2.0% @ 55
Benefit vesting schedule	5 years service	5 years service
Benefit payments	Monthly for life	Monthly for life
Final Average Compensation Period	12 months	12 months
Retirement age	50–63	50–63
Monthly benefits, as a % of eligible compensation	1.426–2.418%	1.426–2.418%
Required employee contribution rates	8.00%	10.74%
Required employer contribution rates	17.49%	14.75%
Pre–Retirement Death Benefit	1959 Survivor Benefit Level 2	1959 Survivor Benefit Level 2
Post–Retirement Death Benefit	$500 Lump Sum	$500 Lump Sum
Cost of living adjustment	2.00%	2.00%
Non–Industrial Standard Disability	1.8% of final compensation multiplied by service	1.8% of final compensation multiplied by service

San Diego Trolley PEPRA Miscellaneous Plan – 26965

Hire date	On or After January 1, 2013
Benefit formula	2.0% @ 62
Benefit vesting schedule	5 years service
Benefit payments	Monthly for life
Final Average Compensation Period	36 months
Retirement age	52–67
Monthly benefits, as a % of eligible compensation	1.0–2.5%
Required employee contribution rates	7.50%
Required employer contribution rates	18.49%
Pre–Retirement Death Benefit	1959 Survivor Benefit Level 2
Post–Retirement Death Benefit	$500 Lump Sum
Cost of living adjustment	2.00%
Non–Industrial Standard Disability	1.8% of final compensation multiplied by service

Note 12 – Employee Retirement Systems (Continued)

C. SDTI (Continued)

2. PARS Plan

Plan Description – All full–time SDTI management employees employed between October 1, 2003 and December 24, 2012 are eligible to participate in the PARS Retirement Enhancement Plan, a defined benefit plan held by the Public Agency Retirement System Trust, an agent multiple employer retirement trust under Internal Revenue Service Code Section 401(a). The Plan is administered by Public Agency Retirement Services (PARS). Separate information for the Plan is included in another financial report issued by PARS. Copies of the financial report can be obtained in writing from Public Agency Retirement Services, 4350 Von Karman Avenue, Suite 100, Newport Beach, CA 92660.

Benefits Provided – PARS provides supplemental service retirement benefits, annual cost–of–living adjustments, and death benefits to plan members and beneficiaries. Members are eligible to receive benefits if they have retired under CalPERS, have terminated employment, or had their position eliminated due to internal reorganization or mandatory operating budget reductions after January 1, 2004. The Plan benefit supplements member's CalPERS benefit to provide members with an enhanced retirement benefit and MTS management has the authority to amend the Plan's benefit terms. The monthly lifetime benefit is calculated by taking the difference between (1) and (2) below and multiplying it by one–twelfth (1/12):

(1) PARS Age Factor x Benefit Service x Highest Average Annual Compensation (Subject to CalPERS Deductions) during the Last 12 Months of Employment

(2) CalPERS Age Factor x Benefit Service x Highest Average Annual Compensation (Subject to CalPERS Deductions) during the Last 12 Months of Employment

The Plan's provisions and benefits in effect as of June 30, 2024 are summarized as follows:

San Diego Trolley PARS Plan
CLOSED TO NEW MEMBERS

Hire date	Prior to January 1, 2013
Benefit formula	2.7% @ 55
Benefit vesting schedule	5 years service
Benefit payments	Monthly for life
Final Average Compensation Period	12 months
Retirement age	50–63
Monthly benefits, as a % of eligible compensation	0.282–0.574%
Required employee contribution rates	Not Required or Permitted
Required employer contribution rates	9.02%
Pre–Retirement Death Benefit	None
Post–Retirement Death Benefit	Joint–and–100% Survivor Option
Disability Retirement Benefit	None
Cost of Living Adjustment	2.00%

Note 12 – Employee Retirement Systems (Continued)

C. SDTI (Continued)

Employees Covered

At June 30, 2024 and 2023 (measurement dates 2023 and 2022), the following employees were covered by the benefit terms for each Plan:

	CalPERS Plan		PARS Plan	
	2024	2023	2024	2023
Inactive employees or beneficiaries currently receiving benefits	339	318	62	55
Inactive employees entitled to but not yet receiving benefits	107	110	1	1
Active employees	699	631	31	38
	1,145	1,059	94	94

*SDTI PEPRA Plan is included in the SDTI Miscellaneous Plan June 30, 2021 valuation report.

Contributions

1. CalPERS Plans

Section 20814(c) of the California Public Employees' Retirement Law (PERL) requires that the employer contribution rates for all public employers be determined on an annual basis by the actuary and shall be effective on the July 1 following notice of a change in the rate. Funding contributions for both Plans are determined annually on an actuarial basis as of June 30 by CalPERS. The actuarially determined rate is the estimated amount necessary to finance the costs of benefits earned by employees during the year, with an additional amount to finance any unfunded accrued liability. SDTI is required to contribute the difference between the actuarially determined rate and the contribution rate of employees.

For the years ended June 30, 2024 and 2023 (measurement dates 2023 and 2022), the active employee contribution rates and average employer contribution rates were as follows:

	2024		2023	
	Employee	Employer	Employee	Employer
SDTI Miscellaneous Plan 1406 - Management EE	8.00%	17.49%	8.00%	16.69%
SDTI Miscellaneous Plan 1406 - Union EE	10.74%	47.75%	10.34%	14.35%
SDTI Miscellaneous PEPRA Plan 26965	7.50%	18.49%	6.25%	17.69%

For the years ended June 30, 2024 and 2023 (measurement dates 2023 and 2022), the contributions recognized as part of pension expense were:

	CalPERS Plans	
	2024	2023
Contributions - employer	$ 6,229,147	$ 5,769,619
Contributions - employees	2,463,713	2,366,931

Note 12 – Employee Retirement Systems (Continued)

C. SDTI (Continued)

Contributions (Continued)

2. PARS Plan

Employer contribution rates for the PARS plan are contractually established by the Plan's administrator and agreed to by the employer, and shall be effective on the July 1 following notice of a change in the rate. Funding contributions for the Plan are determined biannually on an actuarial basis as of June 30 by PARS. For the years ended June 30, 2023 and 2022 (measurement dates) the employer's contribution rate was 9.02%.

For the years June 30, 2024 and 2023 (measurement date 2023 and 2022), the contributions recognized as part of pension expense were:

	PARS Plan	
	2024	2023
Contributions - employer	$ 318,025	$ 348,656
Contributions - employees	-	-

Net Pension Liability

1. CalPERS Plans

SDTI's net pension liability is measured as the total pension liability less the pension plan's fiduciary net position. The net pension liability of the Plan is measured as of June 30, 2023, using an annual actuarial valuation as of June 30, 2022 rolled forward to June 30, 2023 using standard update procedures. A summary of principal assumptions and methods used to determine the net pension liability is shown below.

Actuarial Assumptions – The total pension liabilities in the June 30, 2022 actuarial valuations were determined using the following actuarial assumptions:

Valuation Date	June 30, 2022
Measurement Date	June 30, 2023
Actuarial Cost Method	Entry Age Normal
Actuarial Assumptions:	
Discount Rate	6.90%
Inflation	2.30%
Projected Salary Increase	varies by entry age and service
Payroll Growth	2.80%
Investment Rate of Return	6.90% (1)
Mortality	Derived using CalPERS' Membership Data for all Funds (2)
Post Retirement Benefit Increase	Contract COLA up to 2.30% until Purchasing Power applies, 2.50% thereafter

(1) Net of pension plan investment and administrative expenses; includes inflation
(2) The mortality table used was developed based on CalPERS's specific data. The table includes 15 years of mortality improvements using the Society of Actuaries Scale 80% of scale MP 2020.

Changes in Assumptions – In the current year, the actuarial report did not have any changes in assumptions. The discount rate lowered from 7.15% in 2022 to 6.90% in 2023. The inflation rate lowered from 2.50% in 2022 to 2.30% in 2023. The payroll growth increased from 2.75% in 2022 to 2.80% in 2023. The investment rate of return lowered from 7.15% in 2022 to 6.90% in 2023.

Note 12 – Employee Retirement Systems (Continued)

C. SDTI (Continued)

Net Pension Liability (Continued)

1. CalPERS Plans (Continued)

Discount Rate – The discount rate used to measure the total pension liability was 6.90 percent. The projection of cash flows used to determine the discount rate assumed that contributions from plan members will be made at the current member contribution rates and that contributions from employers will be made at statutorily required rates, actuarially determined. Based on those assumptions, the Plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Therefore, the long-term expected rate of return on plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

Long-Term Expected Rate of Return - The long-term expected rate of return on pension plan investments was determined using a building-block method in which expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class.

In determining the long-term expected rate of return, CalPERS took into account both short-term and long-term market return expectations. Using historical returns of all the funds' asset classes, expected compound (geometric) returns were calculated over the next 20 years using a building block approach. The expected rate of return was then adjusted to account for assumed administrative expenses of 10 Basis points.

The expected real rates of return by asset class are as follows:

Asset Class	New Strategic Allocation	Real Return (a)
Global equity - cap-weighted	30.00%	4.54%
Global equity - non-cap-weighted	12.00%	3.84%
Private equity	13.00%	7.28%
Treasury	5.00%	0.27%
Mortgage-backed securities	5.00%	0.50%
Investment-grade corporates	10.00%	1.56%
High yield	5.00%	2.27%
Emerging market debt	5.00%	2.48%
Private debt	5.00%	3.57%
Real assets	15.00%	3.21%
Leverage	-5.00%	-0.59%

(a) an expected inflation of 2.30% was assumed for this period

Note 12 – Employee Retirement Systems (Continued)

C. SDTI (Continued)

Net Pension Liability (Continued)

2. PARS Plan

The net pension liability for the PARS Plan is measured as the total pension liability, less the pension plan's fiduciary net position. The net pension liability of the Plan is measured as of June 30, 2023, using an actuarial valuation as of June 30, 2021 rolled forward to June 30, 2023 using standard update procedures. A summary of principal assumptions and methods used to determine the net pension liability is shown below.

Actuarial Assumptions – The total pension liability in the June 30, 2023 actuarial valuation was determined using the following actuarial assumptions:

Valuation Date	June 30, 2021
Measurement Date	June 30, 2023
Actuarial Cost Method	Entry Age Normal
Actuarial Assumptions:	
Discount Rate	6.00%
Inflation	2.50%
Salary Increases Including Inflation	Graded rates based on years of services, 3.60% after 22 years of service
Payroll Growth	2.75%
Investment Rate of Return	6.00%
Pre-Retirement Mortality	Consistent with Non-Industrial rates used to value the Miscellaneous CalPERS Pension Plans
Post Retirement Benefit Increase	Consistent with Non-Industrial rates used to value the Miscellaneous CalPERS Pension Plans

Change in Assumptions – In the current year, the actuarial report did not have any changes in assumptions. In the prior year, the discount rate was lowered from 6.50% to 6.00%.

Discount Rate – The discount rate used to measure the total pension liability was 6.00 percent was determined by MTS. After evaluating the discount rates calculated by both CalPERS and the SDTC Actuary, the Agency found the rate suggested by the PAR's actuary was too aggressive. Please see Discount Rate under the SDTC section for more details.

Note 12 – Employee Retirement Systems (Continued)

C. SDTI (Continued)

Net Pension Liability (Continued)

2. PARS Plan (Continued)

Discount Rate (Continued)

The best estimate for the long–term expected rate of return of 6.00 percent was determined by adding expected inflation to expected long–term real returns and reflecting expected volatility and correlation. The rate of return was calculated using the capital market assumptions applied to determine the discount rate and asset allocation. The table below reflects long–term expected real rate of return presented as arithmetic and geometric means by asset class.

Asset Class	Target Allocation	Long-Term Expected Arithmetic Real Rate of Return (a)	Long-Term Expected Geometric Real Rate of Return (a)
U.S. Cash	4.78%	0.51%	0.49%
U.S. Core Fixed Income	37.70%	2.07%	1.93%
U.S. Equity Market	44.26%	5.56%	3.90%
Foreign Developed Equity	7.03%	6.89%	5.07%
Emerging Market Equity	4.44%	9.58%	6.18%
U.S. REITs	1.79%	6.96%	4.74%

(a) Assumed inflation: 2.32% mean and 1.42% standard deviation

Sensitivity of the Net Pension Liability to Changes in the Discount Rate

The following presents SDTI's net pension liability at June 30, 2024 and 2023, calculated using the discount rate, as well as what SDTI's net pension liability would be if it were calculated using a discount rate that is one percentage point lower or one percentage point higher than the current rate:

	CalPERS Plan		PARS Plan	
	2024	2023	2024	2023
1% Decrease	5.90%	5.90%	5.00%	5.00%
Net Pension Liability	$ 78,935,037	$ 75,854,037	$ 3,580,930	$ 3,703,766
Current Discount Rate	6.90%	6.90%	6.00%	6.00%
Net Pension Liability	$ 47,942,045	$ 46,298,914	$ 2,289,341	$ 2,423,205
1% Increase	7.90%	7.90%	7.00%	7.00%
Net Pension Liability	$ 22,511,225	$ 22,039,030	$ 1,205,976	$ 1,351,096

Note 12 – Employee Retirement Systems (Continued)

C. SDTI (Continued)

Changes in the Net Pension Liability

1. CalPERS Plans

At June 30, 2024 (measurement date 2023), the change in the Net Pension Liability for the Plan is as follows:

	Total Pension Liability	Plan Fiduciary Net Position	Net Pension Liability
Balance at July 1, 2023	$ 203,602,024	$ 157,303,110	$ 46,298,914
Changes in the year:			
Service cost	5,794,970	-	5,794,970
Interest on the total pension liability	13,977,882	-	13,977,882
Changes of assumptions	-	-	-
Changes of benefits terms	216,615	-	216,615
Difference between expected and actual experience	56,691	-	56,691
Benefit payments, including refunds of member contributions	(8,389,627)	(8,389,627)	-
Net Plan to Plan resource movement	-	-	-
Contributions - employer	-	6,229,147	(6,229,147)
Contributions - employee	-	2,463,713	(2,463,713)
Net investment income	-	9,825,840	(9,825,840)
Administrative expense	-	(115,673)	115,673
Net Changes	11,656,531	10,013,400	1,643,131
Balance at June 30, 2024	$ 215,258,555	$ 167,316,510	$ 47,942,045

At June 30, 2023 (measurement date 2022), the change in the Net Pension Liability for the Plan is as follows:

	Total Pension Liability	Plan Fiduciary Net Position	Net Pension Liability
Balance at July 1, 2022	$ 184,420,051	$ 169,165,966	$ 15,254,085
Changes in the year:			
Service cost	5,576,840	-	5,576,840
Interest on the total pension liability	13,189,942	-	13,189,942
Changes of assumptions	7,877,718	-	7,877,718
Difference between expected and actual experience	(392,728)	-	(392,728)
Benefit payments, including refunds of member contributions	(7,069,799)	(7,069,799)	-
Net Plan to Plan resource movement	-	-	-
Contributions - employer	-	5,769,619	(5,769,619)
Contributions - employee	-	2,366,931	(2,366,931)
Net investment income	-	(12,824,227)	12,824,227
Administrative expense	-	(105,380)	105,380
Net Changes	19,181,973	(11,862,856)	31,044,829
Balance at June 30, 2023	$ 203,602,024	$ 157,303,110	$ 46,298,914

Pension Plan Fiduciary Net Position – Detailed information about each pension plan's fiduciary net position is available in the separately issued CalPERS financial reports.

Note 12 – Employee Retirement Systems (Continued)

C. SDTI (Continued)

Changes in the Net Pension Liability (Continued)

2. PARS Plan

At June 30, 2024 (measurement date 2023), the change in the net pension liability for the Plan is as follows:

	Total Pension Liability	Plan Fiduciary Net Position	Net Pension Liability
Balance at July 1, 2023	$ 10,521,086	$ 8,097,881	$ 2,423,205
Changes in the year:			
Service cost	199,311	-	199,311
Interest on the total pension liability	628,518	-	628,518
Changes of assumptions	-	-	-
Difference between expected and actual experience	-	-	-
Benefit payments, including refunds of member contributions	(497,452)	(497,452)	-
Contributions - employer	-	318,025	(318,025)
Contributions - employee	-	-	-
Net investment income	-	662,626	(662,626)
Administrative expense	-	(18,958)	18,958
Net Changes	330,377	464,241	(133,864)
Balance at June 30, 2024	$ 10,851,463	$ 8,562,122	$ 2,289,341

At June 30, 2023 (measurement date 2022), the change in the net pension liability for the Plan is as follows:

	Total Pension Liability	Plan Fiduciary Net Position	Net Pension Liability/(Asset)
Balance at July 1, 2022	$ 9,458,310	$ 9,565,472	$ (107,162)
Changes in the year:			
Service cost	193,977	-	193,977
Interest on the total pension liability	566,474	-	566,474
Changes of assumptions	552,904	-	552,904
Difference between expected and actual experience	177,780	-	177,780
Benefit payments, including refunds of member contributions	(428,359)	(428,359)	-
Contributions - employer	-	348,656	(348,656)
Contributions - employee	-	-	-
Net investment income	-	(1,370,500)	1,370,500
Administrative expense	-	(17,388)	17,388
Net Changes	1,062,776	(1,467,591)	2,530,367
Balance at June 30, 2023	$ 10,521,086	$ 8,097,881	$ 2,423,205

Pension Plan Fiduciary Net Position – Detailed information about the PARS Plan's fiduciary net position is available in the separately issued financial reports.

Note 12 – Employee Retirement Systems (Continued)

C. SDTI (Continued)

Pension Expenses and Deferred Outflows/Inflows of Resources Related to Pensions

For the year ended June 30, 2024 and 2023, SDTI recognized pension expense of $11,133,049 and $8,153,663, respectively. At June 30, 2024 and 2023, SDTI reported deferred outflows of resources and deferred inflows of resources related to pensions from the following sources:

	CalPERS Plans			
	2024		2023	
	Deferred Outflows of Resources	Deferred Inflows of Resources	Deferred Outflows of Resources	Deferred Inflows of Resources
Contributions made after measurement date	$ 7,016,748	$ -	$ 6,229,147	$ -
Difference between expected and actual experience	110,231	(342,423)	667,417	(480,294)
Changes in assumptions	4,726,630	-	6,302,174	-
Net difference between projected and actual earnings on pension plan investments	7,545,077	-	8,051,866	-
Total	$ 19,398,686	$ (342,423)	$ 21,250,604	$ (480,294)

	PARS Plan			
	2024		2023	
	Deferred Outflows of Resources	Deferred Inflows of Resources	Deferred Outflows of Resources	Deferred Inflows of Resources
Contributions made after measurement date	$ 300,463	$ -	$ 318,025	$ -
Difference between expected and actual experience	41,026	-	109,403	-
Changes in assumptions	127,594	-	340,249	-
Net difference between projected and actual earnings on pension plan investments	464,523	-	758,452	-
Total	$ 933,606	$ -	$ 1,526,129	$ -

The combined $7,317,211 reported as deferred outflows of resources related to contributions subsequent to the measurement date for the two plans will be recognized as a reduction of the net pension liability in the year ended June 30, 2024 compared to $6,547,172 for the previous year.

Note 12 – Employee Retirement Systems (Continued)

C. SDTI (Continued)

Pension Expenses and Deferred Outflows/Inflows of Resources Related to Pensions (Continued)

As of the measurement date, June 30, 2023, other amounts reported as deferred outflows of resources and deferred inflows of resources related to pensions will be recognized as pension expense as follows:

Year Ended June 30	SDTI CalPERS Plan	SDTI PARS Plan
2025	$ 2,909,497	$ 272,698
2026	2,299,149	45,181
2027	6,616,824	351,786
2028	214,045	(36,522)
2029	-	-
Total	$ 12,039,515	$ 633,143

In the previous year, other amounts reported as deferred outflows of resources and deferred inflows of resources related to pensions will be recognized as pension expense as follows:

Year Ended June 30	SDTI CalPERS Plan	SDTI PARS Plan
2024	$ 3,364,917	$ 428,867
2025	2,693,089	309,222
2026	2,082,741	81,705
2027	6,400,416	388,310
2028	-	-
Total	$ 14,541,163	$ 1,208,104

Payable to the Pension Plan

At June 30, 2024, SDTI reported a payable of $159,923 to CalPERS and $6,513 to PARS for the outstanding amount of contributions to the pension plans required for the fiscal year compared to $91,881 payable to CalPERS and $4,626 payable to PARS for the year ended June 30, 2023.

Note 12 – Employee Retirement Systems (Continued)

D. SDTC

General Information about the Pension Plans

Plan Description - The San Diego Transit Corporation Employees' Retirement Plan (the "Plan") is a single employer defined benefit plan which is currently open to all full-time non-contract employees and certain part-time non-contract employees who have completed one year of service in which they have worked at least 1,000 hours. Effective May 1, 2011, employees in the International Brotherhood of Electrical Workers, Local 465 (the "IBEW") bargaining unit hired after May 1, 2011 participate in a separate defined contribution 401(a) plan. Effective November 1, 2012, employees in the Amalgamated Transit Union, Local 1309 (the "ATU") bargaining unit hired after November 1, 2012 participate in a separate defined contribution 401(a) plan. Therefore, as of November 1, 2012 the Plan was closed to new ATU and IBEW entrants, but remains open for non-contract employees.

The SDTC Plan issues a publicly available financial report that includes financial statements and required supplementary information. The financial report may be obtained by writing to San Diego Transit Corporation, 1255 Imperial Avenue, Suite 1000, San Diego, CA 92101.

Benefits Provided – The SDTC Plan provides retirement and disability benefits and annual cost-of-living adjustments for Plan members as well as joint-survivor benefits to beneficiaries. Benefits are based on years of credited service, equal to one year of full-time employment and can only be amended by the MTS Board of Directors.

The Plan's provisions and benefits as of June 30, 2024 are as follows:

	San Diego Transit Pension Plan – Non–Contract Employees	
Hire date	Prior to January 1, 2013	On or after January 1, 2013
Benefit formula	2% @ 55	2% @ 62
Benefit vesting schedule	5 years service	5 years service
Benefit payments	Monthly for life	Monthly for life
Final Average Compensation Period	12 months	36 months
Retirement age	53–63	52–67
Monthly benefits, as a % of eligible compensation	1.742%–2.418%	1.0%–2.5%
Required employee contribution rates	8.00%	9.50%
Required employer contribution rates	74.29%	72.79%
Pre–Retirement Death Benefit	50% Joint & Survivor	
Post–Retirement Death Benefit	Based on benefit election	
Non–Industrial Standard Disability	1.5% times average monthly final earnings times credited years of service	
Cost of living adjustment	Lesser of CPI or 2.0%	

Note 12 – Employee Retirement Systems (Continued)

D. SDTC (Continued)

General Information about the Pension Plans (Continued)

	SDTC Contract Employees	
	ATU – Closed Plan	**IBEW – Closed Plan**
Hire date	Prior to November 25, 2012	Prior to January 1, 2013
Benefit formula	2% @ 55	2% @ 55
Benefit vesting schedule	5 years service	5 years service
Benefit payments	Monthly for life	Monthly for life
Final Average Compensation Period	36 months	36 months
Retirement age	53–63	55–65
Monthly benefits, as a % of eligible compensation	1.742%–2.418%	2.0%–2.418%
Required employee contribution rates	8.00%	8.00%
Required employer contribution rates	74.29%	74.29%
Pre–Retirement Death Benefit	50% Joint & Survivor	
Post–Retirement Death Benefit	Based on benefit election	
Disability	1.5% times average monthly final earnings times credited years of service	

Employees Covered – At June 30, 2024 and 2023 (measurement date 2023 and 2022), the following employees were covered by the benefit terms for the Plan:

	2024	2023
Inactive employees or beneficiaries currently receiving benefits	1,066	1,058
Inactive employees entitled to but not yet receiving benefits	175	184
Active employees	310	331
	1,551	1,573

Contributions – Section 20814(c) of the California Public Employees' Retirement Law (PERL) requires that the employer contribution rates for all public employers be determined on an annual basis by the actuary and shall be effective on the July 1 following notice of a change in the rate. The employer is required to contribute the difference between the actuarially determined rate and the contribution rate of employees. For the period ended June 30, 2023 (measurement date), the active employee contribution rate is 8.00–9.50% of annual pay, and the average employer's contribution rate is 73.92% of annual payroll compared to 7.75–8.00% and 69.15% for the previous year.

For the year ended June 30, 2024 and 2023 (measurement date 2023 and 2022), the contributions recognized as part of pension expense for the Plan were as follows:

	2024	2023
Contributions - employer	$ 16,157,770	$ 15,838,082
Contributions - employees	1,719,444	1,621,654

Note 12 – Employee Retirement Systems (Continued)

D. SDTC (Continued)

Net Pension Liability

SDTC's net pension liability is measured as the total pension liability less the pension plan's fiduciary net position. The net pension liability of the Plan is measured as of July 1, 2023, using an annual actuarial valuation as of July 1, 2023.

Actuarial Assumptions – The total pension liabilities in the July 1, 2023 actuarial valuations were determined using the following actuarial assumptions:

Valuation Date	July 1, 2023
Measurement Date	July 1, 2023
Actuarial Cost Method	Individual entry age to final decrement
Actuarial Assumptions:	
Discount Rate	6.00%
Inflation	2.50%
Projected Salary Increase	2.75% plus merit component based on employee classification and years of service
Investment Rate of Return (1)	6.00%
Mortality	RP-2000 Tables using male rates for both male and female members with generational improvements using Scale MP-2015
COLA Increase - Non-Contract Members	2.00%

(1) Net of pension plan investment expenses.

Changes in Assumptions – In the current year, the actuarial report did not have any changes in assumptions.

Discount Rate – The discount rate used to measure the Total Pension Liability was 6.00%.

SDTC has assumed that plan member contributions will continue to be made at the required rates. Employer contributions are assumed to be made in accordance with the historical and legal practice of contributing to the Plan based on an actuarially determined contribution. This includes contributions equal to the employer portion of the the Entry Age normal cost for members as of the valuation date, plus the expected administrative expenses, plus an amortization payment of the Unfunded Actuarial Liability. The amortization payment consists of several layers as follows:

- 15-year closed periods for actuarial experience gains and losses; the period for future experience gains and losses will be reduced so that the UAL layer will be fully amoritzed by June 30, 2037
- 25-year closed amortization of the Unfunded Actuarial Liabity as of June 30, 2012

While a formal cash flow projection was not perofrmed as described under Paragraph 27, we believe the above approach satisfies the alternative approach described in Paragraph 29. Therefore, the long-term expected rate of return on Plan investments was applied to all periods of projected benefit payments to determine the Total Pension Liability.

Note 12 – Employee Retirement Systems (Continued)

D. SDTC (Continued)

Net Pension Liability (Continued)

Discount Rate (Continued)

According to Paragraph 30 of GASB Statement 68, the long–term expected rate of return should be determined net of pension plan investment expenses but without reduction for pension plan administrative expenses. The 6.00% investment return assumption used in the Total Pension Liability is net of investment expenses only.

The table below reflects long–term expected real rate of return by asset class. The critical inputs of the asset allocation model are the expected risk, return and correlations of different asset classes.

Asset Class	Target Allocation	Real Return (a)
United States Equity	25.00%	4.00%
International Equity	20.00%	6.65%
Fixed Income	55.00%	1.50%

(a) an expected inflation of 2.5% is used.

Sensitivity of the Net Pension Liability to Changes in the Discount Rate – The following presents the net pension liability for the SDTC Plan as of June 30, 2024 and 2023, calculated using the discount rate, as well as what SDTC's net pension liability would be if it were calculated using a discount rate that is one percentage point lower or one percentage point higher than the current rate:

	2024	2023
1% Decrease	5.00%	5.00%
Net Pension Liability	$ 195,575,453	$ 196,007,935
Current Discount Rate	6.00%	6.00%
Net Pension Liability	$ 159,680,176	$ 160,271,145
1% Increase	7.00%	7.00%
Net Pension Liability	$ 129,138,346	$ 129,904,478

Note 12 – Employee Retirement Systems (Continued)

D. SDTC (Continued)

Changes in Net Pension Liability

At June 30, 2024 (measurement date 2023), the change in the Net Pension Liability for the SDTC Plan is as follows:

	Total Pension Liability	Plan Fiduciary Net Position	Net Pension Liability
Balance at July 1, 2023	$ 337,148,571	$ 176,877,426	$ 160,271,145
Changes in the year:			
Service cost	3,615,035	-	3,615,035
Interest on the total pension liability	19,776,787	-	19,776,787
Changes of assumptions	-	-	-
Difference between expected and actual experience	4,943,085	-	4,943,085
Benefit payments, including refunds of member contributions	(22,630,610)	(22,630,610)	-
Contributions - employer	-	16,157,770	(16,157,770)
Contributions - employee	-	1,719,444	(1,719,444)
Net investment income	-	11,403,121	(11,403,121)
Administrative expense	-	(354,459)	354,459
Net Changes	5,704,297	6,295,266	(590,969)
Balance at June 30, 2024	$ 342,852,868	$ 183,172,692	$ 159,680,176

At June 30, 2023 (measurement date 2022), the change in the Net Pension Liability for the SDTC Plan is as follows:

	Total Pension Liability	Plan Fiduciary Net Position	Net Pension Liability
Balance at July 1, 2022	$ 331,267,043	$ 204,471,831	$ 126,795,212
Changes in the year:			
Service cost	3,612,367	-	3,612,367
Interest on the total pension liability	19,441,516	-	19,441,516
Changes of assumptions	-	-	-
Difference between expected and actual experience	4,856,802	-	4,856,802
Benefit payments, including refunds of member contributions	(22,029,157)	(22,029,157)	-
Contributions - employer	-	15,838,082	(15,838,082)
Contributions - employee	-	1,621,654	(1,621,654)
Net investment income	-	(22,759,878)	22,759,878
Administrative expense	-	(265,106)	265,106
Net Changes	5,881,528	(27,594,405)	33,475,933
Balance at June 30, 2023	$ 337,148,571	$ 176,877,426	$ 160,271,145

Pension Plan Fiduciary Net Position – Detailed information about the SDTC Plan's fiduciary net position is available in the separately issued financial reports. The financial report may be obtained by writing to San Diego Transit Corporation, 1255 Imperial Avenue, Suite 1000, San Diego, CA 92101.

Note 12 – Employee Retirement Systems (Continued)

D. SDTC (Continued)

Pension Expenses and Deferred Outflows/Inflows of Resources Related to Pensions

For the years ended June 30, 2024 and 2023, SDTC recognized pension expense of $21,463,544 and $24,550,685, respectively. At June 30, 2024 and 2023, SDTC reported deferred outflows of resources and deferred inflows of resources related to pensions from the following sources:

	2024		2023	
	Deferred Outflows of Resources	Deferred Inflows of Resources	Deferred Outflows of Resources	Deferred Inflows of Resources
Contributions made after measurement date	$ 17,217,837	$ -	$ 16,125,384	$ -
Changes in assumptions	-	-	-	-
Difference between expected and actual experience	2,471,542	-	2,428,401	-
Net difference between projected and actual earnings on pension plan investments	13,107,262	-	19,047,146	-
Total	$ 32,796,641	$ -	$ 37,600,931	$ -

The $17,217,837 reported as deferred outflows of resources related to contributions subsequent to the measurement date will be recognized as a reduction of the net pension liability in the year ended June 30, 2025 compared to $16,125,384 for the previous year. Other amounts reported as deferred outflows of resources and deferred inflows of resources related to pensions will be recognized as pension expense as follows:

Year Ended June 30	Amounts
2025	$ 6,856,833
2026	2,121,509
2027	6,788,757
2028	(188,295)
2029	-
Total	$ 15,578,804

In the previous year, other amounts reported as deferred outflows of resources and deferred inflows of resources related to pensions were:

Year Ended June 30	Amounts
2024	$ 7,615,102
2025	4,573,587
2026	2,309,805
2027	6,977,053
2028	-
Total	$ 21,475,547

Note 12 – Employee Retirement Systems (Continued)

D. SDTC (Continued)

Payable to the Pension Plan

At June 30, 2024, SDTC reported a payable of $1,377,738 for the outstanding amount of contributions to the pension plan required for the fiscal year compared to $1,302,826 for the year ended June 30, 2023.

Note 13 – Other Required Individual Disclosures

A. Deficit Unrestricted Net Position

Contracted Services, SDTC and SDTI had unrestricted net position deficits as of June 30, 2024 and 2023. MTS fully funds the operations for Contracted Services, SDTC and SDTI, however they do not provide subsidy for estimated liabilites, such as pension, OPEB, leases, compensated absences and accrued damage, injury and employee claims. Those expenses are funded in the years actual expenses are incurred leading to the operators reflecting these deficits.

	2024	2023
MTS Contracted Services	$ (9,810,513)	$ (10,405,627)
San Diego Transit Corporation	(164,017,407)	(156,427,544)
San Diego Trolley, Inc.	(19,554,886)	(12,140,608)

Note 14 – Net Investment in Capital Assets

At June 30, 2024 and 2023, the net investment in capital assets consisted of the following:

	2024	2023
Capital assets, net	$ 3,281,827,887	$ 3,365,458,553
Less: retentions payable	(1,305,601)	(897,501)
Less: lease liabilities	(10,603,511)	(10,884,801)
Less: subscription liabilities	(2,948,291)	(2,357,993)
Net investment in capital assets	$ 3,266,970,484	$ 3,351,318,258

Note 15 – Other Non-Operating Expense

On January 22, 2024, San Diego, CA was hit by a historic flood causing an estimated $24 million in damage to the Trolley System. The destruction was widespread impacting track, stations, buildings and equipment. As of June 30, 2024, MTS had incurred $4.3 million of expenses reimbursable by insurance and $3.9 million in expenses that are not expected to be covered by insurance. These expenses that were not offset with insurance proceeds are included in this year's financial statements as Other Non-Operating Expenses. Once all expenses are final, the agency will be seeking financial assistance from both California Governor's Office of Emergency Services (Cal OES) and Federal Emergency Management Agency (FEMA). The financial assistance will be reported as subsidy revenue in the year the funds are received. MTS is expecting an estimated $15 million in expenses for FY25, with the majority of these being eligible for insurance coverage.

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REQUIRED SUPPLEMENTARY INFORMATION
(Unaudited)

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF PROPORTIONATE SHARE OF THE NET PENSION LIABILITY
MTS
(LAST TEN YEARS)

Measurement Period, Year Ended June 30:	2023	2022	2021	2020	2019
Proportion of the net pension liability	0.38662%	0.37942%	0.43072%	0.35975%	0.35122%
Proportionate share of the net pension liability	$ 19,332,817	$ 17,754,063	$ 8,178,565	$ 15,174,709	$ 14,064,659
Covered payroll	$ 15,217,610	$ 14,346,741	$ 14,166,669	$ 13,715,993	$ 12,892,323
Proportionate share of the net pension liability as percentage of covered payroll	127.04%	123.75%	57.73%	110.64%	109.09%
Plan's fiduciary net position as percentage of the total pension liability	75.35%	75.69%	87.57%	74.92%	75.16%
Proportionate share of aggregate employer contributions	$ 2,456,504	$ 2,867,564	$ 2,265,608	$ 2,024,949	$ 1,763,681

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF PROPORTIONATE SHARE OF THE NET PENSION LIABILITY (CONTINUED)
MTS
(LAST TEN YEARS)

Measurement Period, Year Ended June 30:	2018	2017	2016	2015	2014
Proportion of the net pension liability	0.34449%	0.34040%	0.33571%	0.35383%	0.33427%
Proportionate share of the net pension liability	$ 12,982,663	$ 13,418,753	$ 11,661,984	$ 9,707,169	$ 8,261,550
Covered payroll	$ 12,873,186	$ 11,809,510	$ 11,078,469	$ 9,954,718	$ 9,277,782
Proportionate share of the net pension liability as percentage of covered payroll	100.85%	113.63%	105.27%	97.51%	89.05%
Plan's fiduciary net position as percentage of the total pension liability	75.65%	72.65%	72.53%	75.07%	77.50%
Proportionate share of aggregate employer contributions	$ 1,536,182	$ 1,348,728	$ 1,896,142	$ 1,998,897	$ 755,170

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF CHANGES IN NET PENSION LIABILITY AND RELATED RATIOS
SDTI CALPERS PLANS
(LAST TEN YEARS)

Measurement Period, Year Ended June 30:	2023	2022	2021	2020	2019
Total Pension Liability					
Service cost	$ 5,794,970	$ 5,576,840	$ 4,670,260	$ 4,479,774	$ 4,304,517
Interest on total pension liability	13,977,882	13,189,942	12,372,042	11,672,869	10,947,906
Difference between expected and actual experience	56,691	(392,728)	(284,762)	355,799	2,647,270
Changes in assumptions	-	7,877,718	-	-	-
Changes in benefit terms	216,615	-	-	-	-
Benefit payments, including refunds of employee contributions	(8,389,627)	(7,069,799)	(6,645,332)	(5,723,615)	(5,389,412)
Net change in total pension liability	11,656,531	19,181,973	10,112,208	10,784,827	12,510,281
Total pension liability - beginning	203,602,024	184,420,051	174,307,843	163,523,016	151,012,735
Total pension liability - ending (a)	$ 215,258,555	$ 203,602,024	$ 184,420,051	$ 174,307,843	$ 163,523,016
Plan fiduciary net position					
Contributions - employer	$ 6,229,147	$ 5,769,619	$ 5,237,955	$ 4,532,160	$ 3,824,864
Contributions - employee	2,463,713	2,366,931	2,398,196	2,108,348	2,075,270
Net investment income	9,825,840	(12,824,227)	31,172,082	6,512,893	8,009,279
Benefit payments, including refunds of employee contributions	(8,389,627)	(7,069,799)	(6,645,332)	(5,723,615)	(5,389,412)
Net plan to plan resource movement	-	-	-	-	(86,676)
Administrative expense	(115,673)	(105,380)	(136,995)	(183,118)	281
Net change in plan fiduciary net position	10,013,400	(11,862,856)	32,025,906	7,246,668	8,433,606
Plan fiduciary net position - beginning	157,303,110	169,165,966	137,140,060	129,893,392	121,459,786
Plan fiduciary net position - ending (b)	$ 167,316,510	$ 157,303,110	$ 169,165,966	$ 137,140,060	$ 129,893,392
Net pension liability - ending (a) - (b)	$ 47,942,045	$ 46,298,914	$ 15,254,085	$ 37,167,783	$ 33,629,624
Plan fiduciary net position as a percentage of the total pension liability	77.73%	77.26%	91.73%	78.68%	79.43%
Covered payroll	$ 37,077,411	$ 35,512,059	$ 33,604,962	$ 31,913,060	$ 29,886,251
Plan net pension liability as a percentage of covered payroll	129.30%	130.38%	45.39%	116.47%	112.53%

Notes to Schedule:

Benefit changes: The figures above do not include any liability impact that may have resulted from plan changes which occurred after the June 30, 2022 valuation date.

Changes of assumptions (measurement date)

*2022-Payroll growth increased to 2.80 percent from 2.75 percent.

*2022- increased to Inflation decreased from 2.50 percent from 2.30 percent.

*2022-Discount rate decreased to 6.90 percent from 7.15 percent.

*2022-Investment rate of return decreased to 6.90 percent from 7.15 percent.

*2018 - Demographic assumptions and inflation rate were changed in accordance to CalPERS Experience Study and Review December 2017

*2017 - Discount rate decreased to 7.15 percent from 7.65 percent

*2015 - Discount rate increased to 7.65 percent from 7.50 percent

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF CHANGES IN NET PENSION LIABILITY AND RELATED RATIOS (CONTINUED)
SDTI CALPERS PLANS
(LAST TEN YEARS)

Measurement Period, Year Ended June 30:	2018	2017	2016	2015	2014
Total Pension Liability					
Service cost	$ 4,029,579	$ 3,882,206	$ 3,580,302	$ 3,615,793	$ 3,721,950
Interest on total pension liability	10,112,324	9,611,237	9,201,415	8,554,525	7,982,614
Difference between expected and actual experience	(498,533)	(2,759,754)	375,697	(510,309)	-
Changes in assumptions	(1,064,034)	8,593,509	-	(2,274,755)	-
Changes in benefit terms	-	-	-	-	-
Benefit payments, including refunds of employee contributions	(5,090,945)	(4,901,765)	(4,345,171)	(3,799,240)	(3,155,596)
Net change in total pension liability	7,488,391	14,425,433	8,812,243	5,586,014	8,548,968
Total pension liability - beginning	143,524,344	129,098,911	120,286,668	114,700,654	106,151,686
Total pension liability - ending (a)	$ 151,012,735	$ 143,524,344	$ 129,098,911	$ 120,286,668	$ 114,700,654
Plan fiduciary net position					
Contributions - employer	$ 3,342,623	$ 2,835,680	$ 2,659,911	$ 2,553,900	$ 2,498,345
Contributions - employee	2,034,672	1,806,506	1,778,990	1,839,206	2,179,194
Net investment income	9,482,977	11,214,548	628,353	2,204,904	14,416,106
Benefit payments, including refunds of employee contributions	(5,090,945)	(4,901,765)	(4,345,171)	(3,799,240)	(3,155,596)
Net plan to plan resource movement	(281)	-	-	-	-
Administrative expense	(506,849)	(149,699)	(61,391)	(113,387)	-
Net change in plan fiduciary net position	9,262,197	10,805,270	660,692	2,685,383	15,938,049
Plan fiduciary net position - beginning	112,197,589	101,392,319	100,731,627	98,046,244	82,108,195
Plan fiduciary net position - ending (b)	$ 121,459,786	$ 112,197,589	$ 101,392,319	$ 100,731,627	$ 98,046,244
Net pension liability - ending (a) - (b)	$ 29,552,949	$ 31,326,755	$ 27,706,592	$ 19,555,041	$ 16,654,410
Plan fiduciary net position as a percentage of the total pension liability	80.43%	78.17%	78.54%	83.74%	85.48%
Covered payroll	$ 27,790,199	$ 26,643,371	$ 27,247,357	$ 26,965,416	$ 26,268,261
Plan net pension liability as a percentage of covered payroll	106.34%	117.58%	101.69%	72.52%	63.40%

Notes to Schedule:

Benefit changes: The figures above do not include any liability impact that may have resulted from plan changes which occurred after the June 30, 2022 valuation date.

Changes of assumptions (measurement date)
*2022-Payroll growth increased to 2.80 percent from 2.75 percent.
*2022- increased to Inflation decreased from 2.50 percent from 2.30 percent.
*2022-Discount rate decreased to 6.90 percent from 7.15 percent.
*2022-Investment rate of return decreased to 6.90 percent from 7.15 percent.
*2018 - Demographic assumptions and inflation rate were changed in accordance to CalPERS Experience Study and Review December 2017
*2017 - Discount rate decreased to 7.15 percent from 7.65 percent
*2015 - Discount rate increased to 7.65 percent from 7.50 percent

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF CHANGES IN NET PENSION LIABILITY AND RELATED RATIOS
SDTI PARS PLAN
(LAST TEN YEARS*)

Measurement Period, Year Ended June 30:	2023	2022	2021	2020
Total Pension Liability				
Service cost	$ 199,311	$ 193,977	$ 201,071	$ 195,690
Interest on total pension liability	628,518	566,474	590,139	591,918
Difference between expected and actual experience	-	177,780	-	(262,427)
Changes in assumptions	-	552,904	-	(164,168)
Changes in benefit terms	-	-	-	-
Benefit payments, including refunds of employee contributions	(497,452)	(428,359)	(415,242)	(372,953)
Net change in total pension liability	330,377	1,062,776	375,968	(11,940)
Total pension liability - beginning	10,521,086	9,458,310	9,082,342	9,094,282
Total pension liability - ending (a)	$ 10,851,463	$ 10,521,086	$ 9,458,310	$ 9,082,342
Plan fiduciary net position				
Contributions - employer	$ 318,025	$ 348,656	$ 358,879	$ 436,518
Contributions - employee	-	-	-	-
Net investment income	662,626	(1,370,500)	2,025,536	186,614
Benefit payments, including refunds of employee contributions	(497,452)	(428,359)	(415,242)	(372,953)
Administrative expense	(18,958)	(17,388)	(16,382)	(15,143)
Net change in plan fiduciary net position	464,241	(1,467,591)	1,952,791	235,036
Plan fiduciary net position - beginning	8,097,881	9,565,472	7,612,681	7,377,645
Plan fiduciary net position - ending (b)	$ 8,562,122	$ 8,097,881	$ 9,565,472	$ 7,612,681
Net pension liability (asset) - ending (a) - (b)	$ 2,289,341	$ 2,423,205	$ (107,162)	$ 1,469,661
Plan fiduciary net position as a percentage of the total pension liability	78.90%	76.97%	101.13%	83.82%
Covered payroll	$ 3,466,427	$ 3,927,255	$ 4,471,089	$ 4,351,424
Plan net pension liability as a percentage of covered payroll	66.04%	61.70%	-2.40%	33.77%

Notes to Schedule:

Benefit changes. The figures above do not include any liability impact that may have resulted from plan changes which occurred after the June 30, 2023 valuation date.

Changes in Assumption (measurement date):

*2022 - Investment rate of return decreased fromm 6.50 to 6.00 percent.
*2022 - Discount rate decreased from 6.50 to 6.00 percent
*2020 - Inflation rate decreased from 2.75 to 2.50 percent
*2020 - Payroll growth rate decreased from 3.00 to 2.75 percent
*2018 - Investment rate of return decreased from 7.0 to 6.5 percent
*2016 - Inflation rate decreased from 3.0 to 2.75 percent
*2016 - Salary scale, retirement and pre-retirement mortality assumptions were updated.

*Ten year historical information is not yet available

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF CHANGES IN NET PENSION LIABILITY AND RELATED RATIOS (CONTINUED)
SDTI PARS PLAN
(LAST TEN YEARS*)

Measurement Period, Year Ended June 30:	2019	2018	2017	2016	2015
Total Pension Liability					
Service cost	$ 226,689	$ 198,627	$ 230,296	$ 223,588	$ 267,889
Interest on total pension liability	565,523	587,363	556,089	523,457	480,808
Difference between expected and actual experience	-	(652,788)	-	(166,133)	-
Changes in assumptions	-	473,927	-	321,921	-
Changes in benefit terms	-	-	-	-	-
Benefit payments, including refunds of employee contributions	(337,875)	(313,613)	(302,460)	(273,201)	(229,364)
Net change in total pension liability	454,337	293,516	483,925	629,632	519,333
Total pension liability - beginning	8,639,945	8,346,429	7,862,504	7,232,872	6,713,539
Total pension liability - ending (a)	$ 9,094,282	$ 8,639,945	$ 8,346,429	$ 7,862,504	$ 7,232,872
Plan fiduciary net position					
Contributions - employer	$ 443,125	$ 549,296	$ 605,864	$ 547,473	$ 590,203
Contributions - employee	-	-	-	-	-
Net investment income	413,503	458,921	638,858	(59,981)	127,592
Benefit payments, including refunds of employee contributions	(337,875)	(313,613)	(302,460)	(273,201)	(229,364)
Administrative expense	(14,630)	(17,012)	(13,417)	(14,665)	(12,186)
Net change in plan fiduciary net position	504,123	677,592	928,845	199,626	476,245
Plan fiduciary net position - beginning	6,873,522	6,195,930	5,267,085	5,067,459	4,591,214
Plan fiduciary net position - ending (b)	$ 7,377,645	$ 6,873,522	$ 6,195,930	$ 5,267,085	$ 5,067,459
Net pension liability (asset) - ending (a) - (b)	$ 1,716,637	$ 1,766,423	$ 2,150,499	$ 2,595,419	$ 2,165,413
Plan fiduciary net position as a percentage of the total pension liability	81.12%	79.56%	74.23%	66.99%	70.06%
Covered payroll	$ 4,909,640	$ 4,766,641	$ 5,170,611	$ 5,020,011	$ 4,943,557
Plan net pension liability as a percentage of covered payroll	34.96%	37.06%	41.59%	51.70%	43.80%

Notes to Schedule:

Benefit changes. The figures above do not include any liability impact that may have resulted from plan changes which occurred after the June 30, 2023 valuation date.

Changes in Assumption (measurement date):

*2022 - Investment rate of return decreased fromm 6.50 to 6.00 percent.
*2022 - Discount rate decreased from 6.50 to 6.00 percent
*2020 - Inflation rate decreased from 2.75 to 2.50 percent
*2020 - Payroll growth rate decreased from 3.00 to 2.75 percent
*2018 - Investment rate of return decreased from 7.0 to 6.5 percent
*2016 - Inflation rate decreased from 3.0 to 2.75 percent
*2016 - Salary scale, retirement and pre-retirement mortality assumptions were updated.

*Ten year historical information is not yet available

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF CHANGES IN NET PENSION LIABILITY AND RELATED RATIOS
SDTC PLAN
(LAST TEN YEARS)

Measurement Period, Year Ended June 30:	2023	2022	2021	2020	2019
Total Pension Liability					
Service cost	$ 3,615,035	$ 3,612,367	$ 3,087,757	$ 3,326,248	$ 3,345,262
Interest on total pension liability	19,776,787	19,441,516	20,767,402	20,793,979	20,568,075
Difference between expected and actual experience	4,943,085	4,856,802	3,560,873	(3,159,945)	3,139,304
Changes in assumptions	-	-	10,215,184	-	7,536,766
Changes in benefit terms	-	-	-	-	-
Benefit payments, including refunds of employee contributions	(22,630,610)	(22,029,157)	(21,531,678)	(20,712,755)	(19,969,862)
Net change in total pension liability	5,704,297	5,881,528	16,099,538	247,527	14,619,545
Total pension liability - beginning	337,148,571	331,267,043	315,167,505	314,919,978	300,300,433
Total pension liability - ending (a)	$ 342,852,868	$ 337,148,571	$ 331,267,043	$ 315,167,505	$ 314,919,978
Plan fiduciary net position					
Contributions - employer	$ 16,157,770	$ 15,838,082	$ 23,718,402	$ 14,709,528	$ 13,633,181
Contributions - employee	1,719,444	1,621,654	1,950,898	2,017,164	2,074,025
Net investment income	11,403,121	(22,759,878)	34,664,950	24,666	8,415,801
Benefit payments, including refunds of employee contributions	(22,630,610)	(22,029,157)	(21,531,678)	(20,712,755)	(19,969,862)
Administrative expense	(354,459)	(265,106)	(252,541)	(256,420)	(252,585)
Net change in plan fiduciary net position	6,295,266	(27,594,405)	38,550,031	(4,217,817)	3,900,560
Plan fiduciary net position - beginning	176,877,426	204,471,831	165,921,800	170,139,617	166,239,057
Plan fiduciary net position - ending (b)	$ 183,172,692	$ 176,877,426	$ 204,471,831	$ 165,921,800	$ 170,139,617
Net pension liability - ending (a) - (b)	$ 159,680,176	$ 160,271,145	$ 126,795,212	$ 149,245,705	$ 144,780,361
Plan fiduciary net position as a percentage of the total pension liability	53.43%	52.46%	61.72%	52.65%	54.03%
Covered payroll	$ 23,631,077	$ 25,059,762	$ 24,891,340	$ 25,826,289	$ 27,121,687
Plan net pension liability as a percentage of covered payroll	675.72%	639.56%	509.39%	577.88%	533.82%

Notes to Schedule:

Benefit changes: The figures above do not include any liability impact that may have resulted from plan changes which occurred after the July 1, 2023 valuation date.

Changes of assumptions (measurement date)

*2021-Discount rate decreased from 6.75 to 6.0 percent.
*2021-Inflation rate decreased from 2.75 to 2.5 percent.
*2021 - Expected rate of return on assets decreased from 6.75 to 6.0 percent
*2021-COLA increase changed from 2.0 to 2.5 percent.
*2019 - Investment rate of return decreased from 7.0 to 6.75 percent
*2018 - Valuation salary changed from using the most recent pensionable pay preceding the valuation date to a two-year average of pay from the two years preceding the valuation date
*2016 - Investment rate of return decreased from 7.5 to 7.0 percent
*2016 - Inflation decreased from 3.0 to 2.75 percent
*2016 - Revisions were made to merit pay increases, mortality, disability, service retirements and terminations

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF CHANGES IN NET PENSION LIABILITY AND RELATED RATIOS (CONTINUED)
SDTC PLAN
(LAST TEN YEARS)

Measurement Period, Year Ended June 30:	2018	2017	2016	2015	2014
Total Pension Liability					
Service cost	$ 3,559,738	$ 3,660,961	$ 3,469,595	$ 3,590,766	$ 3,908,376
Interest on total pension liability	20,325,978	19,885,608	18,865,499	18,434,275	17,812,979
Difference between expected and actual experience	(240,474)	1,185,687	(2,174,475)	812,878	2,905,692
Changes in assumptions	(640,322)	-	29,699,872	-	-
Changes in benefit terms	-	-	-	-	-
Benefit payments, including refunds of employee contributions	(18,715,199)	(17,977,346)	(17,350,158)	(16,584,043)	(15,466,924)
Net change in total pension liability	4,289,721	6,754,910	32,510,333	6,253,876	9,160,123
Total pension liability - beginning	296,010,712	289,255,802	256,745,469	250,491,593	241,331,470
Total pension liability - ending (a)	$ 300,300,433	$ 296,010,712	$ 289,255,802	$ 256,745,469	$ 250,491,593
Plan fiduciary net position					
Contributions - employer	$ 13,020,223	$ 12,649,101	$ 10,711,282	$ 11,352,628	$ 12,628,190
Contributions - employee	1,751,616	2,047,593	1,754,869	1,363,092	899,791
Net investment income	8,792,300	12,216,936	(540,093)	(2,018,866)	18,417,439
Benefit payments, including refunds of employee contributions	(18,715,199)	(17,977,346)	(17,350,158)	(16,584,043)	(15,466,924)
Administrative expense	(244,890)	(234,128)	(290,381)	(262,808)	(258,142)
Net change in plan fiduciary net position	4,604,050	8,702,156	(5,714,481)	(6,149,997)	16,220,354
Plan fiduciary net position - beginning	161,635,007	152,932,851	158,647,332	164,797,329	148,576,975
Plan fiduciary net position - ending (b)	$ 166,239,057	$ 161,635,007	$ 152,932,851	$ 158,647,332	$ 164,797,329
Net pension liability - ending (a) - (b)	$ 134,061,376	$ 134,375,705	$ 136,322,951	$ 98,098,137	$ 85,694,264
Plan fiduciary net position as a percentage of the total pension liability	55.36%	54.60%	52.87%	61.79%	65.79%
Covered payroll	$ 29,672,305	$ 31,660,643	$ 31,048,663	$ 32,658,827	$ 32,313,553
Plan net pension liability as a percentage of covered payroll	451.81%	424.43%	439.06%	300.37%	265.20%

Notes to Schedule:

Benefit changes: The figures above do not include any liability impact that may have resulted from plan changes which occurred after the July 1, 2023 valuation date.

Changes of assumptions (measurement date)

*2021-Discount rate decreased from 6.75 to 6.0 percent.
*2021-Inflation rate decreased from 2.75 to 2.5 percent.
*2021 - Expected rate of return on assets decreased from 6.75 to 6.0 percent
*2021-COLA increase changed from 2.0 to 2.5 percent.
*2019 - Investment rate of return decreased from 7.0 to 6.75 percent
*2018 - Valuation salary changed from using the most recent pensionable pay preceding the valuation date to a two-year average of pay from the two years preceding the valuation date
*2016 - Investment rate of return decreased from 7.5 to 7.0 percent
*2016 - Inflation decreased from 3.0 to 2.75 percent
*2016 - Revisions were made to merit pay increases, mortality, disability, service retirements and terminations

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
Last Ten Fiscal Years

SCHEDULE OF CONTRIBUTIONS
MTS

Fiscal Year Ended June 30:	2024	2023	2022	2021	2020
Actuarially determined contribution	$ 3,117,363	$ 2,960,147	$ 2,772,487	$ 2,580,445	$ 2,320,104
Contributions in relation to the actuarially determined contribution	(3,117,363)	(2,960,147)	(2,772,487)	(2,580,445)	(2,320,104)
Contribution deficiency (excess)	$ -	$ -	$ -	$ -	$ -
Covered payroll	$ 16,641,398	$ 15,217,610	$ 14,346,741	$ 14,166,669	$ 13,715,993
Contributions as a percentage of covered payroll	18.73%	19.45%	19.32%	18.21%	16.92%

Notes to Schedule:

Methods and assumptions used to determine contribution rates
The actuarial methods and assumption used to set the actuarially determined contributions for Fiscal Year 2024 were derived from the June 30, 2020 funding valuation report.

Actuarial cost method	Entry Age Actuatial Cost method
Amortization method/period	For details, see June 30, 2020 Funding Valuation Report
Asset valuation method	Fair value of assets
Inflation	2.500%
Salary increases	Varies based on entry age and service
Payroll growth	2.750%
Investment rate of return	7.00% net of pension plan investment and administrative expenses
Retirement age	The probabilities of retirement are based on the 2017 CalPERS Experience Study for the period from 1997 and 2015.
Mortality	The probabilities of mortality are based on the 2017 CalPERS Experience Study for the period from 1997 to 2015. Pre-retirement and post-retirement mortality rates include 15 years of projected mortality improvement using Society of Actuaries Scales 90% of scale MP 2016.

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
Last Ten Fiscal Years

SCHEDULE OF CONTRIBUTIONS (CONTINUED)
MTS

Fiscal Year Ended June 30:	2019	2018	2017	2016	2015
Actuarially determined contribution	$ 2,041,117	$ 1,896,639	$ 1,731,711	$ 1,582,497	$ 1,559,846
Contributions in relation to the actuarially determined contribution	(2,041,117)	(1,896,639)	(1,731,711)	(1,582,497)	(1,559,846)
Contribution deficiency (excess)	$ -	$ -	$ -	$ -	$ -
Covered payroll	$ 12,892,323	$ 12,873,186	$ 11,809,510	$ 11,078,469	$ 9,954,718
Contributions as a percentage of covered payroll	15.83%	14.73%	14.66%	14.28%	15.67%

Notes to Schedule:

Methods and assumptions used to determine contribution rates

The actuarial methods and assumption used to set the actuarially determined contributions for Fiscal Year 2024 were derived from the June 30, 2020 funding valuation report.

Actuarial cost method	Entry Age Actuatial Cost method
Amortization method/period	For details, see June 30, 2020 Funding Valuation Report
Asset valuation method	Fair value of assets
Inflation	2.500%
Salary increases	Varies based on entry age and service
Payroll growth	2.750%
Investment rate of return	7.00% net of pension plan investment and administrative expenses
Retirement age	The probabilities of retirement are based on the 2017 CalPERS Experience Study for the period from 1997 and 2015.
Mortality	The probabilities of mortality are based on the 2017 CalPERS Experience Study for the period from 1997 to 2015. Pre-retirement and post-retirement mortality rates include 15 years of projected mortality improvement using Society of Actuaries Scales 90% of scale MP 2016.

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
Last Ten Fiscal Years

SCHEDULE OF CONTRIBUTIONS
SDTI CALPERS PLAN

Fiscal Year Ended June 30:	2024	2023	2022	2021	2020
Actuarially determined contribution	$ 7,016,748	$ 6,229,147	$ 5,769,619	$ 5,237,955	$ 4,532,160
Contributions in relation to the actuarially determined contribution	(7,016,748)	(6,229,147)	(5,769,619)	(5,237,955)	(4,532,160)
Contribution deficiency (excess)	$ -	$ -	$ -	$ -	$ -
Covered payroll	$ 40,234,632	$ 37,077,411	$ 35,512,059	$ 33,604,962	$ 31,913,060
Contributions as a percentage of covered payroll	17.44%	16.80%	16.25%	15.59%	14.20%

Notes to Schedule:

Methods and assumptions used to determine contribution rates

The actuarial methods and assumptions used to set the actuarially determined contributions for Fiscal Year 2024 were derived from the June 30, 2020 funding valuation report.

Actuarial cost method	Entry Age Normal Actuarial; Cost method
Amortization method/period	For details, see June 30, 2020 Funding Valuation Report
Asset valuation method	Fair value of assets
Inflation	2.500%
Salary increases	Varies based on entry age and service
Payroll growth	2.750%
Investment rate of return	7.0% net of pension plan investment and administrative expenses
Retirement age	The probabilities of retirement are based on the 2017 CalPERS Experience Study for the period from 1997 and 2015.
Mortality	The probabilities of mortality are based on the 2017 CalPERS Experience Study for the period from 1997 to 2015. Pre-retirement and post-retirement mortality rates include 15 years of projected mortality improvement using Society of American Actuaries Scales 90% of scale MP 2016.

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
Last Ten Fiscal Years

SCHEDULE OF CONTRIBUTIONS (CONTINUED)
SDTI CALPERS PLAN

Fiscal Year Ended June 30:	2019	2018	2017	2016	2015
Actuarially determined contribution	$ 3,824,864	$ 3,266,081	$ 2,835,680	$ 2,659,911	$ 2,553,900
Contributions in relation to the actuarially determined contribution	(3,824,864)	(3,266,081)	(2,835,680)	(2,659,911)	(2,553,900)
Contribution deficiency (excess)	$ -	$ -	$ -	$ -	$ -
Covered payroll	$ 29,886,251	$ 27,790,199	$ 26,643,371	$ 27,247,357	$ 26,965,416
Contributions as a percentage of covered payroll	12.80%	11.75%	10.64%	9.76%	9.47%

Notes to Schedule:

Methods and assumptions used to determine contribution rates

The actuarial methods and assumptions used to set the actuarially determined contributions for Fiscal Year 2024 were derived from the June 30, 2020 funding valuation report.

Actuarial cost method	Entry Age Normal Actuarial; Cost method
Amortization method/period	For details, see June 30, 2020 Funding Valuation Report
Asset valuation method	Fair value of assets
Inflation	2.500%
Salary increases	Varies based on entry age and service
Payroll growth	2.750%
Investment rate of return	7.0% net of pension plan investment and administrative expenses
Retirement age	The probabilities of retirement are based on the 2017 CalPERS Experience Study for the period from 1997 and 2015.
Mortality	The probabilities of mortality are based on the 2017 CalPERS Experience Study for the period from 1997 to 2015. Pre-retirement and post-retirement mortality rates include 15 years of projected mortality improvement using Society of American Actuaries Scales 90% of scale MP 2016.

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
Last Ten Fiscal Years

SCHEDULE OF CONTRIBUTIONS
SDTI PARS PLAN

Fiscal Year Ended June 30:	2024	2023	2022	2021	2020
Actuarially determined contribution	$ 288,810	$ 312,672	$ 334,820	$ 381,185	$ 408,250
Contributions in relation to the actuarially determined contribution	(300,463)	(318,025)	(348,656)	(358,878)	(418,735)
Contribution deficiency (excess)	$ (11,653)	$ (5,353)	$ (13,836)	$ 22,307	$ (10,485)
Covered payroll	$ 3,201,890	$ 3,466,427	$ 3,927,255	$ 4,471,089	$ 4,351,424
Contributions as a percentage of covered payroll	9.38%	9.17%	8.88%	8.03%	9.62%

Notes to Schedule:

Methods and assumptions used to determine contribution rates

The actuarial methods and assumptions used to set the actuarially determined contributions for Fiscal Year 2023 were derived from the June 30, 2021 funding valuation report.

Valuation date	June 30, 2021
Actuarial cost method	Entry Age Normal
Amortization method	Level dollar
Amortization period	12 years as of valuation date
Asset valuation method	5-year smoothed market
Inflation	2.50%
Salary increases	Varies based on entry age and service
Payroll growth	2.75%
Investment rate of return	6.00%

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
Last Ten Fiscal Years

SCHEDULE OF CONTRIBUTIONS (CONTINUED)
SDTI PARS PLAN

Fiscal Year Ended June 30:	2019	2018	2017	2016	2015
Actuarially determined contribution	$ 459,504	$ 460,930	$ 499,993	$ 445,465	$ 546,873
Contributions in relation to the actuarially determined contribution	(435,748)	(549,296)	(605,864)	(547,473)	(590,203)
Contribution deficiency (excess)	$ 23,756	$ (88,366)	$ (105,871)	$ (102,008)	$ (43,330)
Covered payroll	$ 4,909,640	$ 4,766,641	$ 5,170,611	$ 5,020,011	$ 4,943,557
Contributions as a percentage of covered payroll	8.88%	11.52%	11.72%	10.91%	11.94%

Notes to Schedule:

Methods and assumptions used to determine contribution rates

The actuarial methods and assumptions used to set the actuarially determined contributions for Fiscal Year 2023 were derived from the June 30, 2021 funding valuation report.

Valuation date	June 30, 2021
Actuarial cost method	Entry Age Normal
Amortization method	Level dollar
Amortization period	12 years as of valuation date
Asset valuation method	5-year smoothed market
Inflation	2.50%
Salary increases	Varies based on entry age and service
Payroll growth	2.75%
Investment rate of return	6.00%

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
Last Ten Fiscal Years

SCHEDULE OF CONTRIBUTIONS
SDTC PLAN

Fiscal Year Ended June 30:	2024	2023	2022	2021	2020
Actuarially determined contribution	$ 17,217,837	$ 16,125,384	$ 15,838,082	$ 17,585,592	$ 14,709,813
Contributions in relation to the actuarially determined contribution	(17,217,837)	(16,125,384)	(15,838,082)	(23,718,402)	(14,709,813)
Contribution deficiency (excess)	$ -	$ -	$ -	$ (6,132,810)	$ -
Covered payroll	$ 23,668,509	$ 23,631,077	$ 25,059,762	$ 24,891,340	$ 25,826,289
Contributions as a percentage of covered payroll	72.75%	68.24%	63.20%	95.29%	56.96%

Notes to Schedule:

Methods and assumptions used to determine contribution rates

The actuarial methods and assumptions used to set the actuarially determined contributions for Fiscal Year 2024 were derived from the July 1, 2021 funding valuation report.

Valuation date	July 1, 2021
Actuarial cost method	Entry Age
Amortization method/period	Level percent of payroll, closed 25-year period
Asset valuation method	5-year smoothed market
Salary increases	2.5% plus merit component based on employee classification and years of services
Investment rate of return	6.0% net of pension plan investment expenses
Mortality	For ATU and IBEW Actives, Cheiron's ATU Non-Annuitant mortality with generational improvemetns from the base year 2016 using Scale MP-2020. For Clerical and Non-Contract Actives, the 2010 Pub-G Employee mortality with gernerational improvements from the base year 2010 using Scale MP-2020

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
Last Ten Fiscal Years

SCHEDULE OF CONTRIBUTIONS (CONTINUED)
SDTC PLAN

Fiscal Year Ended June 30:	2019	2018	2017	2016	2015
Actuarially determined contribution	$ 13,633,181	$ 13,020,223	$ 12,649,101	$ 10,711,282	$ 11,352,628
Contributions in relation to the actuarially determined contribution	(13,633,181)	(13,020,223)	(12,649,101)	(10,711,282)	(11,352,628)
Contribution deficiency (excess)	$ -	$ -	$ -	$ -	$ -
Covered payroll	$ 27,121,687	$ 29,672,305	$ 31,660,643	$ 31,048,663	$ 32,658,827
Contributions as a percentage of covered payroll	50.27%	43.88%	39.95%	34.50%	34.76%

Notes to Schedule:

Methods and assumptions used to determine contribution rates

The actuarial methods and assumptions used to set the actuarially determined contributions for Fiscal Year 2024 were derived from the July 1, 2021 funding valuation report.

Valuation date	July 1, 2021
Actuarial cost method	Entry Age
Amortization method/period	Level percent of payroll, closed 25-year period
Asset valuation method	5-year smoothed market
Salary increases	2.5% plus merit component based on employee classification and years of services
Investment rate of return	6.0% net of pension plan investment expenses
Mortality	For ATU and IBEW Actives, Cheiron's ATU Non-Annuitant mortality with generational improvemetns from the base year 2016 using Scale MP-2020. For Clerical and Non-Contract Actives, the 2010 Pub-G Employee mortality with gernerational improvements from the base year 2010 using Scale MP-2020

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF CHANGES IN THE TOTAL OPEB LIABILITY AND RELATED RATIOS
MTS
(LAST TEN YEARS*)

Measurement period, year ended June 30:	2023	2022	2021	2020	2019
Total OPEB Liability					
Service cost	$ 461,314	$ 714,088	$ 559,935	$ 544,949	$ 452,623
Interest	291,679	200,714	211,713	217,111	224,774
Change of benefit terms	-	-	-	-	-
Difference between expected and actual experience	(668,252)	-	(31,742)	(206,133)	(324,826)
Change in assumptions	(221,195)	(2,608,790)	465,523	610,704	139,049
Benefit payments, including refunds of member contributions	(147,799)	(110,701)	(112,510)	(117,063)	(111,141)
Net change in total OPEB liability	(284,253)	(1,804,689)	1,092,919	1,049,568	380,479
Total OPEB liability - beginning	6,743,351	8,548,040	7,455,121	6,405,553	6,025,074
Total OPEB liability - ending (a)	$ 6,459,098	$ 6,743,351	$ 8,548,040	$ 7,455,121	$ 6,405,553
OPEB fiduciary net position					
Contributions - employer	$ 147,799	$ 110,701	$ 112,510	$ 117,063	$ 111,141
Net investment income	-	-	-	-	-
Benefit payments, including refunds of member contributions	(147,799)	(110,701)	(112,510)	(117,063)	(111,141)
Administrative expense	-	-	-	-	-
Net change in plan fiduciary net position	-	-	-	-	-
Plan fiduciary net position - beginning	-	-	-	-	-
Plan fiduciary net position - ending (b)	$ -	$ -	$ -	$ -	$ -
Plan net OPEB liability - ending (a) - (b)	$ 6,459,098	$ 6,743,351	$ 8,548,040	$ 7,455,121	$ 6,405,553
Plan fiduciary net position as a percentage of the total OPEB liability	0.00%	0.00%	0.00%	0.00%	0.00%
Covered-employee payroll	$ 15,418,605	$ 14,503,909	$14,147,812	$12,699,847	$13,522,496
Plan net OPEB liability as a percentage of covered employee payroll	41.89%	46.49%	60.42%	58.70%	47.37%

Note to schedule: There are no assets accumulated in a trust that meets the criteria of GASB codification P22.101 or P52.101 to pay related benefits for the OPEB plan.

*Ten year historical information is not yet available

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF CHANGES IN THE TOTAL OPEB LIABILITY AND RELATED RATIOS (CONTINUED)
MTS
(LAST TEN YEARS*)

Measurement period, year ended June 30:	2018	2017
Total OPEB Liability		
Service cost	$ 450,678	$ 504,282
Interest	203,185	171,522
Change of benefit terms	-	-
Difference between expected and actual experience	-	-
Change in assumptions	(104,394)	(566,410)
Benefit payments, including refunds of member contributions	(99,520)	(96,621)
Net change in total OPEB liability	449,949	12,773
Total OPEB liability - beginning	5,575,125	5,562,352
Total OPEB liability - ending (a)	$ 6,025,074	$ 5,575,125
OPEB fiduciary net position		
Contributions - employer	$ 99,520	$ 96,621
Net investment income	-	-
Benefit payments, including refunds of member contributions	(99,520)	(96,621)
Administrative expense	-	-
Net change in plan fiduciary net position	-	-
Plan fiduciary net position - beginning	-	-
Plan fiduciary net position - ending (b)	$ -	$ -
Plan net OPEB liability - ending (a) - (b)	$ 6,025,074	$ 5,575,125
Plan fiduciary net position as a percentage of the total OPEB liability	0.00%	0.00%
Covered-employee payroll	$ 12,763,760	$ 12,392,000
Plan net OPEB liability as a percentage of covered employee payroll	47.20%	44.99%

Note to schedule: There are no assets accumulated in a trust that meets the criteria of GASB codification P22.101 or P52.101 to pay related benefits for the OPEB plan.

*Ten year historical information is not yet available

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF CHANGES IN THE TOTAL OPEB LIABILITY AND RELATED RATIOS
SDTI
(LAST TEN YEARS*)

Measurement period, year ended June 30:	2023	2022	2021	2020	2019
Total OPEB Liability					
Service cost	$ 467,782	$ 749,568	$ 577,191	$ 561,743	$ 442,873
Interest	460,997	317,424	386,140	412,287	415,912
Change of benefit terms	-	-	-	-	-
Difference between expected and actual experience	1,112,998	-	(1,764,102)	(351,313)	230,450
Change in assumptions	(505,754)	(3,912,097)	832,716	997,581	238,432
Benefit payments, including refunds of member contributions	(187,732)	(138,350)	(181,540)	(233,181)	(251,166)
Net change in total OPEB liability	1,348,291	(2,983,455)	(149,595)	1,387,117	1,076,501
Total OPEB liability - beginning	10,896,484	13,879,939	14,029,534	12,642,417	11,565,916
Total OPEB liability - ending (a)	$ 12,244,775	$ 10,896,484	$ 13,879,939	$ 14,029,534	$ 12,642,417
OPEB fiduciary net position					
Contributions - employer	$ 187,732	$ 138,350	$ 181,540	$ 233,181	$ 251,166
Net investment income	-	-	-	-	-
Benefit payments, including refunds of member contributions	(187,732)	(138,350)	(181,540)	(233,181)	(251,166)
Administrative expense	-	-	-	-	-
Net change in plan fiduciary net position	-	-	-	-	-
Plan fiduciary net position - beginning	-	-	-	-	-
Plan fiduciary net position - ending (b)	$ -	$ -	$ -	$ -	$ -
Plan net OPEB liability - ending (a) - (b)	$ 12,244,775	$ 10,896,484	$ 13,879,939	$ 14,029,534	$ 12,642,417
Plan fiduciary net position as a percentage of the total OPEB liability	0.00%	0.00%	0.00%	0.00%	0.00%
Covered-employee payroll	$ 37,310,945	$ 35,758,575	$ 33,827,843	$ 32,204,645	$ 34,000,928
Plan net OPEB liability as a percentage of covered employee payroll	32.82%	30.47%	41.03%	43.56%	37.18%

Note to Schedule: There are no assets accumulated in a trust that meets the criteria of GASB codification P22.101 or P52.101 to pay related benefits for the OPEB plan.

*Ten year historical information is not yet available

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF CHANGES IN THE TOTAL OPEB LIABILITY AND RELATED RATIOS (CONTINUED)
SDTI
(LAST TEN YEARS*)

Measurement period, year ended June 30:	2018	2017
Total OPEB Liability		
Service cost	$ 440,969	$ 493,375
Interest	389,043	336,668
Change of benefit terms	-	-
Difference between expected and actual experience	-	-
Change in assumptions	(168,207)	(956,245)
Benefit payments, including refunds of member contributions	(194,710)	(189,039)
Net change in total OPEB liability	467,095	(315,241)
Total OPEB liability - beginning	11,098,821	11,414,062
Total OPEB liability - ending (a)	$ 11,565,916	$ 11,098,821
OPEB fiduciary net position		
Contributions - employer	$ 194,710	$ 189,039
Net investment income	-	-
Benefit payments, including refunds of member contributions	(194,710)	(189,039)
Administrative expense	-	-
Net change in plan fiduciary net position	-	-
Plan fiduciary net position - beginning	-	-
Plan fiduciary net position - ending (b)	$ -	$ -
Plan net OPEB liability - ending (a) - (b)	$ 11,565,916	$ 11,098,821
Plan fiduciary net position as a percentage of the total OPEB liability	0.00%	0.00%
Covered-employee payroll	$ 31,280,070	$ 30,369,000
Plan net OPEB liability as a percentage of covered employee payroll	36.98%	36.55%

Note to Schedule: There are no assets accumulated in a trust that meets the criteria of GASB codification P22.101 or P52.101 to pay related benefits for the OPEB plan.

*Ten year historical information is not yet available

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF CHANGES IN THE TOTAL OPEB LIABILITY AND RELATED RATIOS
SDTC
(LAST TEN YEARS*)

Measurement period, year ended June 30:	2023	2022	2021	2020	2019
Total OPEB Liability					
Service Cost	$ 1,433,157	$ 2,246,032	$ 1,354,186	$ 1,317,943	$ 1,180,991
Interest	1,057,025	721,320	879,890	947,591	1,056,425
Changes of benefit terms	-	-	-	-	-
Difference between expected and actual experience	(1,968,176)	-	(1,192,985)	(424,383)	(2,478,929)
Changes in assumptions	(3,415,439)	(8,349,207)	(907,986)	2,156,592	1,027,981
Benefit payments, including refunds of member contributions	(1,127,242)	(977,243)	(1,052,058)	(1,022,172)	(1,035,246)
Net change in total OPEB liability	(4,020,675)	(6,359,098)	(918,953)	2,975,571	(248,778)
Total OPEB liability - beginning	24,968,955	31,328,053	32,247,006	29,271,435	29,520,213
Total OPEB liability - ending (a)	$ 20,948,280	$ 24,968,955	$ 31,328,053	$ 32,247,006	$ 29,271,435
OPEB fiduciary net position					
Contributions - employer	$ 1,127,242	$ 977,243	$ 1,052,058	$ 1,022,172	$ 1,035,246
Net investment income	-	-	-	-	-
Benefit payments, including refunds of member contributions	(1,127,242)	(977,243)	(1,052,058)	(1,022,172)	(1,035,246)
Administrative expense	-	-	-	-	-
Net change in plan fiduciary net position	-	-	-	-	-
Plan fiduciary net position - beginning	-	-	-	-	-
Plan fiduciary net position - ending (b)	$ -	$ -	$ -	$ -	$ -
Plan net OPEB liability - ending (a) - (b)	$ 20,948,280	$ 24,968,955	$ 31,328,053	$ 32,247,006	$ 29,271,435
Plan fiduciary net position as a percentage of the total OPEB liability	0.00%	0.00%	0.00%	0.00%	0.00%
Covered-employee payroll	$ 49,579,476	$ 46,831,537	$ 44,955,979	$ 43,063,090	$ 41,720,578
Plan net OPEB liability as a percentage of covered employee payroll	42.25%	53.32%	69.69%	74.88%	70.16%

Note to schedule: There are no assets accumulated in a trust that meets the criteria of GASB codification P22.101 or P52.101 to pay related benefits for the OPEB plan.

*Ten year historical information is not yet available

San Diego Metropolitan Transit System
Required Supplementary Information (Unaudited) (Continued)
For the Years Ended June 30, 2024 and 2023

SCHEDULE OF CHANGES IN THE TOTAL OPEB LIABILITY AND RELATED RATIOS (CONTINUED)
SDTC
(LAST TEN YEARS*)

Measurement period, year ended June 30:	2018	2017
Total OPEB Liability		
Service Cost	$ 1,176,005	$ 1,317,293
Interest	1,000,292	875,283
Changes of benefit terms	-	-
Difference between expected and actual experience	-	-
Changes in assumptions	(421,922)	(2,399,513)
Benefit payments, including refunds of member contributions	(957,045)	(929,170)
Net change in total OPEB liability	797,330	(1,136,107)
Total OPEB liability - beginning	28,722,883	29,858,990
Total OPEB liability - ending (a)	$ 29,520,213	$ 28,722,883
OPEB fiduciary net position		
Contributions - employer	$ 957,045	$ 929,170
Net investment income	-	-
Benefit payments, including refunds of member contributions	(957,045)	(929,170)
Administrative expense	-	-
Net change in plan fiduciary net position	-	-
Plan fiduciary net position - beginning	-	-
Plan fiduciary net position - ending (b)	$ -	$ -
Plan net OPEB liability - ending (a) - (b)	$ 29,520,213	$ 28,722,883
Plan fiduciary net position as a percentage of the total OPEB liability	0.00%	0.00%
Covered-employee payroll	$ 40,561,400	$ 39,380,000
Plan net OPEB liability as a percentage of covered employee payroll	72.78%	72.94%

Note to schedule: There are no assets accumulated in a trust that meets the criteria of GASB codification P22.101 or P52.101 to pay related benefits for the OPEB plan.

*Ten year historical information is not yet available

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SUPPLEMENTARY INFORMATION

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San Diego Metropolitan Transit System
Combining Schedule of Net Position
June 30, 2024

	General Operations	Contracted Services	SDTC	SDTI	Total
ASSETS					
Current assets:					
Cash, cash equivalents, and investments	$ 260,874,178	$ (25,243)	$ (275,551)	$ (495,990)	$ 260,077,394
Cash, cash equivalents, and investments restricted for capital support	34,148,777	-	-	-	34,148,777
Accounts and other receivables	13,699,773	131,920	597,041	1,989,747	16,418,481
Due from other governments	114,948,061	1,038	29,805	161,735	115,140,639
Leases receivable	2,181,156	-	-	-	2,181,156
Internal balances	(32,076,111)	3,676,079	16,290,472	12,109,560	-
Inventory	-	-	4,695,813	33,383,443	38,079,256
Prepaid items and other current assets	1,531,068	35,000	1,204,036	1,175,897	3,946,001
Total current assets	395,306,902	3,818,794	22,541,616	48,324,392	469,991,704
Noncurrent assets:					
Lease receivable, due in more than one year	60,528,351	-	-	-	60,528,351
Capital assets, net	152,398,708	283,281,981	235,450,159	2,610,697,039	3,281,827,887
Total noncurrent assets	212,927,059	283,281,981	235,450,159	2,610,697,039	3,342,356,238
Total assets	608,233,961	287,100,775	257,991,775	2,659,021,431	3,812,347,942
DEFERRED OUTFLOWS OF RESOURCES					
Pension-related deferred outflows of resources	9,039,524	-	32,796,641	20,332,292	62,168,457
OPEB-related deferred outflows of resources	939,985	-	2,510,094	2,794,907	6,244,986
Total deferred outflows of resources	9,979,509	-	35,306,735	23,127,199	68,413,443
LIABILITIES					
Current liabilities:					
Accounts payable	11,933,839	11,758,001	1,520,487	8,157,696	33,370,023
Due to other governments	1,788,843	89,806	72,200	477,257	2,428,106
Unearned revenue	45,869,999	1,781,500	-	-	47,651,499
Accrued expenses	792,542	-	2,684,784	1,025,649	4,502,975
Retentions payable	1,239,124	943	-	65,534	1,305,601
Retentions payable from restricted assets	3,031,659	-	-	-	3,031,659
Due within one year:					
Aggregate total OPEB liability	137,235	-	1,179,053	260,616	1,576,904
Lease liability	-	171,843	96,294	23,058	291,195
Subscription liability	714,597	-	-	-	714,597
Compensated absences	1,264,472	-	3,698,724	3,329,925	8,293,121
Accrued damage, injury, and employee claims	808,727	-	5,435,943	2,717,267	8,961,937
Total current liabilities	67,581,037	13,802,093	14,687,485	16,057,002	112,127,617
Noncurrent liabilities:					
Due in more than one year:					
Lease liability	-	8,690,093	290,675	1,331,548	10,312,316
Subscription liability	2,233,694	-	-	-	2,233,694
Compensated absences	463,041	-	3,198,915	748,020	4,409,976
Accrued damage, injury, and employee claims	1,544,581	-	11,420,118	6,193,185	19,157,884
Aggregate net pension liability	19,332,817	-	159,680,176	50,231,386	229,244,379
Aggregate total OPEB liability	6,321,863	-	19,769,227	11,984,159	38,075,249
Total noncurrent liabilities	29,895,996	8,690,093	194,359,111	70,488,298	303,433,498
Total liabilities	97,477,033	22,492,186	209,046,596	86,545,300	415,561,115
DEFERRED INFLOWS OF RESOURCES					
Pension-related deferred inflows of resources	423,071	-	-	342,423	765,494
OPEB-related deferred inflows of resources	3,567,216	-	13,206,131	5,538,894	22,312,241
Lease-related deferred inflows of resources	62,929,628	-	-	-	62,929,628
Total deferred inflows of resources	66,919,915	-	13,206,131	5,881,317	86,007,363
NET POSITION					
Net investment in capital assets	148,211,293	274,419,102	235,063,190	2,609,276,899	3,266,970,484
Unrestricted (deficit)	305,605,229	(9,810,513)	(164,017,407)	(19,554,886)	112,222,423
Total net position	$ 453,816,522	$ 264,608,589	$ 71,045,783	$ 2,589,722,013	$ 3,379,192,907

San Diego Metropolitan Transit System
Combining Schedule of Revenues, Expenses, and Changes in Net Position
For the Year Ended June 30, 2024

	General Operations	Contracted Services	SDTC
Operating revenues:			
Passenger revenue	$ -	$ 22,847,501	$ 19,675,154
Advertising	3,450,852	-	-
Miscellaneous	17,685,897	-	2,239
Total operating revenues	21,136,749	22,847,501	19,677,393
Operating expenses:			
Personnel costs	32,449,224	972,749	97,268,586
Outside services	27,632,286	107,191,183	2,434,875
Transit operations funding	200,707,428	-	-
Materials and supplies	204,716	96,829	7,722,260
Energy costs	334,475	9,271,166	7,735,080
Risk management	1,116,487	15,000	3,138,057
Miscellaneous	(20,703,284)	2,592,163	2,379,196
Depreciation and amortization	5,041,520	28,183,822	26,784,533
Total operating expenses	246,782,852	148,322,912	147,462,587
Operating income (loss)	(225,646,103)	(125,475,411)	(127,785,194)
Public support and nonoperating revenues (expenses):			
Federal revenue	185,787,042	33,926,202	39,482,268
Transportation Development Act (TDA) funds	134,821,107	49,849,438	1,834,501
State Transit Assistance (STA) funds	38,466,309	-	10,088,619
State revenue - other	24,717,975	3,767,276	-
TransNet funds	78,161,542	8,709,460	38,853,886
Other local subsidies	12,661,090	1,381,737	3,180,770
Investment earnings	10,483,951	-	-
Interest expense	(97,446)	(173,980)	(46,551)
Gain (loss) on disposal of assets	3,249,423	-	(18,282,322)
Reduction in contributed capital	-	-	(20,867,121)
Other non-operating expenses	-	-	-
Total public support and nonoperating revenues (expenses)	488,250,993	97,460,133	54,244,050
Income (loss) before transfers and contributed capital	262,604,890	(28,015,278)	(73,541,144)
Transfers	(99,673,713)	-	-
Capital contributions, net	(140,493,722)	32,801,165	54,929,222
Changes in net position	22,437,455	4,785,887	(18,611,922)
Net Position:			
Beginning of year	431,379,067	259,822,702	89,657,705
End of year	$ 453,816,522	$ 264,608,589	$ 71,045,783

San Diego Metropolitan Transit System
Combining Schedule of Revenues, Expenses, and Changes in Net Position (Continued)
For the Year Ended June 30, 2024

	SDTI	Eliminations	Total
Operating revenues:			
Passenger revenue	$ 29,825,713	$ -	$ 72,348,368
Advertising	-	-	3,450,852
Miscellaneous	852,951	-	18,541,087
Total operating revenues	30,678,664	-	94,340,307
Operating expenses:			
Personnel costs	58,959,333	-	189,649,892
Outside services	16,101,097	-	153,359,441
Transit operations funding	-	(200,189,408)	518,020
Materials and supplies	11,720,395	-	19,744,200
Energy costs	25,784,952	-	43,125,673
Risk management	5,305,870	-	9,575,414
Miscellaneous	24,250,041	-	8,518,116
Depreciation and amortization	147,338,880	-	207,348,755
Total operating expenses	289,460,568	(200,189,408)	631,839,511
Operating income (loss)	(258,781,904)	200,189,408	(537,499,204)
Public support and nonoperating revenues (expenses):			
Federal revenue	45,041,855	(118,450,325)	185,787,042
Transportation Development Act (TDA) funds	33,173,286	(84,857,225)	134,821,107
State Transit Assistance (STA) funds	-	(10,088,619)	38,466,309
State revenue - other	477,294	(4,244,570)	24,717,975
TransNet funds	24,596,529	(77,659,875)	72,661,542
Other local subsidies	-	(4,562,507)	12,661,090
Investment earnings	-	-	10,483,951
Interest expense	(26,499)	-	(344,476)
Gain (loss) on disposal of assets	(1,887,077)	-	(16,919,976)
Reduction in contributed capital	-	-	(20,867,121)
Other non-operating expenses	(3,861,916)	-	(3,861,916)
Total public support and nonoperating revenues (expenses)	97,513,472	(299,863,121)	437,605,527
Income (loss) before transfers and contributed capital	(161,268,432)	(99,673,713)	(99,893,677)
Transfers	-	99,673,713	-
Capital contributions, net	72,993,814	-	20,230,479
Changes in net position	(88,274,618)	-	(79,663,198)
Net Position:			
Beginning of year	2,677,996,631	-	3,458,856,105
End of year	$ 2,589,722,013	$ -	$ 3,379,192,907

San Diego Metropolitan Transit System
Combining Schedule of Cash Flows
For the Year Ended June 30, 2024

	General Operations	Contracted Services	SDTC	SDTI	Total
Cash flows from operating activities:					
Receipts from customers and users	$ 18,946,247	$ 23,449,770	$ 19,806,822	$ 28,971,217	$ 91,174,056
Payments to suppliers	(7,675,224)	(114,807,886)	(24,497,855)	(76,058,175)	(223,039,140)
Payments to employees	(30,052,658)	(972,749)	(85,945,287)	(52,779,754)	(169,750,448)
Payments for damage and injury	(105,921)	-	(2,413,864)	(1,066,128)	(3,585,913)
Net cash provided by (used in) operating activities	(18,887,556)	(92,330,865)	(93,050,184)	(100,932,840)	(305,201,445)
Cash flows from noncapital financing activities:					
Public support funds received	193,326,724	92,905,249	95,726,637	106,261,119	488,219,729
Net cash provided by noncapital financing activities	193,326,724	92,905,249	95,726,637	106,261,119	488,219,729
Cash flows from capital and related financing activities:					
Debt service costs	-	-	(1,879,403)	-	(1,879,403)
Property acquisition	(153,316,826)	(342,524)	(97,956)	(7,770,631)	(161,527,937)
Proceeds from disposal of assets	3,428,360	-	114,524	2,086,392	5,629,276
Net cash provided by (used in) capital and related financing activities	(149,888,466)	(342,524)	(1,862,835)	(5,684,239)	(157,778,064)
Cash flows from investing activities:					
Interest received on investments	8,660,958	-	-	-	8,660,958
Net cash provided by investing activities	8,660,958	-	-	-	8,660,958
Net increase (decrease) in cash and cash equivalents	33,211,660	231,860	813,618	(355,960)	33,901,178
Cash, cash equivalents, and investments:					
Beginning of year	261,811,295	(257,103)	(1,089,169)	(140,030)	260,324,993
End of year	$ 295,022,955	$ (25,243)	$ (275,551)	$ (495,990)	$ 294,226,171
Cash, cash equivalents, and investments:					
Cash, cash equivalents, and investments	$ 260,874,178	$ (25,243)	$ (275,551)	$ (495,990)	$ 260,077,394
Cash restricted for capital support	34,148,777	-	-	-	34,148,777
Total cash, cash equivalents, and investments	$ 295,022,955	$ (25,243)	$ (275,551)	$ (495,990)	$ 294,226,171

San Diego Metropolitan Transit System
Combining Schedule of Cash Flows (Continued)
For the Year Ended June 30, 2024

	General Operations	Contracted Services	SDTC	SDTI	Total
Reconciliation of Operating (Loss) to Net Cash (Used In) Operating Activities					
Operating (loss):	$ (25,456,695)	$ (125,475,411)	$ (127,785,194)	$ (258,781,904)	$ (537,499,204)
Adjustments to reconcile operating (loss) to net cash (used in) operating activities:					
Depreciation and amortization	5,041,520	28,183,822	26,784,533	147,338,880	207,348,755
(Increase) decrease in:					
Accounts and other receivables	(2,277,946)	(5,691)	1,463,329	(1,699,414)	(2,519,722)
Due from other governments	(582,782)	-	(2,685)	-	(585,467)
Inventory	-	-	-	2,499,813	2,499,813
Prepaid expenses and other current assets	(310,941)	15,000	(300,404)	(738,569)	(1,334,914)
Increase (decrease) in:					
Accounts payable	1,272,036	4,347,398	(1,512,510)	3,959,805	8,066,729
Due to other governments	(247,272)	(3,943)	(2,782)	60,370	(193,627)
Accrued expenses	258,357	-	725,152	313,712	1,297,221
Unearned revenue	2,838,751	607,960	-	-	3,446,711
Aggregate net pension liability	986,908	-	4,213,321	3,815,837	9,016,066
Aggregate total OPEB liability	346,957	-	(688,204)	292,652	(48,595)
Compensated absences	129,483	-	151,376	219,523	500,382
Accrued damage, injury and employee claims	(885,932)	-	3,903,884	1,786,455	4,804,407
Total adjustments	6,569,139	33,144,546	34,735,010	157,849,064	232,297,759
Net cash (used in) operating activities	$ (18,887,556)	$ (92,330,865)	$ (93,050,184)	$ (100,932,840)	$ (305,201,445)

Supplemental noncash disclosures:

During the year SANDAG contributed $20,230,479 in capital assets and inventory parts

During the year the fair value of investments decreased by $247,055

San Diego Metropolitan Transit System
Schedule of Revenues, Expenses, and Changes in Net Position – Budget and Actual
Combined Operations
For the Year Ended June 30, 2024

	Budgeted Amounts		Actual Amounts			
	Original	Final	Actuals per Statement of Revenues, Expenses, and Changes in Net Position Amounts	Budget Basis Adjustments	Actuals on Budget Basis	Variance with Final Budget Positive (Negative)
Operating revenues:						
Passenger revenue	$ 78,850,492	$ 74,504,395	$ 72,348,368	$ -	$ 72,348,368	$ (2,156,027)
Advertising	3,570,046	3,248,991	3,450,852	7,519	3,458,371	209,380
Miscellaneous operating revenues	19,250,869	19,457,786	18,541,087	853,113	19,394,200	(63,586)
Total operating revenues	101,671,407	97,211,172	94,340,307	860,632	95,200,939	(2,010,233)
Operating expenses:						
Personnel costs	173,408,404	178,553,467	189,649,892	(14,679,751)	174,970,141	3,583,326
Outside services	152,266,821	152,528,202	153,359,441	(1,601,260)	151,758,181	770,021
Transit operations funding	846,910	846,910	518,020	-	518,020	328,890
Materials and supplies	16,333,496	18,750,232	19,744,200	(966,145)	18,778,055	(27,823)
Energy costs	46,684,316	46,650,714	43,125,673	-	43,125,673	3,525,041
Risk management	9,058,779	8,502,081	9,575,414	(1,453,379)	8,122,035	380,046
Miscellaneous operating expenses	8,344,018	8,069,231	8,518,116	(112,720)	8,405,396	(336,165)
Depreciation and amortization	-	-	207,348,755	(207,348,755)	-	-
Total operating expenses	406,942,744	413,900,837	631,839,511	(226,162,010)	405,677,501	8,223,336
Operating income (loss)	(305,271,337)	(316,689,665)	(537,499,204)	227,022,642	(310,476,562)	6,213,103
Public support and nonoperating revenues (expenses):						
Federal revenue	155,771,127	155,466,498	185,787,042	(30,646,357)	155,140,685	(325,813)
Transportation Development Act (TDA) funds	92,858,099	92,858,099	134,821,107	(41,848,667)	92,972,440	114,341
State Transit Assistance (STA) funds	11,300,000	8,400,000	38,466,309	(28,377,690)	10,088,619	1,688,619
State revenue - other	112,000	4,500,000	24,717,975	(20,196,641)	4,521,334	21,334
TransNet funds	72,710,953	72,923,021	72,661,542	-	72,661,542	(261,479)
Other local subsidies	4,490,994	4,490,994	12,661,090	(8,098,583)	4,562,507	71,513
Investment earnings	1,864,000	8,254,375	10,483,951	(1,020,359)	9,463,592	1,209,217
Interest expense	(54,149)	(54,149)	(344,476)	308,149	(36,327)	17,822
Gain (loss) on disposal of assets	100,000	250,000	(16,919,976)	19,170,833	2,250,857	2,000,857
Reduction in contributed capital	-	-	(20,867,121)	20,867,121	-	-
Other non-operating expenses	-	-	(3,861,916)	3,861,916	-	-
Total public support and nonoperating revenues (expenses):	339,153,024	347,088,838	437,605,527	(85,980,278)	351,625,249	4,536,411
Income (loss) before contributed capital	33,881,687	30,399,173	(99,893,677)	141,042,364	41,148,687	10,749,514
Reserve revenue	(33,881,687)	(30,399,173)	-	(30,505,034)	(30,505,034)	(105,861)
Capital contributions, net	-	-	20,230,479	(20,230,479)	-	-
Changes in net position	$ -	$ -	(79,663,198)	$ 90,306,851	$ 10,643,653	$ 10,643,653
Net Position:						
Beginning of year			3,458,856,105			
End of year			$ 3,379,192,907			

San Diego Metropolitan Transit System
Schedule of Revenues, Expenses, and Changes in Net Position – Budget and Actual
General Operations
For the Year Ended June 30, 2024

	Budgeted Amounts		Actual Amounts			
	Original	Final	Actuals per Statement of Revenues, Expenses, and Changes in Net Position Amounts	Budget Basis Adjustments	Actuals on Budget Basis	Variance with Final Budget Positive (Negative)
Operating revenues:						
Advertising	$ 3,570,046	$ 3,248,991	$ 3,450,852	$ 7,519	$ 3,458,371	$ 209,380
Miscellaneous operating revenues	17,360,476	17,662,895	16,673,242	852,922	17,526,164	(136,731)
Total operating revenues	20,930,522	20,911,886	20,124,094	860,441	20,984,535	72,649
Operating expenses:						
Personnel costs	28,094,979	30,593,098	31,792,636	(1,957,012)	29,835,624	757,474
Outside services	27,194,055	27,407,402	27,618,193	(52,198)	27,565,995	(158,593)
Transit operations funding	846,910	846,910	200,707,428	(200,189,407)	518,021	328,889
Materials and supplies	47,370	340,750	204,230	(140,280)	63,950	276,800
Energy costs	326,300	331,600	329,647	-	329,647	1,953
Risk management	1,085,155	859,000	1,066,639	(392,268)	674,371	184,629
Miscellaneous operating expenses	(26,683,995)	(21,698,248)	(20,756,306)	(599,999)	(21,356,305)	(341,943)
Depreciation and amortization	-	-	5,027,464	(5,027,464)	-	-
Total operating expenses	30,910,774	38,680,512	245,989,931	(208,358,628)	37,631,303	1,049,209
Operating income (loss)	(9,980,252)	(17,768,626)	(225,865,837)	209,219,069	(16,646,768)	1,121,858
Public support and nonoperating revenues (expenses):						
Federal revenue	6,581,221	36,763,267	185,787,042	(149,096,682)	36,690,360	(72,907)
Transportation Development Act (TDA) funds	846,910	846,910	134,821,107	(124,808,259)	10,012,848	9,165,938
State Transit Assistance (STA) funds	-	-	38,466,309	(38,466,309)	-	-
State revenue - other	-	1,500,000	24,717,975	(23,963,917)	754,058	(745,942)
TransNet funds	588,121	486,120	78,161,542	(77,659,875)	501,667	15,547
Other local subsidies	-	-	12,661,090	(12,661,090)	-	-
Investment earnings	1,864,000	8,254,375	10,459,524	(995,932)	9,463,592	1,209,217
Interest expense	-	-	(97,446)	97,446	-	-
Gain (loss) on disposal of assets	100,000	100,000	3,249,423	(3,199,482)	49,941	(50,059)
Total public support and nonoperating revenues (expenses):	9,980,252	47,950,672	488,226,566	(430,754,100)	57,472,466	9,521,794
Income (loss) before transfers and contributed capital	-	30,182,046	262,360,729	(221,535,031)	40,825,698	10,643,652
Transfers	-	-	(99,673,713)	99,673,713	-	-
Reserve revenue	-	(30,182,046)	-	(30,182,046)	(30,182,046)	-
Capital contributions, net	-	-	(140,493,722)	140,493,722	-	-
Changes in net position	$ -	$ -	$ 22,193,294	$ (11,549,642)	$ 10,643,652	$ 10,643,652
Net Position:						
Beginning of year			412,627,446			
End of year			$ 434,820,740			

San Diego Metropolitan Transit System
Schedule of Revenues, Expenses, and Changes in Net Position – Budget and Actual
For Hire Vehicle Administration
For the Year Ended June 30, 2024

	Budgeted Amounts		Actual Amounts			
	Original	Final	Actuals per Statement of Revenues, Expenses, and Changes in Net Position Amounts	Budget Basis Adjustments	Actuals on Budget Basis	Variance with Final Budget Positive (Negative)
Operating revenues:						
Miscellaneous operating revenues	$ 710,600	$ 758,000	$ 775,527	$ -	$ 775,527	$ 17,527
Total operating revenues	710,600	758,000	775,527	-	775,527	17,527
Operating expenses:						
Personnel costs	541,088	549,113	653,947	(89,007)	564,940	(15,827)
Outside services	23,800	23,200	14,093	-	14,093	9,107
Materials and supplies	500	500	486	-	486	14
Energy costs	7,000	7,000	4,828	-	4,828	2,172
Risk management	9,000	9,475	9,475	-	9,475	-
Miscellaneous operating expenses	71,468	31,234	30,056	-	30,056	1,178
Total operating expenses	652,856	620,522	712,885	(89,007)	623,878	(3,356)
Operating income (loss)	57,744	137,478	62,642	89,007	151,649	14,171
Reserve revenue	(57,744)	(137,478)	-	(151,649)	(151,649)	(14,171)
Changes in net position	$ -	$ -	62,642	$ (62,642)	$ -	$ -
Net Position:						
Beginning of year			632,634			
End of year			$ 695,276			

San Diego Metropolitan Transit System
Schedule of Revenues, Expenses, and Changes in Net Position – Budget and Actual
San Diego and Arizona Eastern Railway
For the Year Ended June 30, 2024

	Budgeted Amounts		Actual Amounts			
	Original	Final	Actuals per Statement of Revenues, Expenses, and Changes in Net Position Amounts	Budget Basis Adjustments	Actuals on Budget Basis	Variance with Final Budget Positive (Negative)
Operating revenues:						
Miscellaneous operating revenues	$ 190,000	$ 233,000	$ 237,128	$ 191	$ 237,319	$ 4,319
Total operating revenues	190,000	233,000	237,128	191	237,319	4,319
Operating expenses:						
Personnel costs	9,288	5,351	2,641	-	2,641	2,710
Outside services	35,000	35,000	-	-	-	35,000
Risk management	80,000	80,000	40,373	-	40,373	39,627
Miscellaneous operating expenses	33,000	33,000	22,966	-	22,966	10,034
Depreciation and amortization	-	-	14,056	(14,056)	-	-
Total operating expenses	157,288	153,351	80,036	(14,056)	65,980	87,371
Operating income (loss)	32,712	79,649	157,092	14,247	171,339	91,690
Public support and nonoperating revenues (expenses):						
Investment earnings	-	-	24,427	(24,427)	-	-
Total public support and nonoperating revenues (expenses)	-	-	24,427	(24,427)	-	-
Income (loss) before transfers and contributed capital	32,712	79,649	181,519	(10,180)	171,339	91,690
Reserve revenue	(32,712)	(79,649)	-	(171,339)	(171,339)	(91,690)
Changes in net position	$ -	$ -	181,519	$ (181,519)	$ -	$ -
Net Position:						
Beginning of year			18,118,987			
End of year			$ 18,300,506			

San Diego Metropolitan Transit System
Schedule of Revenues, Expenses, and Changes in Net Position – Budget and Actual
MTS - Contracted Services
For the Year Ended June 30, 2024

	Budgeted Amounts		Actual Amounts			
	Original	Final	Actuals per Statement of Revenues, Expenses, and Changes in Net Position Amounts	Budget Basis Adjustments	Actuals on Budget Basis	Variance with Final Budget Positive (Negative)
Operating revenues:						
Passenger revenue	$ 26,069,855	$ 23,845,676	$ 22,847,501	$ -	$ 22,847,501	$ (998,175)
Total operating revenues	26,069,855	23,845,676	22,847,501	-	22,847,501	(998,175)
Operating expenses:						
Personnel costs	852,000	876,500	972,749	-	972,749	(96,249)
Outside services	109,614,085	107,456,549	107,191,183	(506,586)	106,684,597	771,952
Materials and supplies	79,700	43,382	96,829	-	96,829	(53,447)
Energy costs	10,652,931	10,402,535	9,271,166	-	9,271,166	1,131,369
Risk management	15,050	15,000	15,000	-	15,000	-
Miscellaneous operating expenses	3,445,479	2,920,209	2,592,163	342,524	2,934,687	(14,478)
Depreciation and amortization	-	-	28,183,822	(28,183,822)	-	-
Total operating expenses	124,659,245	121,714,175	148,322,912	(28,347,884)	119,975,028	1,739,147
Operating income (loss)	(98,589,390)	(97,868,499)	(125,475,411)	28,347,884	(97,127,527)	740,972
Public support and nonoperating revenues (expenses):						
Federal revenue	44,741,945	34,179,106	33,926,202	-	33,926,202	(252,904)
Transportation Development Act (TDA) funds	43,166,540	50,652,897	49,849,438	(506,586)	49,342,852	(1,310,045)
State revenue - other	112,000	3,000,000	3,767,276	-	3,767,276	767,276
TransNet funds	9,267,594	8,735,185	8,709,460	-	8,709,460	(25,725)
Other local subsidies	1,301,311	1,301,311	1,381,737	-	1,381,737	80,426
Interest expense	-	-	(173,980)	173,980	-	-
Total public support and nonoperating revenues (expenses):	98,589,390	97,868,499	97,460,133	(332,606)	97,127,527	(740,972)
Income (loss) before contributed capital	-	-	(28,015,278)	28,015,278	-	-
Capital contributions, net	-	-	32,801,165	(32,801,165)	-	-
Changes in net position	$ -	$ -	4,785,887	$ (4,785,887)	$ -	$ -
Net Position:						
Beginning of year			259,822,702			
End of year			$ 264,608,589			

San Diego Metropolitan Transit System
Schedule of Revenues, Expenses, and Changes in Net Position – Budget and Actual
San Diego Transit Corporation (SDTC)
For the Year Ended June 30, 2024

	Budgeted Amounts		Actual Amounts			
	Original	Final	Actuals per Statement of Revenues, Expenses, and Changes in Net Position Amounts	Budget Basis Adjustments	Actuals on Budget Basis	Variance with Final Budget Positive (Negative)
Operating revenues:						
Passenger revenue	$ 21,576,772	$ 20,688,182	$ 19,675,154	$ -	$ 19,675,154	$ (1,013,028)
Miscellaneous operating revenues	-	2,500	2,239	-	2,239	(261)
Total operating revenues	21,576,772	20,690,682	19,677,393	-	19,677,393	(1,013,289)
Operating expenses:						
Personnel costs	91,078,794	91,980,610	97,268,586	(7,665,128)	89,603,458	2,377,152
Outside services	3,022,117	2,628,262	2,434,875	(40,630)	2,394,245	234,017
Materials and supplies	6,986,065	7,448,368	7,722,260	(29,674)	7,692,586	(244,218)
Energy costs	8,673,000	8,786,246	7,735,080	-	7,735,080	1,051,166
Risk management	3,324,003	3,117,321	3,138,057	84,752	3,222,809	(105,488)
Miscellaneous operating expenses	6,163,845	2,475,150	2,379,196	97,956	2,477,152	(2,002)
Depreciation and amortization	-	-	26,784,533	(26,784,533)	-	-
Total operating expenses	119,247,824	116,435,957	147,462,587	(34,337,257)	113,125,330	3,310,627
Operating income (loss)	(97,671,052)	(95,745,275)	(127,785,194)	34,337,257	(93,447,937)	2,297,338
Public support and nonoperating revenues (expenses):						
Federal revenue	49,772,532	38,911,901	39,482,268	-	39,482,268	570,367
Transportation Development Act (TDA) funds	28,673,056	5,778,150	1,834,501	(70,304)	1,764,197	(4,013,953)
State Transit Assistance (STA) funds	11,300,000	8,400,000	10,088,619	-	10,088,619	1,688,619
TransNet funds	38,581,161	39,369,690	38,853,886	-	38,853,886	(515,804)
Other local subsidies	3,189,683	3,189,683	3,180,770	-	3,180,770	(8,913)
Interest expense	(54,149)	(54,149)	(46,551)	10,224	(36,327)	17,822
Gain (loss) on disposal of assets	-	150,000	(18,282,322)	18,396,846	114,524	(35,476)
Reduction in contributed capital	-	-	(20,867,121)	20,867,121		
Total public support and nonoperating revenues (expenses):	131,462,283	95,745,275	54,244,050	39,203,887	93,447,937	(2,297,338)
Income (loss) before contributed capital	33,791,231	-	(73,541,144)	73,541,144	-	-
Reserve revenue	(33,791,231)	-	-	-	-	-
Capital contributions, net	-	-	54,929,222	(54,929,222)	-	-
Changes in net position	$ -	$ -	(18,611,922)	$ 18,611,922	$ -	$ -
Net Position:						
Beginning of year			89,657,705			
End of year			$ 71,045,783			

San Diego Metropolitan Transit System
Schedule of Revenues, Expenses, and Changes in Net Position – Budget and Actual
San Diego Trolley, Inc. (SDTI)
For the Year Ended June 30, 2024

	Budgeted Amounts		Actual Amounts			
	Original	Final	Actuals per Statement of Revenues, Expenses, and Changes in Net Position Amounts	Budget Basis Adjustments	Actuals on Budget Basis	Variance with Final Budget Positive (Negative)
Operating revenues:						
Passenger revenue	$ 31,203,865	$ 29,970,537	$ 29,825,713	$ -	$ 29,825,713	$ (144,824)
Miscellaneous operating revenues	989,793	801,391	852,951	-	852,951	51,560
Total operating revenues	32,193,658	30,771,928	30,678,664	-	30,678,664	(93,264)
Operating expenses:						
Personnel costs	52,832,255	54,548,795	58,959,333	(4,968,604)	53,990,729	558,066
Outside services	12,377,764	14,977,789	16,101,097	(1,001,846)	15,099,251	(121,462)
Materials and supplies	9,219,861	10,917,232	11,720,395	(796,191)	10,924,204	(6,972)
Energy costs	27,025,085	27,123,333	25,784,952	-	25,784,952	1,338,381
Risk management	4,545,571	4,421,285	5,305,870	(1,145,863)	4,160,007	261,278
Miscellaneous operating expenses	25,314,221	24,307,886	24,250,041	46,799	24,296,840	11,046
Depreciation and amortization	-	-	147,338,880	(147,338,880)	-	-
Total operating expenses	131,314,757	136,296,320	289,460,568	(155,204,585)	134,255,983	2,040,337
Operating income (loss)	(99,121,099)	(105,524,392)	(258,781,904)	155,204,585	(103,577,319)	1,947,073
Public support and nonoperating revenues (expenses):						
Federal revenue	54,675,429	45,612,224	45,041,855	-	45,041,855	(570,369)
Transportation Development Act (TDA) funds	20,171,593	35,580,142	33,173,286	(1,320,743)	31,852,543	(3,727,599)
State revenue - other	-	-	477,294	(477,294)	-	-
TransNet funds	24,274,077	24,332,026	24,596,529	-	24,596,529	264,503
Interest expense			(26,499)	26,499	-	
Gain (loss) on disposal of assets	-	-	(1,887,077)	3,973,469	2,086,392	2,086,392
Other non-operating expenses	-	-	(3,861,916)	3,861,916		
Total public support and nonoperating revenues (expenses):	99,121,099	105,524,392	97,513,472	6,063,847	103,577,319	(1,947,073)
Income (loss) before contributed capital	-	-	(161,268,432)	161,268,432	-	-
Capital contributions, net	-	-	72,993,814	(72,993,814)	-	-
Changes in net position	$ -	$ -	(88,274,618)	$ 88,274,618	$ -	$ -
Net Position:						
Beginning of year, as restated			2,677,996,631			
End of year			$ 2,589,722,013			

STATISTICAL SECTION
(Unaudited)

Included in this section of the Metropolitan Transit System annual comprehensive financial report is detailed information to assist in analysis and understanding of the information presented in the financial statements, notes and required supplementary information.

Contents

Financial Trends
These schedules contain trend information to help the reader understand how MTS's financial position has changed over time.

Revenue Capacity
These schedules contain detailed information about the fare structures and revenue generated from transit operations provided by MTS.

Debt Capacity
This schedule presents information to help the reader assess the affordability of MTS's current levels of outstanding debt and MTS's ability to issue debt in the future.

Demographic and Economic Information
These schedules provide service and infrastructure data to help the reader understand how the information in MTS's financial report relates to the services MTS provides.

Operating Information
These schedules provide service and infrastructure data to help the reader understand how the information in MTS's financial report relates to the services MTS provides.

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FINANCIAL TRENDS

San Diego Metropolitan Transit System
Net Position by Component (in 000's)
Last Ten Fiscal Years

	2024	2023	2022	2021	2020
Business-type activities:					
Net investment in capital assets	$ 3,266,970	$ 3,351,318	$ 3,473,998	$ 1,965,674	$ 1,874,320
Restricted	-	-	-	-	218
Unrestricted (deficit)	112,222	107,538	9,192	(46,746)	(12,024)
Total business-type activities net position	$ 3,379,192	$ 3,458,856	$ 3,483,190	$ 1,918,928	$ 1,862,514
Primary government:					
Net investment in capital assets	$ 3,266,970	$ 3,351,318	$ 3,473,998	$ 1,965,674	$ 1,874,320
Restricted	-	-	-	-	218
Unrestricted (deficit)	112,222	107,538	9,192	(46,746)	(12,024)
Total primary government net position	$ 3,379,192	$ 3,458,856	$ 3,483,190	$ 1,918,928	$ 1,862,514

Source: Audited Financial Statements.

San Diego Metropolitan Transit System
Net Position by Component (in 000's)(Continued)
Last Ten Fiscal Years

	2019	2018	2017	2016	2015
Business-type activities:					
Net investment in capital assets	$ 1,822,922	$ 1,785,808	$ 1,739,360	$ 1,760,427	$ 1,699,222
Restricted	212	4,545	4,440	8,750	5,309
Unrestricted (deficit)	(53,159)	(55,407)	(19,615)	(31,668)	(31,900)
Total business-type activities net position	$ 1,769,975	$ 1,734,946	$ 1,724,185	$ 1,737,509	$ 1,672,631
Primary government:					
Net investment in capital assets	$ 1,822,922	$ 1,785,808	$ 1,739,360	$ 1,760,427	$ 1,699,222
Restricted	212	4,545	4,440	8,750	5,309
Unrestricted (deficit)	(53,159)	(55,407)	(19,615)	(31,668)	(31,900)
Total primary government net position	$ 1,769,975	$ 1,734,946	$ 1,724,185	$ 1,737,509	$ 1,672,631

Source: Audited Financial Statements.

San Diego Metropolitan Transit System
Changes in Net Position (in 000's)
Last Ten Fiscal Years

	2024	2023	2022	2021	2020
Operating revenues:					
Passenger revenue	$ 72,348	$ 67,481	$ 56,077	$ 47,913	$ 79,532
Advertising	3,451	3,501	1,946	1,013	2,027
Charter	-	-	-	-	-
Miscellaneous	18,541	16,061	19,412	17,411	18,627
Total operating revenues	94,340	87,043	77,435	66,337	100,186
Operating expenses:					
Personnel costs	189,650	173,773	143,950	151,561	149,331
Outside services	153,359	124,333	117,535	111,280	110,590
Transit operations funding	518	659	616	397	523
Materials and supplies	19,744	17,295	14,779	16,334	14,275
Energy costs	43,126	51,203	38,975	31,262	28,587
Risk management	9,575	6,399	11,539	5,584	7,858
Miscellaneous	8,518	8,167	6,334	4,750	4,394
Depreciation and amortization	207,349	205,492	172,251	124,496	127,365
Total operating expenses	631,839	587,321	505,979	445,664	442,923
Operating (loss)	(537,499)	(500,278)	(428,544)	(379,327)	(342,737)
Public support and nonoperating revenues (expenses):					
Grants and contributions	469,115	472,790	386,270	396,581	312,705
Investment earnings	10,484	5,056	800	1,086	1,899
Interest expense	(344)	(442)	(551)	(686)	(797)
Gain (loss) on disposal of assets	(16,920)	(104)	(762)	(249)	2,243
Other expenses	(24,729)	(24,976)	-	-	-
Total public support and nonoperating revenues (expenses)	437,606	452,324	385,757	396,733	316,050
Income (loss) before contributed capital	(99,893)	(47,954)	(42,787)	17,404	(26,686)
Capital contributions, net	20,230	23,621	1,607,050	39,010	119,225
Changes in net position	$ (79,663)	$ (24,333)	$ 1,564,263	$ 56,414	$ 92,539

Source: Audited Financial Statements.

San Diego Metropolitan Transit System
Changes in Net Position (in 000's)(Continued)
Last Ten Fiscal Years

	2019	2018	2017	2016	2015
Operating revenues:					
Passenger revenue	$ 92,225	$ 90,236	$ 93,279	$ 97,914	$ 97,615
Advertising	1,604	1,131	1,379	968	816
Charter	-	-	-	-	6
Miscellaneous	18,831	17,404	18,863	15,781	9,349
Total operating revenues	112,660	108,771	113,521	114,663	107,786
Operating expenses:					
Personnel costs	146,006	146,282	137,021	121,921	114,575
Outside services	107,846	101,574	97,800	94,802	84,302
Transit operations funding	498	488	463	491	2,692
Materials and supplies	12,927	14,918	13,065	9,715	10,307
Energy costs	28,784	26,414	25,552	24,531	28,003
Risk management	2,183	6,675	4,276	4,864	5,849
Miscellaneous	5,446	5,854	5,934	4,978	4,975
Depreciation and amortization	123,007	120,928	123,880	119,520	108,199
Total operating expenses	426,697	423,133	407,991	380,822	358,902
Operating (loss)	(314,037)	(314,362)	(294,470)	(266,159)	(251,116)
Public support and nonoperating revenues (expenses):					
Grants and contributions	243,544	253,298	232,775	235,763	235,755
Investment earnings	1,952	941	636	292	3,065
Interest expense	(671)	(809)	(963)	(1,071)	(6,883)
Gain (loss) on disposal of assets	(2,351)	(809)	396	2,433	67
Other expenses	-	-	-	-	-
Total public support and nonoperating revenues (expenses)	242,474	252,621	232,844	237,417	232,004
Income (loss) before contributed capital	(71,563)	(61,741)	(61,626)	(28,742)	(19,112)
Capital contributions, net	106,592	99,551	48,301	93,619	245,717
Changes in net position	$ 35,029	$ 37,810	$ (13,325)	$ 64,877	$ 226,605

Source: Audited Financial Statements.

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REVENUE CAPACITY

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San Diego Metropolitan Transit System
Operating Revenues by Source (in 000's)
Last Ten Fiscal Years

Fiscal Year Ended	Passenger Fares	Federal Operating Funds	State Operating Funds	Local Operating Funds	Other	Total
San Diego Transit Corporation						
2015	$ 27,156	$ 18,096	$ 18,085	$ 28,982	$ 5	$ 92,324
2016	26,169	18,000	15,993	35,558	2	95,722
2017	24,864	20,000	17,138	31,038	10	93,050
2018	23,034	20,225	16,467	38,889	187	98,802
2019	22,041	20,500	10,050	40,904	6	93,501
2020	19,749	27,350	12,955	40,401	3	100,458
2021	14,430	46,955	7,374	43,580	-	112,339
2022	14,819	35,700	11,820	38,097	-	100,436
2023	19,666	33,132	20,117	39,396	-	112,311
2024	19,675	39,482	11,923	42,035	2	113,117
San Diego Trolley, Inc.						
2015	41,140	21,151	5,047	5,000	628	72,966
2016	41,113	21,148	6,040	5,000	698	73,999
2017	38,968	23,149	13,609	5,000	704	81,430
2018	39,354	24,247	22,930	-	777	87,308
2019	42,006	24,751	17,012	-	789	84,558
2020	36,464	30,213	23,808	187	740	91,412
2021	19,338	45,824	31,897	-	586	97,645
2022	25,519	39,825	17,086	21,190	904	104,524
2023	26,664	36,897	38,972	24,604	969	128,106
2024	29,826	45,042	33,651	24,597	853	133,969
MTS - Contracted Services						
2015	29,318	14,127	30,543	2,123	79	76,190
2016	30,631	13,827	33,796	2,258	(2)	80,510
2017	29,447	13,838	36,162	2,296	2	81,745
2018	27,848	14,599	38,320	2,699	2	83,468
2019	28,178	15,613	41,445	5,705	1	90,942
2020	23,319	22,221	36,414	9,448	-	91,402
2021	14,146	39,296	26,591	9,875	-	89,908
2022	15,740	33,294	42,426	10,607	-	102,067
2023	21,151	27,516	44,745	10,222	-	103,634
2024	22,848	33,926	53,617	10,091	-	120,482

Source: Audited Financial Statements.

San Diego Metropolitan Transit System
Fare Structure
Last Ten Fiscal Years

	2024	2023	2022	2021	2020
***Stored Value One Way Fares**					
One-way fare, Regional	$ 2.50	$ 2.50	$ 2.50	$ -	$ -
Senior/disabled, Regional	1.25	1.25	1.25	-	-
One-way fare, Premium Regional	5.00	5.00	5.00	-	-
Senior/disabled, Premium Regional	2.50	2.50	2.50	-	-
Rural	8.00	8.00	8.00	-	-
Senior/disabled Rural	4.00	4.00	4.00	-	-
Bus Cash Fares					
One-way fare, regional	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.50
Senior/disabled, regional	1.25	1.25	1.25	1.25	1.25
Youth regional	1.25	1.25	1.25	1.25	1.25
Rapid/Express	2.50	2.50	2.50	2.50	2.50
Senior/disabled Rapid/Express	1.25	1.25	1.25	1.25	1.25
Youth Rapid/Express	1.25	1.25	1.25	1.25	1.25
Rapid Express/Premium	5.00	5.00	5.00	5.00	5.00
Senior/disabled Rapid Express/Premium	2.50	2.50	2.50	2.50	2.50
Youth Rapid Express/Premium	2.50	2.50	2.50	2.50	2.50
Rural bus	8.00	8.00	8.00	8.00	8.00
Senior/disabled Rural bus	4.00	4.00	4.00	4.00	4.00
Youth Rural bus	4.00	4.00	4.00	4.00	4.00
Trolley Cash Fares					
One-way fare, all stations	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.50
Senior/disabled one-way fare	1.25	1.25	1.25	1.25	1.25
Youth one-way fare	1.25	1.25	1.25	1.25	1.25
Bus and Trolley Day Passes					
Regional day pass	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00
Senior/disabled and youth	3.00	3.00	3.00	3.00	3.00
Premium regional day	12.00	12.00	12.00	12.00	12.00
Senior/disabled and youth premium regional day	6.00	6.00	6.00	6.00	6.00
Bus and Trolley Monthly Passes					
Regional monthly pass	$ 72.00	$ 72.00	$ 72.00	$ 72.00	$ 72.00
Senior/disabled Regional	23.00	23.00	23.00	23.00	23.00
Youth Regional	-	-	-	23.00	23.00
14-Day Regional	-	-	-	-	-
Premium Regional monthly pass	100.00	100.00	100.00	100.00	100.00
Senior/disabled Premium Regional	32.00	32.00	32.00	32.00	32.00
Youth Premium Regional	-	-	-	32.00	32.00
14-Day Rapid Express/Premium	-	-	-	-	-

*Riders using PRONTO Stored Value can transfer free to a Regional service within two (2) hours of paying a one-way fare.

*The PRONTO system will charge a customer the cost of a one-way fare per boarding up to a daily and monthly maximum equal to the cost of a Day or Monthly Pass. Once the cap is reached, additional boardings made during the day or month after reaching the cap are free.
Beginning May 2022, Youth riders with a valid PRONTO card are free. Cash paying passengers will still need to pay the youth fare.

SOURCE: SANDAG Comprehensive Fare Ordinance, amendments effective April 2021.

San Diego Metropolitan Transit System
Fare Structure (Continued)
Last Ten Fiscal Years

	2019	2018	2017	2016	2015
***Stored Value One Way Fares**					
One-way fare, Regional	$ -	$ -	$ -	$ -	$ -
Senior/disabled, Regional	-	-	-	-	-
One-way fare, Premium Regional	-	-	-	-	-
Senior/disabled, Premium Regional	-	-	-	-	-
Rural	-	-	-	-	-
Senior/disabled Rural	-	-	-	-	-
Bus Cash Fares					
One-way fare, regional	$ 2.25	$ 2.25	$ 2.25	$ 2.25	$ 2.25
Senior/disabled, regional	1.10	1.10	1.10	1.10	1.10
Youth regional	2.25	2.25	2.25	2.25	2.25
Rapid/Express	2.50	2.50	2.50	2.50	2.50
Senior/disabled Rapid/Express	1.25	1.25	1.25	1.25	1.25
Youth Rapid/Express	2.50	2.50	2.50	2.50	2.50
Rapid Express/Premium	5.00	5.00	5.00	5.00	5.00
Senior/disabled Rapid Express/Premium	2.50	2.50	2.50	2.50	2.50
Youth Rapid Express/Premium	5.00	5.00	5.00	5.00	5.00
Rural bus	5.00-10.00	5.00-10.00	5.00-10.00	5.00-10.00	5.00-10.00
Senior/disabled Rural bus	2.50-5.00	2.50-5.00	2.50-5.00	2.50-5.00	2.50-5.00
Youth Rural bus	5.00-10.00	5.00-10.00	5.00-10.00	5.00-10.00	5.00-10.00
Trolley Cash Fares					
One-way fare, all stations	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.50
Senior/disabled one-way fare all stations	1.25	1.25	1.25	1.25	1.25
Youth one-way fare	2.50	2.50	2.50	2.50	2.50
Bus and Trolley Day Passes					
Regional day pass	$ 5.00	$ 5.00	$ 5.00	$ 5.00	$ 5.00
Senior/disabled and youth	5.00	5.00	5.00	5.00	5.00
Premium regional day	12.00	12.00	12.00	12.00	12.00
Senior/disabled and youth premium regional day	12.00	12.00	12.00	12.00	12.00
Bus and Trolley Monthly Passes					
Regional monthly pass	$ 72.00	$ 72.00	$ 72.00	$ 72.00	$ 72.00
Senior/disabled Regional	18.00	18.00	18.00	18.00	18.00
Youth Regional	36.00	36.00	36.00	36.00	36.00
14-Day Regional	43.00	43.00	43.00	43.00	43.00
Premium Regional monthly pass	100.00	100.00	100.00	100.00	100.00
Senior/disabled Premium Regional	25.00	25.00	25.00	25.00	25.00
Youth Premium Regional	50.00	50.00	50.00	50.00	50.00
14-Day Rapid Express/Premium	60.00	60.00	60.00	60.00	60.00

San Diego Metropolitan Transit System
Farebox Recovery Percentage
Last Ten Fiscal Years

Fiscal Year Ended	San Diego Transit	San Diego Trolley	MTS-Contracted Services
2015	29.50	56.64	38.48
2016	27.39	54.76	38.05
2017	26.21	47.81	36.02
2018	23.12	44.89	33.36
2019	23.41	49.71	30.98
2020	19.94	39.16	25.51
2021	12.82	20.32	15.73
2022	14.33	23.86	15.41
2023	17.59	20.67	20.39
2024	16.77	21.60	18.95

Source: Audited financial statements; calculated as passenger revenue divided by operating expenses (less depreciation, GASB 68 related pension expense and GASB 75 related OPEB expenses), and interest expense.

DEBT CAPACITY

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San Diego Metropolitan Transit System
Ratio of Outstanding Debt by Type
Last Ten Fiscal Years

Year ended June 30	MTS Tower	1995 LRV Lease/ Leaseback	Pension Obligation Bonds	Leases	Subscription-Based Technology Arrangements (SBITAs)	Total	Percentage of Personal Income	Debt per Capita
2015	$ 3,006,729	$ 18,108,323	$ 21,960,000	$ -	$ -	$ 43,075,052	0.02%	13
2016	2,393,787	-	19,860,000	-	-	22,253,787	0.01%	7
2017	1,747,713	-	17,655,000	-	-	19,402,713	0.01%	6
2018	1,071,269	-	15,340,000	-	-	16,411,269	0.01%	5
2019	363,072	-	12,910,000	-	-	13,273,072	0.01%	4
2020	-	-	10,355,000	11,667,917	-	22,022,917	0.01%	7
2021	-	-	7,665,000	11,416,609	1,459,402	20,541,011	0.01%	6
2022	-	-	4,830,000	11,155,700	1,179,045	17,164,745	0.01%	5
2023	-	-	1,845,000	10,884,801	2,357,993	15,087,794	0.01%	5
2024	-	-	-	10,603,511	2,948,291	13,551,802	0.01%	4

Details regarding MTS's outstanding debt can be found in the notes to the financial statements.

- MTS retired the 1995 LRV Lease/Leaseback obligation in FY2016
- MTS retired the MTS Tower obligation in FY2020
- MTS retired the Pension Obligation Bonds in FY2024
- Ten year historical information is not yet available for leases or SBITAs.

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DEMOGRAPHIC AND ECONOMIC INFORMATION

San Diego Metropolitan Transit System
Regional Population and Personal Income Statistics
Last Ten Fiscal Years

	County of San Diego Population (1)	County of San Diego Personal Income (thousands) (1)	Per Capita Personal Income (1)	San Diego County Average Unemployment Rate (2)
2015	3,275,897	$ 180,100,000	$ 56,796	5.00%
2016	3,297,202	186,100,000	60,271	5.10%
2017	3,320,387	193,300,000	60,460	4.30%
2018	3,344,430	204,500,000	61,134	3.70%
2019	3,366,285	216,700,000	62,665	3.30%
2020	3,386,230	225,500,000	63,105	13.90%
2021	3,366,072	221,300,000	63,169	7.00%
2022	3,279,493	262,000,000	79,815	3.20%
2023	3,276,996	278,000,000	81,619	4.00%
2024	3,275,175	294,000,000	83,616	4.50%

Source:
(1) California Department of Transportation - Actuals 2015-2022, Forecast 2023-2024
(2) California Employment Development Department, June 2024

San Diego Metropolitan Transit System
Full-Time and Part-Time Employees by Function
Last Ten Fiscal Years

	MTS	San Diego Transit	San Diego Trolley	Total
2015	154	852	595	1,601
2016	163	823	571	1,557
2017	165	825	578	1,568
2018	166	802	593	1,561
2019	166	841	612	1,619
2020	169	833	624	1,626
2021	168	793	643	1,604
2022	160	753	657	1,570
2023	168	763	663	1,594
2024	184	763	735	1,682

Source: MTS Human Resources records

San Diego Metropolitan Transit System
Ten Largest Employers in San Diego County

Company Name	Number of Employees (1)	Percent of 1,510,700 County Total (2)
University of California, San Diego	40,285	2.67%
Naval Base San Diego	38,079	2.52%
Sharp HealthCare	19,528	1.29%
County of San Diego	17,591	1.16%
Scripps Health	14,686	0.97%
San Diego Unified School District	13,453	0.89%
City of San Diego	12,505	0.83%
Qualcomm Inc.	11,615	0.77%
Kaiser Permanente	7,345	0.49%
Amazon Fulfillment Centers (all locations)	7,331	0.49%

Source:

1. Data for fiscal year 2024 not available as of publication date. Data shown for the most recent available information: City of San Diego Annual Comprehensive Financial Report - June 30, 2023.
2. Employment Development Department, State of California, June 2024.

Note: County of San Diego employment information is presented. Employer information is not currently available for the area served by the Metropolitan Transit System within San Diego County. MTS presents only current employment data for the County of San Diego.

OPERATING INFORMATION

San Diego Metropolitan Transit System
Operating Indicators by Function
Last Ten Fiscal Years

	2024	2023	2022	2021	2020
Operating Cost (in 000's)					
San Diego Transit	$ 117,297	$ 111,789	$ 103,386	$ 112,591	$ 99,027
San Diego Trolley	138,097	129,013	106,936	95,148	93,117
MTS-Contract Services	120,552	103,708	102,143	89,907	91,403
Farebox Revenue (in 000's)					
San Diego Transit	$ 19,675	$ 19,666	$ 14,819	$ 14,430	$ 19,749
San Diego Trolley	29,826	26,664	25,519	19,338	36,464
MTS-Contract Services	22,848	21,151	15,740	14,146	23,319
Total Passengers (in 000's)					
San Diego Transit	17,819	16,519	13,098	8,604	18,383
San Diego Trolley	39,649	36,047	29,739	19,516	32,003
MTS-Contract Services	18,214	15,945	14,780	11,095	20,838
Revenue Miles (in 000's)					
San Diego Transit	9,052	8,826	9,426	9,632	9,236
San Diego Trolley	12,156	12,701	11,627	10,077	9,210
MTS-Contract Services	14,565	12,569	13,675	12,966	14,485
Subsidy / Total Passenger					
San Diego Transit	$ 5.48	$ 5.58	$ 6.76	$ 11.41	$ 4.32
San Diego Trolley	2.73	2.84	2.74	3.88	1.76
MTS-Contract Services	5.36	5.18	5.85	6.83	3.27

Source: NTD Report, and audited financial statements.

San Diego Metropolitan Transit System
Operating Indicators by Function (Continued)
Last Ten Fiscal Years

	2019	2018	2017	2016	2015
Operating Cost (in 000's)					
San Diego Transit	$ 94,160	$ 99,619	$ 94,878	$ 95,526	$ 92,059
San Diego Trolley	84,507	87,666	81,501	75,086	72,637
MTS-Contract Services	90,942	83,468	81,744	80,511	76,190
Farebox Revenue (in 000's)					
San Diego Transit	$ 22,041	$ 23,034	$ 24,864	$ 26,169	$ 27,156
San Diego Trolley	42,006	39,354	38,968	41,113	41,140
MTS-Contract Services	28,178	27,848	29,447	30,631	29,318
Total Passengers (in 000's)					
San Diego Transit	22,397	22,867	24,315	25,628	27,264
San Diego Trolley	37,294	36,995	37,639	39,614	40,082
MTS-Contract Services	25,667	25,567	26,241	27,194	27,574
Revenue Miles (in 000's)					
San Diego Transit	9,739	9,684	9,626	9,702	9,561
San Diego Trolley	8,821	8,656	8,728	8,424	8,596
MTS-Contract Services	15,666	14,983	15,144	14,969	13,328
Subsidy / Total Passenger					
San Diego Transit	$ 3.22	$ 3.35	$ 2.88	$ 2.71	$ 2.38
San Diego Trolley	1.14	1.31	1.13	0.86	0.78
MTS-Contract Services	2.45	2.18	2.00	1.83	1.70

Source: NTD Report, and audited financial statements.

San Diego Metropolitan Transit System
Service Performance Data
Last Ten Fiscal Years

	2024	2023	2022	2021	2020
Service Provided					
San Diego Transit					
Vehicle Revenue Miles (in 000's)	9,052	8,826	9,426	9,632	9,236
Vehicle Revenue Hours (in 000's)	784	762	806	814	782
Passengers (in 000's)	17,819	16,519	13,098	8,604	18,383
Passenger Miles (in 000's)	77,382	72,309	57,895	45,774	80,855
Number of Vehicles	261	258	270	278	277
San Diego Trolley					
Vehicle Revenue Miles (in 000's)	12,156	12,701	11,627	10,077	9,210
Vehicle Revenue Hours (in 000's)	669	693	639	555	508
Passenger Car Hours (in 000's)	691	715	658	571	527
Passengers (in 000's)	39,649	36,047	29,739	19,516	32,003
Passenger Miles (in 000's)	290,715	248,512	210,465	123,389	194,285
Number of Vehicles	176	173	157	163	168
MTS-Contracted Services					
Vehicle Revenue Miles (in 000's)	14,565	12,569	13,675	12,966	14,485
Vehicle Revenue Hours (in 000's)	1,245	1,119	1,207	1,168	1,237
Passengers (in 000's)	18,214	15,945	14,780	11,095	20,838
Passenger Miles (in 000's)	73,795	65,301	58,910	44,276	82,173
Number of Vehicles	481	462	456	468	508
Total					
Passengers (in 000's)	75,682	68,511	57,617	39,215	71,224
Passenger Miles (in 000's)	441,892	386,122	327,270	213,439	357,313

Source: NTD Report and MTS internal capital asset system

San Diego Metropolitan Transit System
Service Performance Data (Continued)
Last Ten Fiscal Years

	2019	2018	2017	2016	2015
Service Provided					
San Diego Transit					
Vehicle Revenue Miles (in 000's)	9,739	9,684	9,626	9,702	9,561
Vehicle Revenue Hours (in 000's)	823	821	822	825	806
Passengers (in 000's)	22,397	22,867	24,315	25,628	27,264
Passenger Miles (in 000's)	98,896	104,545	109,727	111,639	117,585
Number of Vehicles	271	271	278	279	272
San Diego Trolley					
Vehicle Revenue Miles (in 000's)	8,821	8,656	8,728	8,424	8,596
Vehicle Revenue Hours (in 000's)	487	478	490	493	496
Passenger Car Hours (in 000's)	500	486	504	507	509
Passengers (in 000's)	37,294	36,995	37,639	39,614	40,082
Passenger Miles (in 000's)	219,453	214,376	210,971	223,185	224,422
Number of Vehicles	142	131	179	179	179
MTS-Contracted Services					
Vehicle Revenue Miles (in 000's)	15,666	14,983	15,144	14,969	13,328
Vehicle Revenue Hours (in 000's)	1,305	1,256	1,269	1,252	1,112
Passengers (in 000's)	25,667	25,567	26,241	27,194	27,573
Passenger Miles (in 000's)	97,045	94,665	95,940	97,479	94,504
Number of Vehicles	529	536	526	520	520
Total					
Passengers (in 000's)	85,358	85,429	88,195	92,436	94,919
Passenger Miles (in 000's)	415,394	413,586	416,638	432,303	436,511

Source: NTD Report and MTS internal capital asset system

San Diego Metropolitan Transit System
Capital Asset Statistics by Function
Last Ten Fiscal Years

	2024	2023	2022	2021	2020
General Operations					
Buildings and structures	1	1	1	1	1
Nonrevenue vehicles	-	-	-	-	-
San Diego Transit					
Land (parcels)	4	2	2	2	2
Buildings and structures	15	11	11	11	11
Buses	261	258	270	278	277
Nonrevenue vehicles	11	11	11	12	14
San Diego Trolley					
Trolley stations	63	63	63	54	55
Track miles	65	65	65	54	54
Buildings and structures	3	2	2	-	-
Light rail vehicles (total inventory)	176	173	157	163	168
Nonrevenue vehicles	9	9	9	10	11
MTS - Contracted Services					
Land (parcel)	2	2	2	2	2
Buildings and structures	18	11	11	11	11
Buses	481	462	456	468	508
Nonrevenue vehicles	2	2	2	2	2
For Hire Vehicle Administration					
Buildings and structures	-	1	1	1	1
Nonrevenue vehicles	-	-	-	-	1

Source: MTS ERP System

San Diego Metropolitan Transit System
Capital Asset Statistics by Function (Continued)
Last Ten Fiscal Years

	2019	2018	2017	2016	2015
General Operations					
Buildings and structures	1	1	1	1	1
Nonrevenue vehicles	-	-	-	1	3
San Diego Transit					
Land (parcels)	2	2	2	2	2
Buildings and structures	11	11	9	8	7
Buses	271	271	278	279	272
Nonrevenue vehicles	15	15	12	12	12
San Diego Trolley					
Trolley stations	54	54	54	54	54
Track miles	54	54	54	54	54
Buildings and structures	-	-	-	-	-
Light rail vehicles (total inventory)	142	131	179	179	179
Nonrevenue vehicles	11	11	12	12	16
MTS - Contracted Services					
Land (parcel)	2	2	2	2	2
Buildings and structures	11	5	4	4	4
Buses	529	536	526	520	520
Nonrevenue vehicles	7	7	9	9	10
For Hire Vehicle Administration					
Buildings and structures	1	1	1	1	1
Nonrevenue vehicles	1	1	1	1	2

Source: MTS ERP System

San Diego Metropolitan Transit System
Ridership
Last Ten Fiscal Years

Ridership (in 000's)	2024	2023	2022	2021	2020
San Diego Transit	17,819	16,519	13,098	8,604	18,383
% Change	7.87%	26.12%	52.23%	-53.20%	-17.92%
San Diego Trolley	39,649	36,047	29,739	19,516	32,003
% Change	9.99%	21.21%	52.38%	-39.02%	-14.19%
MTS - Contracted Services	18,214	15,945	14,780	11,095	20,838
% Change	14.23%	7.88%	33.21%	-46.76%	-18.81%

Source: NTD Report

San Diego Metropolitan Transit System
Ridership (Continued)
Last Ten Fiscal Years

Ridership (in 000's)	2019	2018	2017	2016	2015
San Diego Transit	22,397	22,867	24,315	25,628	27,264
% Change	-2.06%	-5.96%	-5.12%	-6.00%	-4.47%
San Diego Trolley	37,294	36,995	37,639	39,614	40,082
% Change	0.81%	-1.71%	-4.99%	-1.17%	0.97%
MTS - Contracted Services	25,667	25,567	26,241	27,194	27,574
% Change	0.39%	-2.57%	-3.51%	-1.38%	16.05%

Source: NTD Report

San Diego Metropolitan Transit System
Operating Subsidy
Last Ten Fiscal Years

	2024	2023	2022	2021	2020
Average Fare per Rider					
San Diego Transit	$ 1.10	$ 1.19	$ 1.13	$ 1.68	$ 1.07
San Diego Trolley	0.75	0.74	0.86	0.99	1.14
MTS - Contract Services	1.25	1.33	1.06	1.28	1.12
Operating Expense per Rider					
San Diego Transit	$ 6.58	$ 6.77	$ 7.89	$ 13.09	$ 5.39
San Diego Trolley	3.48	3.58	3.60	4.88	2.91
MTS - Contract Services	6.62	6.50	6.91	8.10	4.39
Subsidy per Rider					
San Diego Transit	$ 5.48	$ 5.58	$ 6.76	$ 11.41	$ 4.32
San Diego Trolley	2.73	2.84	2.74	3.88	1.76
MTS - Contract Services	5.37	5.18	5.85	6.83	3.27

Source: NTD report and audited financial statements

San Diego Metropolitan Transit System
Operating Subsidy (Continued)
Last Ten Fiscal Years

	2019	2018	2017	2016	2015
Average Fare per Rider					
San Diego Transit	$ 0.98	$ 1.01	$ 1.02	$ 1.02	$ 1.00
San Diego Trolley	1.13	1.06	1.04	1.04	1.03
MTS - Contract Services	1.10	1.09	1.12	1.13	1.06
Operating Expense per Rider					
San Diego Transit	$ 4.19	$ 4.36	$ 3.90	$ 3.73	$ 3.38
San Diego Trolley	2.18	2.37	2.17	1.90	1.81
MTS - Contract Services	3.54	3.27	3.12	2.96	2.76
Subsidy per Rider					
San Diego Transit	$ 3.21	$ 3.35	$ 2.88	$ 2.71	$ 2.38
San Diego Trolley	1.05	1.31	1.13	0.86	0.78
MTS - Contract Services	2.44	2.18	2.00	1.83	1.70

Source: NTD report and audited financial statements

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REPORT ON INTERNAL CONTROL OVER FINANCIAL REPORTING AND ON COMPLIANCE AND OTHER MATTERS BASED ON AN AUDIT OF FINANCIAL STATEMENTS PERFORMED IN ACCORDANCE WITH *GOVERNMENT AUDITING STANDARDS*

Independent Auditors' Report

To the Board of Directors
of the San Diego Metropolitan Transit System
San Diego, California

We have audited, in accordance with the auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States, the financial statements of the business-type activities and the aggregate remaining fund information of the San Diego Metropolitan Transit System ("MTS"), as of and for the years ended June 30, 2024 and June 30, 2023, and the related notes to the basic financial statements, which collectively comprise MTS's basic financial statements, and have issued our report thereon dated _____, 2024.

Report on Internal Control Over Financial Reporting

In planning and performing our audit of the financial statements, we considered MTS's internal control over financial reporting (internal control) as a basis for designing audit procedures that are appropriate in the circumstances for the purpose of expressing our opinion on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of MTS's internal control. Accordingly, we do not express an opinion on the effectiveness of MTS's internal control.

A *deficiency in internal control* exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, misstatements on a timely basis. A *material weakness* is a deficiency, or a combination of deficiencies, in internal control, such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected on a timely basis. A *significant deficiency* is a deficiency, or a combination of deficiencies, in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance.

Our consideration of internal control was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies. Given these limitations, during our audit we did not identify any deficiencies in internal control that we consider to be material weaknesses. However, material weaknesses or significant deficiencies may exist that have not been identified.

Report on Compliance and Other Matters

As part of obtaining reasonable assurance about whether MTS's basic financial statements are free from material misstatement, we performed tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements, noncompliance with which could have a direct and material effect on the financial statements. However, providing an opinion on compliance with those provisions was not an objective of our audit, and accordingly, we do not express such an opinion. The results of our tests disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards*.

Purpose of this report

The purpose of this report is solely to describe the scope of our testing of internal control and compliance and the results of that testing, and not to provide an opinion on the effectiveness of the entity's internal control or on compliance. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the entity's internal control and compliance. Accordingly, this communication is not suitable for any other purpose.

San Diego, California
_____, 2024

THE PUN GROUP
ACCOUNTANTS & ADVISORS

4660 La Jolla Village Drive, Suite 100
San Diego, California 92122

www.pungroup.cpa

November 7, 2024

To the Board of Directors
of the San Diego Metropolitan Transit System
San Diego, California

We have audited the financial statements of the San Diego Metropolitan Transit System ("MTS") for the year ended June 30, 2024, and have issued our report thereon dated November 7, 2024. Professional standards require that we provide you with information about our responsibilities under generally accepted auditing standards, as well as certain information related to the scope and timing of our audit. We have communicated such information in our letter to you dated April 1, 2024. Professional standards also require that we communicate to you the following information related to our audit.

Significant Audit Matters

Qualitative Aspects of Accounting Practices

Management is responsible for the selection and use of appropriate accounting policies. The significant accounting policies used by MTS are described in Note 1 to the basic financial statements.

New Accounting Standards

- In June 2022, GASB issued Statement No. 100, *Accounting Changes and Error Corrections – an Amendment of GASB Statement No. 62*. The primary objective of this Statement is to enhance accounting and financial reporting requirements for accounting changes and error corrections to provide more understandable, reliable, relevant, consistent, and comparable information for making decisions or assessing accountability. Application of this statement did not have a significant effect on MTS's fiscal year ending June 30, 2024.

We noted no other new accounting policies were adopted and the application of existing policies was not changed during 2024. We noted no transactions entered into by MTS during the year for which there is a lack of authoritative guidance or consensus. All significant transactions have been recognized in the financial statements in the proper period.

Accounting Estimates

Accounting estimates are an integral part of the financial statements prepared by management and are based on management's knowledge and experience about past and current events and assumptions about future events. Certain accounting estimates are particularly sensitive because of their significance to the financial statements and because of the possibility that future events affecting them may differ significantly from those expected.

The most sensitive estimates affecting MTS's financial statements were:

- Management's estimate of the fair value of investments is based on information provided by the State of California, City of San Diego, U.S. Treasury, and financial institutions. We agreed the fair value factor used in determining that it is reasonable in relation to the financial statements as a whole.

- Management's estimate of the depreciation on capital assets is based on the industry standard and past experience on actual useful life of the asset groups. We evaluated the key factors and assumptions used to develop the depreciation on capital assets in determining that it is reasonable in relation to the financial statements taken as a whole.

- Management's estimate of the net other postemployment benefit ("OPEB") liability is based on an actuarial valuation on total OPEB liability. We evaluated the key factors and assumptions used to develop the net OPEB liability in determining that it is reasonable in relation to the financial statements taken as a whole.

- Management's estimate of the net pension liabilities is based on the actuarial valuation on total pension liability and based on audited financial statements on fiduciary net position for CalPERS plans. We evaluated the key factors and assumptions used to develop the net pension liability in determining that it is reasonable in relation to the financial statements taken as a whole.

Certain financial statement disclosures are particularly sensitive because of their significance to financial statement users. The most sensitive disclosures affecting the financial statements were:

Note 1 - Summary of Significant Accounting Polices
Note 2 – Cash, Cash Equivalents, and Investments
Note 5 – Capital Assets
Note 9 – Risk Management
Note 11 – Other Postemployment Benefits
Note 12 – Employee Retirement Systems
Note 13 – Other Required Individual Disclosures

The financial statement disclosures are neutral, consistent, and clear.

Difficulties Encountered in Performing the Audit

We encountered no significant difficulties in dealing with management in performing and completing our audit.

Corrected and Uncorrected Misstatements

Professional standards require us to accumulate all known and likely misstatements identified during the audit, other than those that are clearly trivial, and communicate them to the appropriate level of management. Management has corrected all such misstatements. In addition, none of the misstatements detected as a result of audit procedures and corrected by management were material, either individually or in the aggregate, to each opinion unit's financial statements taken as a whole.

Disagreements with Management

For purposes of this letter, a disagreement with management is a financial accounting, reporting, or auditing matter, whether or not resolved to our satisfaction, that could be significant to the financial statements or the auditors' report. We are pleased to report that no such disagreements arose during the course of our audit.

Management Representations

We have requested certain representations from management that are included in the management representation letter dated November 7, 2024.

Management Consultations with Other Independent Accountants

In some cases, management may decide to consult with other accountants about auditing and accounting matters, similar to obtaining a "second opinion" on certain situations. If a consultation involves application of an accounting principle to the governmental unit's financial statements or a determination of the type of auditors' opinion that may be expressed on those statements, our professional standards require the consulting accountant to check with us to determine that the consultant has all the relevant facts. To our knowledge, there were no such consultations with other accountants.

Other Audit Findings or Issues

We generally discuss a variety of matters, including the application of accounting principles and auditing standards, with management each year prior to retention as the governmental unit's auditors. However, these discussions occurred in the normal course of our professional relationship and our responses were not a condition to our retention.

Other Matters

We applied certain limited procedures to the MD&A, the Schedule of Proportionate Share of the Net Pension Liability, the Schedule of Changes in Net Pension Liability and Related Ratios, the Schedule of Contributions, and the Schedules of Changes in the Total OPEB Liability and Related Ratios, which are Required Supplementary Information ("RSI") that supplement the basic financial statements. Our procedures consisted of inquiries of management regarding the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We did not audit the RSI and do not express an opinion or provide any assurance on the RSI.

We were engaged to report on the Combining Statements and the Budgetary Comparison Schedules, which accompany the financial statements but are not RSI. With respect to this supplementary information, we made certain inquiries of management and evaluated the form, content, and methods of preparing the information to determine that the information complies with accounting principles generally accepted in the United States of America, the method of preparing it has not changed from the prior period, and the information is appropriate and complete in relation to our audit of the financial statements. We compared and reconciled the supplementary information to the underlying accounting records used to prepare the financial statements or to the financial statements themselves.

We were not engaged to report on the Introductory and Statistical Sections, which accompany the financial statements but are not RSI. We did not audit or perform other procedures on this other information and we do not express an opinion or provide any assurance on it.

Restriction on Use

This information is intended solely for the use of the MTS Audit Oversight Committee, the MTS Board of Directors, and management of MTS and is not intended to be, and should not be, used by anyone other than these specified parties.

Very truly yours,

The Pun Group, LLP

San Diego, California

THE PUN GROUP
ACCOUNTANTS & ADVISORS

San Diego Metropolitan Transit System

Presentation to the Joint Audit Oversight & Executive Committee
For the Fiscal Year Ended June 30, 2024

November 7, 2024

CONTENTS

- Management's and Auditors' Responsibilities
- Overview of the Financial Statements
- Key Pension and OPEB Information
- Audit Results

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MANAGEMENT AND AUDITORS' RESPONSIBILITIES

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Management's Responsibilities

- Preparation and fair presentation of the financial statements in accordance with accounting principles generally accepted in the United States of America,
- Design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.
- In preparing the financial statements, management is required to evaluate whether there are conditions or events, considered in the aggregate, that raise substantial doubt about MTS's ability to continue as a going concern for twelve months beyond the financial statement date, including any currently known information that may raise substantial doubt shortly thereafter.

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

Auditors' Responsibilities

- Form and express an opinion about whether the financial statements that have been prepared by management with Board oversight are presented fairly, in all material respects, in accordance with accounting principles generally accepted in the United States of America
- Plan and perform the audit to obtain "reasonable" assurance (not "absolute" assurance) about whether the financial statements are free of material misstatements.
- Consider internal control over financial reporting. However, such considerations were solely for the purpose of determining our risk assessment and audit procedures and were not to provide any assurance concerning such internal control.

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

Auditors' Responsibilities (Continued)

- Exercise professional judgment and maintain professional skepticism throughout the audit.
- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the MTS's internal control. Accordingly, no such opinion is expressed.
- Evaluate the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluate the overall presentation of the financial statements.
- Conclude whether, in our judgment, there are conditions or events, considered in the aggregate, that raise substantial doubt about the MTS's ability to continue as a going concern for a reasonable period of time.

OVERVIEW OF THE FINANCIAL STATEMENTS

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San Diego Metropolitan Transit System
Summary Statements of Net Position – Primary Government
June 30, 2024 and 2023

	2024	2023	$ Diff	% Diff
Current assets	$ 469,991,704	$ 434,835,372	$ 35,156,332	8.08%
Noncurrent assets	3,342,356,238	3,407,815,415	(65,459,177)	-1.92%
Deferred Outflows of Resources	68,413,443	74,965,242	(6,551,799)	-8.74%
Current Liabilities	112,127,617	94,986,635	17,140,982	18.05%
Noncurrent liabilities	303,433,498	299,235,393	4,198,105	1.40%
Deferred Inflows of Resources	86,007,363	64,537,896	21,469,467	33.27%
Net Position				
Net investment in capital assets	3,266,970,484	3,351,318,258	(84,347,774)	-2.52%
Unrestricted	112,222,423	107,537,847	4,684,576	4.36%
Total Net Position	$ 3,379,192,907	$ 3,458,856,105	$ (79,663,198)	-2.30%

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San Diego Metropolitan Transit System
Summary Statements of Revenues, Expenses and Changes in Net Position
Primary Government
For the Years Ended June 30, 2024 and 2023

	2024	2023	$ Diff	% Diff
Revenues				
Operating revenues	$ 94,340,307	$ 87,043,097	$ 7,297,210	8.38%
Nonoperating revenues	479,599,016	477,845,410	1,753,606	0.37%
Total revenues	573,939,323	564,888,507	9,050,816	1.60%
Expenses				
Operating expenses	631,839,511	587,320,838	44,518,673	7.58%
Nonoperating expenses	41,993,489	25,522,507	16,470,982	64.54%
Total expenses	673,833,000	612,843,345	60,989,655	9.95%
Income (loss) before capital contributions	(99,893,677)	(47,954,838)	(51,938,839)	108.31%
Capital contributions, net	20,230,479	23,620,737	(3,390,258)	-14.35%
Changes in net position	$ (79,663,198)	$ (24,334,101)	$ (55,329,097)	227.37%

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San Diego Metropolitan Transit System
Summary Statements of Cash Flows – Primary Government
For the Years Ended June 30, 2024 and 2023

	2024	2023	$ Diff	% Diff
Cash Flows from Operating Activities	$ (305,201,445)	$ (272,972,158)	$ (32,229,287)	11.81%
Cash Flows from Noncapital Financing Activities	488,219,729	466,095,261	22,124,468	4.75%
Cash Flows from Capital and Related Financing Activities	(157,778,064)	(72,896,708)	(84,881,356)	116.44%
Cash Flows from Investing Activities	8,660,958	3,145,167	5,515,791	175.37%
Changes in cash, cash equivalents, and investments	$ 33,901,178	$ 123,371,562	$ (89,470,384)	-72.52%

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San Diego Metropolitan Transit System
Summary Statements of Fiduciary Net Position
June 30, 2024 and 2023

	2024	2023	$ Diff	% Diff
Assets	$ 193,652,083	$ 184,032,663	$ 9,619,420	5.23%
Liabilities	707,320	859,971	(152,651)	-17.75%
Net Position	$ 192,944,763	$ 183,172,692	$ 9,772,071	5.33%

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San Diego Metropolitan Transit System
Summary Statements of Changes in Fiduciary Net Position
For the Years Ended June 30, 2024 and 2023

	2024	2023	$ Diff	% Diff
Additions				
Contributions	$ 18,926,019	$ 17,877,214	$ 1,048,805	5.87%
Net investment income (loss)	14,304,780	11,403,121	2,901,659	25.45%
Total additions	33,230,799	29,280,335	3,950,464	13.49%
Deductions				
Distributions	23,302,300	22,630,610	671,690	2.97%
Administrative expenses	156,428	354,459	(198,031)	-55.87%
Total deductions	23,458,728	22,985,069	473,659	2.06%
Changes in fiduciary net position	$ 9,772,071	$ 6,295,266	$ 3,476,805	55.23%

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KEY PENSION AND OPEB INFORMATION

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San Diego Metropolitan Transit System
Net Pension Liability Sensitivity to Changes in the Discount Rate
June 30, 2024

Discount Rate	MTS	SDTC	SDTI PERS	SDTI PARS	Aggregate
1% decrease	5.90%	5.00%	5.90%	5.00%	
Net pension liability	$ 29,939,269	$ 195,575,453	$ 78,935,037	$ 3,580,930	$ 308,030,689
Current discount rate	6.90%	6.00%	6.90%	6.00%	
Net pension liability	$ 19,332,817	$ 159,680,176	$ 47,942,045	$ 2,289,341	$ 229,244,379
1% increase	7.90%	7.00%	7.90%	7.00%	
Net pension liability	$ 10,602,797	$ 129,138,346	$ 22,511,225	$ 1,205,976	$ 163,458,344

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San Diego Metropolitan Transit System
Pension Expense
For the Years Ended June 30, 2024 and 2023

	2024	2023	$ Diff	% Diff
MTS CalPERS	$ 4,104,272	$ 1,734,279	$ 2,369,993	136.66%
SDTC Retirement Plan	21,463,544	24,550,685	(3,087,141)	-12.57%
SDTI CalPERS	10,373,926	7,592,651	2,781,275	36.63%
SDTI PARS	759,123	561,012	198,111	35.31%
Total Pension Expense	$ 36,700,865	$ 34,438,627	$ 2,262,238	6.57%

THE PUN GROUP
ACCOUNTANTS & ADVISORS

San Diego Metropolitan Transit System
Other Postemployment Benefits Plan
OPEB Liability Sensitivity to Changes in Discount Rate
June 30, 2024

Discount Rate	MTS	SDTC	SDTI	Aggregate
1% decrease	3.13%	3.13%	3.13%	
Total OPEB liability	$ 7,567,070	$ 14,269,247	$ 24,615,100	$ 46,451,417
Current discount rate	4.13%	4.13%	4.13%	
Total OPEB liability	$ 6,459,098	$ 12,244,775	$ 20,948,280	$ 39,652,153
1% increase	5.13%	5.13%	5.13%	
Total OPEB liability	$ 5,562,346	$ 10,599,419	$ 18,003,107	$ 34,164,872

THE PUN GROUP
ACCOUNTANTS & ADVISORS

San Diego Metropolitan Transit System
OPEB Expense
For the Years Ended June 30, 2024 and 2023

	2024	2023	$ Diff	% Diff
MTS	$ 464,374	$ 700,304	$ (235,930)	-33.69%
SDTC	449,883	1,200,089	(750,206)	-62.51%
SDTI	552,197	639,806	(87,609)	-13.69%
Total OPEB Expense	$ 1,466,454	$ 2,540,199	$ (1,073,745)	-42.27%

THE PUN GROUP
ACCOUNTANTS & ADVISORS

San Diego Metropolitan Transit System
Federal Single Audit
For the Year Ended June 30, 2024

Federal Grantor/Pass-Through Grantor Program Title	Federal Assistance Listing Number	Federal Expenditures
U.S. Department of Transportation		
Direct Programs:		
Federal Transit Cluster	20.507/20.509/20.525	$ 184,474,585
	Total Major Programs	$ 184,474,585
	TOTAL EXPENDITURES OF FEDERAL AWARDS	$ 185,787,042
	Percent tested as major programs	99%

AUDIT RESULTS

THE PUN GROUP
ACCOUNTANTS & ADVISORS

Audit Results

- **Unmodified Opinion**
  - Financial statements are fairly presented in all material respects
  - Significant accounting policies have been consistently applied
  - Estimates are reasonable
  - Disclosures are properly reflected in the financial statements
- **Other Results**
  - No disagreements with management
  - No material weaknesses or significant deficiencies in internal controls were noted
  - No accounting issues noted

THE PUN GROUP
ACCOUNTANTS & ADVISORS

Questions/ Comments

HQ - ORANGE COUNTY
200 E. Sandpointe Avenue
Suite 600
Santa Ana, CA 92707

SAN DIEGO
4365 Executive Drive
Suite 710
San Diego, CA 92121

BAY AREA
2121 North California Blvd.
Suite 290
Walnut Creek, CA 94596

LAS VEGAS
1050 Indigo Drive
Suite 110
Las Vegas, NV 89145

PHOENIX
4742 North 24th Street
Suite 300
Phoenix, AZ 85016

Metropolitan Transit System

Agenda Item No. 5

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
JOIN AUDIT OVERSIGHT AND EXECUTIVE COMMITTEE

November 7, 2024

SUBJECT:

Operations Budget Status Report for September 2024 (Gordon Meyer)

INFORMATIONAL ONLY

Budget Impact

None

DISCUSSION:

This report summarizes the year-to-date operating results for September 2024 compared to the Fiscal Year (FY) 2025 budget for the San Diego Metropolitan Transit System (MTS). Attachment A-1 combines the operations', administrations', and other activities' results for September 2024. Attachment A-2 details the September 2024 combined operations' results and Attachments A-3 to A-7 present budget comparisons for each MTS operation. Attachment A-8 details budget comparisons for MTS Administration, and Attachment A-9 provides September 2024 results for MTS's other activities (For Hire Vehicle Administration (FHV)/San Diego and Arizona Eastern Railway Company (SD&AE)).

MTS NET-OPERATING SUBSIDY RESULTS

As indicated within Attachment A-1, for the year-to-date period ending September 2024, MTS's net-operating income favorable variance totaled $2,023,000 (2.4%). Operations produced a $2,044,000 (2.5%) favorable variance and the administrative/other activities areas were unfavorable by $21,000 (-0.7%).

MTS COMBINED RESULTS

Operating Revenues. Year-to-date combined revenues through September 2024 were $24,770,000 compared to the year-to-date budget of $24,807,000, representing a $36,000 (-0.1%) unfavorable variance. Year-to-date passenger revenue was favorable by $40,000 (0.2%) through September. Passenger revenue is up by $1,302,000 (7.2%) versus the prior year.

Other operating revenue was unfavorable by $77,000 (-1.4%), primarily due to unfavorable energy credit revenue and advertising revenue.

Operating Expenses. Year-to-date combined expenses through September 2024 were $108,676,000 compared to the budget of $110,736,000, resulting in a $2,060,000 (1.9%) favorable variance.

Personnel Costs. Year-to-date personnel-related costs totaled $47,479,000, compared to a budgetary figure of $48,951,000, producing a favorable variance of $1,472,000 (3.0%). This is primarily due to favorable health and welfare costs within Bus and Trolley operations, defined contribution pension plan costs within Bus operations, and favorable Flagging and Security wages.

Outside Services and Purchased Transportation. Total outside services through three months of the fiscal year totaled $39,064,000, compared to a budget of $38,684,000, resulting in an unfavorable variance of $379,000 (-1.0%). This is primarily unfavorable due to contracted security costs within Administration, engines/transmission repairs within Fixed Route operations, and Closed Circuit Television (CCTV) repairs and upgrades.

Materials and Supplies. Total year-to-date materials and supplies expenses were $5,142,000, compared to a budgetary figure of $5,102,000, resulting in an unfavorable variance of $40,000 (-0.8%). This is primarily due to unfavorable revenue vehicle parts and maintenance supplies within Bus operations.

Energy. Total year-to-date energy costs were $12,073,000, compared to the budget of $13,252,000, resulting in a favorable variance of $1,178,000 (8.9%). This is primarily due to favorable commodity rates for both Compressed Natural Gas (CNG) and electricity.

Risk Management. Total year-to-date expenses for risk management were $2,503,000 compared to the budget of $2,614,000, resulting in a favorable variance totaling $111,000 (4.3%). This is primarily due to favorable claim payouts and legal costs.

General and Administrative. The year-to-date general and administrative costs were $1,834,000 through September 2024, compared to a budget of $1,560,000, resulting in an unfavorable variance of $274,000 (-17.6%). This is primarily due to unfavorable office equipment due to handheld unit purchases for Security within Administration.

Vehicle and Facility Leases. The year-to-date vehicle and facilities lease costs were $582,000 compared to the budget of $574,000, resulting in an $8,000 (-1.5%) unfavorable variance.

YEAR-TO-DATE SUMMARY

The September 2024, year-to-date net-operating income totaled a favorable variance of $2,023,000 (2.4%). These factors include favorable variances in passenger revenue, personnel, energy, and risk management; partially offset by unfavorable variances in other revenue, outside services, materials and supplies, general and administrative costs, and vehicle/facility leases.

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachment: A. FY24 September Operations Budget Results

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

MTS
CONSOLIDATED

COMPARISON TO BUDGET - FISCAL YEAR 2024
SEPTEMBER 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	**BUDGET**	**VARIANCE**	**VAR. %**
Passenger Revenue	$ 19,338	$ 19,298	$ 40	0.2%
Other Revenue	5,432	5,509	(77)	-1.4%
Total Operating Revenue	**$ 24,770**	**$ 24,807**	**$ (36)**	**-0.1%**
Personnel costs	$ 47,479	$ 48,951	$ 1,472	3.0%
Outside services	39,064	38,684	(379)	-1.0%
Materials and supplies	5,142	5,102	(40)	-0.8%
Energy	12,073	13,252	1,178	8.9%
Risk management	2,503	2,614	111	4.3%
General & administrative	1,834	1,560	(274)	-17.6%
Vehicle/facility leases	582	574	(8)	-1.5%
Administrative Allocation	0	0	0	0.0%
Total Operating Expenses	**$ 108,676**	**$ 110,736**	**$ 2,060**	**1.9%**
Operating Income (Loss)	**$ (83,906)**	**$ (85,929)**	**$ 2,023**	**2.4%**
Total Non-Operating Activities	**80**	**320**	**(240)**	**-75.0%**
Income (Loss) before Capital Contributions	**$ (83,826)**	**$ (85,609)**	**$ 1,783**	**-2.1%**

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OPERATIONS
CONSOLIDATED

COMPARISON TO BUDGET - FISCAL YEAR 2024
SEPTEMBER 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	**BUDGET**	**VARIANCE**	**VAR. %**
Passenger Revenue	$ 19,338	$ 19,298	$ 40	0.2%
Other Revenue	132	173	(42)	-24.1%
Total Operating Revenue	**$ 19,470**	**$ 19,471**	**$ (2)**	**0.0%**
Personnel costs	$ 39,053	$ 40,053	$ 1,000	2.5%
Outside services	31,902	31,814	(88)	-0.3%
Materials and supplies	5,132	5,086	(45)	-0.9%
Energy	11,737	12,913	1,176	9.1%
Risk management	2,270	2,283	14	0.6%
General & administrative	273	269	(4)	-1.6%
Vehicle/facility leases	477	470	(7)	-1.5%
Administrative Allocation	9,476	9,476	(0)	0.0%
Total Operating Expenses	**$ 100,319**	**$ 102,364**	**$ 2,045**	**2.0%**
Operating Income (Loss)	**$ (80,849)**	**$ (82,893)**	**$ 2,044**	**2.5%**
Total Non-Operating Activities	**80**	**320**	**(240)**	**-75.0%**
Income (Loss) before Capital Contributions	**$ (80,769)**	**$ (82,573)**	**$ 1,804**	**-2.2%**

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OPERATIONS

BUS - DIRECTLY OPERATED (SAN DIEGO TRANSIT CORP.)

COMPARISON TO BUDGET - FISCAL YEAR 2024

SEPTEMBER 30, 2024

(in $000's)

	YEAR TO DATE			
	ACTUAL	**BUDGET**	**VARIANCE**	**VAR. %**
Passenger Revenue	$ 4,909	$ 5,012	$ (102)	-2.0%
Other Revenue	-	13	(13)	-
Total Operating Revenue	**$ 4,909**	**$ 5,024**	**$ (115)**	**-2.3%**
Personnel costs	$ 24,219	$ 24,826	$ 607	2.4%
Outside services	446	558	111	20.0%
Materials and supplies	1,963	1,934	(29)	-1.5%
Energy	1,838	2,185	348	15.9%
Risk management	858	919	61	6.6%
General & administrative	109	129	20	15.6%
Vehicle/facility leases	170	161	(9)	-5.4%
Administrative Allocation	1,462	1,462	0	0.0%
Total Operating Expenses	**$ 31,066**	**$ 32,175**	**$ 1,110**	**3.4%**
Operating Income (Loss)	**$ (26,156)**	**$ (27,151)**	**$ 995**	**3.7%**
Total Non-Operating Activities	**-**	**115**	**(115)**	**-**
Income (Loss) before Capital Contributions	**$ (26,156)**	**$ (27,036)**	**$ 880**	**-3.3%**

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OPERATIONS
RAIL (SAN DIEGO TROLLEY INC.)

COMPARISON TO BUDGET - FISCAL YEAR 2024
SEPTEMBER 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	**BUDGET**	**VARIANCE**	**VAR. %**
Passenger Revenue	$ 8,155	$ 8,021	$ 133	1.7%
Other Revenue	132	161	(29)	-18.2%
Total Operating Revenue	**$ 8,286**	**$ 8,182**	**$ 104**	**1.3%**
Personnel costs	$ 14,599	$ 15,018	$ 419	2.8%
Outside services	3,109	2,972	(137)	-4.6%
Materials and supplies	3,135	3,138	3	0.1%
Energy	7,679	8,054	374	4.6%
Risk management	1,396	1,349	(47)	-3.5%
General & administrative	163	134	(29)	-21.7%
Vehicle/facility leases	217	217	0	0.2%
Administrative Allocation	7,262	7,262	0	0.0%
Total Operating Expenses	**$ 37,561**	**$ 38,145**	**$ 584**	**1.5%**
Operating Income (Loss)	**$ (29,275)**	**$ (29,963)**	**$ 688**	**2.3%**
Total Non-Operating Activities	**-**	**125**	**(125)**	**-**
Income (Loss) before Capital Contributions	**$ (29,275)**	**$ (29,838)**	**$ 563**	**-1.9%**

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OPERATIONS
BUS - CONTRACTED SERVICES (FIXED ROUTE)
COMPARISON TO BUDGET - FISCAL YEAR 2024
SEPTEMBER 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	**BUDGET**	**VARIANCE**	**VAR. %**
Passenger Revenue	$ 5,896	$ 5,893	$ 3	0.1%
Other Revenue	-	-	-	-
Total Operating Revenue	**$ 5,896**	**$ 5,893**	**$ 3**	**0.1%**
Personnel costs	$ 196	$ 162	$ (34)	-21.2%
Outside services	23,614	23,432	(182)	-0.8%
Materials and supplies	33	14	(19)	-137.4%
Energy	1,969	2,355	386	16.4%
Risk management	-	-	-	-
General & administrative	1	3	2	59.6%
Vehicle/facility leases	4	5	1	23.9%
Administrative Allocation	615	615	(0)	0.0%
Total Operating Expenses	**$ 26,433**	**$ 26,586**	**$ 154**	**0.6%**
Operating Income (Loss)	**$ (20,537)**	**$ (20,694)**	**$ 157**	**0.8%**
Total Non-Operating Activities	**-**	**-**	**-**	**-**
Income (Loss) before Capital Contributions	**$ (20,537)**	**$ (20,694)**	**$ 157**	**-0.8%**

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OPERATIONS
BUS - CONTRACTED SERVICES (PARATRANSIT)
COMPARISON TO BUDGET - FISCAL YEAR 2024
SEPTEMBER 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	**BUDGET**	**VARIANCE**	**VAR. %**
Passenger Revenue	$ 378	$ 373	$ 5	1.5%
Other Revenue	-	-	-	-
Total Operating Revenue	**$ 378**	**$ 373**	**$ 5**	**1.5%**
Personnel costs	$ 39	$ 47	$ 8	17.7%
Outside services	4,653	4,772	119	2.5%
Materials and supplies	-	-	-	-
Energy	251	319	68	21.3%
Risk management	15	15	0	0.3%
General & administrative	0	3	3	94.5%
Vehicle/facility leases	86	86	0	0.1%
Administrative Allocation	136	136	(0)	0.0%
Total Operating Expenses	**$ 5,180**	**$ 5,378**	**$ 198**	**3.7%**
Operating Income (Loss)	**$ (4,801)**	**$ (5,005)**	**$ 203**	**4.1%**
Total Non-Operating Activities	**-**	**-**	**-**	**-**
Income (Loss) before Capital Contributions	**$ (4,801)**	**$ (5,005)**	**$ 203**	**-4.1%**

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OPERATIONS
CORONADO FERRY

COMPARISON TO BUDGET - FISCAL YEAR 2024
SEPTEMBER 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	**BUDGET**	**VARIANCE**	**VAR. %**
Passenger Revenue	$ -	$ -	$ -	-
Other Revenue	-	-	-	-
Total Operating Revenue	**$ -**	**$ -**	**$ -**	**-**
Personnel costs	$ -	$ -	$ -	-
Outside services	80	80	-	0.0%
Materials and supplies	-	-	-	-
Energy	-	-	-	-
Risk management	-	-	-	-
General & administrative	-	-	-	-
Vehicle/facility leases	-	-	-	-
Administrative Allocation	-	-	-	0.0%
Total Operating Expenses	**$ 80**	**$ 80**	**$ -**	**0.0%**
Operating Income (Loss)	**$ (80)**	**$ (80)**	**$ -**	**0.0%**
Total Non-Operating Activities	**80**	**80**	**-**	**0.0%**
Income (Loss) before Capital Contributions	**$ -**	**$ -**	**$ -**	**-**

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

ADMINISTRATION
CONSOLIDATED

COMPARISON TO BUDGET - FISCAL YEAR 2024
SEPTEMBER 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	**BUDGET**	**VARIANCE**	**VAR. %**
Passenger Revenue	$ -	$ -	$ -	-
Other Revenue	5,197	5,230	(33)	-0.6%
Total Operating Revenue	**$ 5,197**	**$ 5,230**	**$ (33)**	**-0.6%**
Personnel costs	$ 8,287	$ 8,729	$ 442	5.1%
Outside services	7,159	6,854	(304)	-4.4%
Materials and supplies	10	15	5	31.6%
Energy	335	337	2	0.6%
Risk management	212	299	87	29.2%
General & administrative	1,552	1,280	(273)	-21.3%
Vehicle/facility leases	100	103	2	2.1%
Administrative Allocation	(9,480)	(9,480)	0	0.0%
Total Operating Expenses	**$ 8,175**	**$ 8,136**	**$ (39)**	**-0.5%**
Operating Income (Loss)	**$ (2,979)**	**$ (2,906)**	**$ (72)**	**-2.5%**
Total Non-Operating Activities	**-**	**-**	**-**	**-**
Income (Loss) before Capital Contributions	**$ (2,979)**	**$ (2,906)**	**$ (72)**	**2.5%**

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OTHER ACTIVITIES
CONSOLIDATED

COMPARISON TO BUDGET - FISCAL YEAR 2024
SEPTEMBER 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	**BUDGET**	**VARIANCE**	**VAR. %**
Passenger Revenue	$ -	$ -	$ -	-
Other Revenue	104	105	(1)	-1.4%
Total Operating Revenue	**$ 104**	**$ 105**	**$ (1)**	**-1.4%**
Personnel costs	$ 139	$ 169	$ 30	17.7%
Outside services	3	16	13	81.6%
Materials and supplies	-	0	0	-
Energy	1	2	1	42.2%
Risk management	22	32	10	32.0%
General & administrative	8	11	3	23.8%
Vehicle/facility leases	5	2	(4)	-243.3%
Administrative Allocation	4	4	(0)	0.0%
Total Operating Expenses	**$ 182**	**$ 235**	**$ 53**	**22.5%**
Operating Income (Loss)	**$ (78)**	**$ (130)**	**$ 51**	**-39.6%**
Total Non-Operating Activities	**-**	**-**	**-**	**-**
Income (Loss) before Capital Contributions	**$ (78)**	**$ (130)**	**$ 51**	**-39.6%**

FY 25 Operating Budget – September 2024 Financial Review

Joint Audit Oversight &

Executive Committee

CONSOLIDATED MTS OPERATIONS

COMPARISON TO BUDGET – SEPTEMBER 30, 2024 - FY 2025

TOTAL OPERATING REVENUES ($000'S)

	ACTUAL	BUDGET	VARIANCE	VAR %
Fare Revenue	$ 19,338	$ 19,298	$ 40	0.2%
Other Operating Revenue	$ 5,432	$ 5,509	$ (77)	-1.4%
Operating Revenue	**$ 24,770**	**$ 24,807**	**$ (36)**	**-0.1%**

- Fare Revenue
  - Strong July and August – averaged 9.2% increase in revenue over prior year
  - September revenue was only 3.4% higher than prior year
  - Year to date revenue 7.2% higher than last year
  - Ridership averaging 16.1% higher than prior year while average fare -5.8% lower than prior year
- Other Operating Revenue
  - Unfavorable energy credit revenue and advertising revenue

CONSOLIDATED MTS OPERATIONS

COMPARISON TO BUDGET – SEPTEMBER 30, 2024 - FY 2025

TOTAL OPERATING EXPENSES ($000'S)

	ACTUAL	BUDGET	VARIANCE	VAR %
Personnel Costs	$ 47,479	$ 48,951	$ 1,472	3.0%
Purchased Transportation	$ 27,185	$ 27,148	$ (37)	-0.1%
Other Outside Services	$ 11,879	$ 11,536	$ (343)	-3.0%
Energy	$ 12,073	$ 13,252	$ 1,178	8.9%
Other Expenses	$ 10,061	$ 9,849	$ (212)	-2.1%
Operating Expenses	**$ 108,676**	**$110,736**	**$ 2,060**	**1.9%**

- Personnel - favorable security/flagging wages, defined contribution costs within SDTC, and health and welfare
- Other Outside Services – unfavorable engine/transmission repair, CCTV maintenance, contracted security costs
- Energy – favorable CNG and electricity costs due to commodity rates
- Other – unfavorable general & administrative costs due to handheld unit purchases within Security

CONSOLIDATED MTS OPERATIONS

COMPARISON TO BUDGET – SEPTEMBER 30, 2024 - FY 2025

TOTAL OPERATING ACTIVITIES ($000'S)

	ACTUAL	BUDGET	VARIANCE	VAR %
MTS Operating Revenue	$ 24,770	$ 24,807	$ (36)	-0.1%
MTS Operating Expenses	$ 108,676	$ 110,736	$ 2,060	1.9%
Total Net Operating Variance	**$ (83,906)**	**$ (85,929)**	**$ 2,023**	**2.4%**

- Net income favorable $2.0M through September

Questions/Comments

Metropolitan Transit System

Agenda Item No. 6

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
JOINT AUDIT OVERSIGHT AND EXECUTIVE COMMITTEE

November 7, 2024

SUBJECT:

Fiscal Year (FY) 2024 Final Operating Budget Results (Gordon Meyer)

RECOMMENDATION:

That the San Diego Metropolitan Transit System (MTS) Executive Committee receive the MTS operations budget status report for FY 2024 and approve staff recommendations for programming excess revenues less expenses.

Budget Impact

Final FY 2024 results show revenues exceeding expenses by $8,799,000. After reserve related adjustments, there will be $8,392,000 in excess revenues, which staff recommends be allocated between the following:

- Allocate $2,084,000 in land sale proceeds to MTS Capital Improvement Program (CIP) for programming in FY 2026.
- Allocate $2,500,000 to increase Self-Insured Retention (SIR) from $5,000,000 to $7,500,000 in accordance with MTS' Excess General Liability Insurance program.
- Allocate remaining $3,807,000 to contingency reserve.

DISCUSSION:

This report summarizes the year-end operating results for FY 2024 compared to the FY 2024 amended budget for MTS. Attachment A-1 combines the operations', administrations', and other activities' results for FY 2024. Attachment A-2 details the FY 2024 combined operations' results and Attachments A-3 to A-7 present budget comparisons for each MTS operation. Attachment A-8 details budget comparisons for MTS Administration, and Attachment A-9 provides FY 2024 results for MTS's other activities (For Hire Vehicle (FHV) Administration/San Diego and Arizona Eastern (SD&AE) Railway Company). Attachment A-10 details subsidy revenue and other non-operating revenue and expenses. Attachment A-11 details MTS's contingency reserve balance.

MTS OPERATING SUBSIDY RESULTS

As indicated within Attachment A-1, for the fiscal year ending June 2024, MTS's net-operating income favorable variance totaled $7,578,000 (2.5%). The favorable budget results were

primarily due to favorable experience in other revenue, personnel expenses, and energy expenses.

As indicated within Attachment A-10, non-operating net subsidy for FY 2024 was favorable to budget by $1,220,000 (0.4%).

In total, revenues exceeded expenses by $8,799,000 for FY 2024.

MTS COMBINED RESULTS

Operating Revenues. Total combined operating revenues for FY 2024 were $106,915,000 compared to the budget of $105,716,000, representing a $1,200,000 (1.1%) favorable variance. Passenger revenue was unfavorable to budget by $2,154,000 (-2.9%) due to both ridership and average fare being lower than the amended budget figures. FY 2024 ridership was 75,682,000 passengers, compared to a budget of 76,470,000, resulting in an unfavorable variance of 788,000 (-1.0%) passengers. Average fare in FY 2024 was $0.96 versus the budget of $0.98, an unfavorable variance of -1.9%. Other revenue was favorable by $3,354,000 (10.8%), primarily due to favorable interest revenue, rental income, and gain on sale of assets resulting from the sale of multiple land parcels.

Operating Expenses. Total combined expenses for FY 2024 were $407,522,000 compared to the budget of $413,901,000 resulting in a $6,378,000 (1.5%) favorable variance.

Personnel Costs. Personnel-related costs totaled $176,442,000, compared to a budgetary figure of $177,948,000, producing a favorable variance of $1,506,000 (0.8%). This was primarily due to favorable cost recovery for flood-related expenses as well as favorable paid absences within Bus Operations.

Outside Services and Purchased Transportation. Total outside services expenses for the fiscal year were $152,104,000 compared to a budget of $152,855,000, resulting in a favorable variance of $751,000 (0.5%). This was primarily due to favorable purchased transportation costs for both fixed route and paratransit services. Fixed route costs were favorable primarily due to operating slightly less service than anticipated and favorable performance bonuses. Paratransit costs were favorable due to favorable taxi pass-through costs.

Materials and Supplies. Total materials and supplies expenses were $18,674,000, compared to a budgetary figure of $18,637,000, resulting in an unfavorable variance of $36,000 (-0.2%).

Energy. Total energy costs were $44,489,000, compared to the budget of $48,056,000, resulting in a favorable variance of $3,567,000 (7.4%). Compressed natural gas (CNG) costs were $1,779,000 (11.7%) favorable to budget, primarily due to favorable commodity rates, while traction power electricity costs were favorable by $1,604,000 (6.7%) due to favorable commodity rates as well.

Risk Management. Total expenses for risk management were $8,122,000 compared to the budget of $8,502,000, resulting in a favorable variance totaling $380,000 (4.5%). This was primarily due to favorable claim payouts, claim recoveries, and risk-related legal expenses, partially offset by unfavorable property insurance premiums.

General and Administrative. Total general and administrative costs were $5,986,000 for FY 2024, compared to a budget of $6,209,000, resulting in a favorable variance of $223,000 (3.6%). This was primarily due to favorable office equipment purchases within the Information Technology (IT) department combined with smaller variances in travel/meeting costs, advertising, and office supplies.

Vehicle and Facility Leases. Vehicle and facility lease costs were $1,706,000 compared to the budget of $1,693,000, resulting in a $13,000 (-0.8%) unfavorable variance.

Subsidy Revenue and Other Non-Operating Revenue and Expenses

Attachment A-10 details subsidy revenue and other non-operating revenue and expenses. Subsidy and net non-operating revenues for FY 2024 were $309,406,000 compared to the fiscal year budget of $308,185,000, representing a favorable variance of $1,220,000 (0.4%). This was primarily due to favorable State Transit Assistance (STA) funding, which is derived from the state sales tax on diesel fuel.

On March 16, 2023 (Agenda Item (AI) 13), the MTS Board of Directors directed staff to draw federal stimulus funds as fast as possible based on eligible expenses (versus budgetary need) and to transfer any excess funds to the operating deficit reserve until needed to address structural deficits in future fiscal years. MTS received $85,000,000 in federal stimulus funds during FY 2024, consistent with the budgeted amount. The FY 2024 amended budget included a contribution of $30,182,000 of excess stimulus funds to the operating deficit reserve, and MTS was able to contribute the planned amount based on final year-end results. As of June 30, 2024, MTS has drawn $312.6 million of the $360 million in total apportioned stimulus funds, leaving $47.4 million in remaining funds to be drawn in FY 2025.

As detailed in Attachment A-10, the FY 2024 amended budget for other non-operating income (reserves) included a contribution of $30,399,000 to reserves, including a $30.2 million contribution to the operating deficit reserve mentioned above, and a $217,000 contribution to the FHV Administration and SD&AE reserves. The actual reserve contribution amount for FY 2024 was $30,505,000, or $106,000 (0.3%) higher than budget, due to higher excess revenues over expenses within the FHV Administration and SD&AE departments.

Net Revenues Less Expenses

For FY 2024, MTS had an excess of revenues over expenses totaling $8,799,000. After reserve adjustments for interest, there is $8,392,000 in excess revenues over expenses. Staff recommends the following actions to program excess revenues:

- Allocate $2,084,000 in land sale proceeds to MTS CIP for programming in FY 2026.
- Allocate $2,500,000 to increase Self-Insured Retention (SIR) from $5,000,000 to $7,500,000 in accordance with MTS' Excess General Liability insurance program.
- Allocate remaining $3,807,000 to contingency reserve

The amended FY 2024 budget included a $59.1 million structural deficit. Favorable expenses and revenue resulted in an actual structural deficit of $50.2 million in FY 2024.

Reserves

Attachment A-11 details MTS's contingency reserve. Under Board Policy 26, the Board's contingency reserve target is 12.5% of the operating budget.

The ending reserve balance on June 30, 2023, was $44,963,000.

After interest and other adjustments, there was $8,392,000 in excess revenues over expenses in FY 2024 which staff recommends allocating as follows:

- $2,084,000 of the excess revenues is from land sale proceeds, and staff is recommending transferring this share to the FY 2026 CIP since the funding is one-time in nature.

- Staff recommends allocating $2,500,000 to increase the separate Excess Liability insurance SIR from $5,000,000 to $7,500,000 to match the change in the MTS Excess General Liability Insurance program approved by the Board on March 14, 2024 (AI 18).

- After these allocations, there is a remaining balance of $3,807,000 in excess revenues available for contribution to the contingency reserve. This would bring the contingency reserve balance to $48,770,000, or 12.3% of the FY 2025 operating budget (net of Transnet funded activities, FHV Administration, and SD&AE expenses). Although the contingency reserve would be lower than the 12.5% target in Policy 36, it is important to note that the operating deficit reserve has a balance of $87,148,000 as of June 30, 2024. The operating deficit reserve will be the balancing mechanism for the operating budget for the next few years until depleted. When the operating deficit reserve is combined with the contingency reserves, MTS far exceeds the Policy 36 minimum reserve goals.

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachment: A. Comparison to Budget

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

MTS
CONSOLIDATED
COMPARISON TO BUDGET - FISCAL YEAR 2024
JUNE 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	BUDGET	VARIANCE	VAR. %
Passenger Revenue	$ 72,404	$ 74,558	$ (2,154)	-2.9%
Other Revenue	34,512	31,158	3,354	10.8%
Total Operating Revenue	**$ 106,915**	**$ 105,716**	**$ 1,200**	**1.1%**
Personnel costs	$ 176,442	$ 177,948	$ 1,506	0.8%
Outside services	152,104	152,855	751	0.5%
Materials and supplies	18,674	18,637	(36)	-0.2%
Energy	44,489	48,056	3,567	7.4%
Risk management	8,122	8,502	380	4.5%
General & administrative	5,986	6,209	223	3.6%
Vehicle/facility leases	1,706	1,693	(13)	-0.8%
Administrative Allocation	0	0	(0)	0.0%
Total Operating Expenses	**$ 407,522**	**$ 413,901**	**$ 6,378**	**1.5%**
Operating Income (Loss)	**$ (300,607)**	**$ (308,185)**	**$ 7,578**	**2.5%**
Total Non-Operating Activities	**309,406**	**308,185**	**1,220**	**0.4%**
Income (Loss) before Capital Contributions	**$ 8,799**	**$ 0**	**$ 8,799**	

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OPERATIONS
CONSOLIDATED

COMPARISON TO BUDGET - FISCAL YEAR 2024
JUNE 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	BUDGET	VARIANCE	VAR. %
Passenger Revenue	$ 72,404	$ 74,558	$ (2,154)	-2.9%
Other Revenue	3,001	901	2,100	233.3%
Total Operating Revenue	**$ 75,404**	**$ 75,458**	**$ (54)**	**-0.1%**
Personnel costs	$ 146,371	$ 147,560	$ 1,190	0.8%
Outside services	124,730	125,622	892	0.7%
Materials and supplies	18,632	18,301	(331)	-1.8%
Energy	43,241	46,787	3,546	7.6%
Risk management	7,398	7,554	156	2.1%
General & administrative	1,023	1,084	61	5.6%
Vehicle/facility leases	1,320	1,367	47	3.5%
Administrative Allocation	27,018	27,018	0	0.0%
Total Operating Expenses	**$ 369,732**	**$ 375,293**	**$ 5,561**	**1.5%**
Operating Income (Loss)	**$ (294,328)**	**$ (299,835)**	**$ 5,508**	**1.8%**
Total Non-Operating Activities	**292,470**	**299,835**	**(7,365)**	**-2.5%**
Income (Loss) before Capital Contributions	**$ (1,858)**	**$ 0**	**$ (1,858)**	

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OPERATIONS
BUS - DIRECTLY OPERATED (SAN DIEGO TRANSIT CORP.)
COMPARISON TO BUDGET - FISCAL YEAR 2024
JUNE 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	BUDGET	VARIANCE	VAR. %
Passenger Revenue	$ 19,675	$ 20,688	$ (1,013)	-4.9%
Other Revenue	117	153	(36)	-23.4%
Total Operating Revenue	**$ 19,792**	**$ 20,841**	**$ (1,049)**	**-5.0%**
Personnel costs	$ 91,448	$ 91,951	$ 502	0.5%
Outside services	2,394	2,628	234	8.9%
Materials and supplies	7,675	7,430	(245)	-3.3%
Energy	7,804	8,859	1,055	11.9%
Risk management	3,223	3,117	(105)	-3.4%
General & administrative	476	520	44	8.4%
Vehicle/facility leases	423	405	(18)	-4.5%
Administrative Allocation	1,526	1,526	(0)	0.0%
Total Operating Expenses	**$ 114,970**	**$ 116,436**	**$ 1,466**	**1.3%**
Operating Income (Loss)	**$ (95,178)**	**$ (95,595)**	**$ 417**	**0.4%**
Total Non-Operating Activities	**93,333**	**95,595**	**(2,262)**	**-2.4%**
Income (Loss) before Capital Contributions	**$ (1,845)**	**$ 0**	**$ (1,845)**	

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OPERATIONS
RAIL (SAN DIEGO TROLLEY INC.)
COMPARISON TO BUDGET - FISCAL YEAR 2024
JUNE 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	BUDGET	VARIANCE	VAR. %
Passenger Revenue	$ 29,881	$ 30,024	$ (143)	-0.5%
Other Revenue	2,884	748	2,136	285.6%
Total Operating Revenue	**$ 32,765**	**$ 30,772**	**$ 1,993**	**6.5%**
Personnel costs	$ 53,991	$ 54,446	$ 455	0.8%
Outside services	15,099	14,978	(121)	-0.8%
Materials and supplies	10,860	10,827	(33)	-0.3%
Energy	26,009	27,376	1,367	5.0%
Risk management	4,160	4,421	261	5.9%
General & administrative	506	542	35	6.5%
Vehicle/facility leases	543	599	56	9.3%
Administrative Allocation	23,108	23,108	(0)	0.0%
Total Operating Expenses	**$ 134,276**	**$ 136,296**	**$ 2,020**	**1.5%**
Operating Income (Loss)	**$ (101,511)**	**$ (105,524)**	**$ 4,013**	**3.8%**
Total Non-Operating Activities	**101,491**	**105,524**	**(4,033)**	**-3.8%**
Income (Loss) before Capital Contributions	**$ (20)**	**$ (0)**	**$ (20)**	

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OPERATIONS
BUS - CONTRACTED SERVICES (FIXED ROUTE)
COMPARISON TO BUDGET - FISCAL YEAR 2024
JUNE 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	BUDGET	VARIANCE	VAR. %
Passenger Revenue	$ 21,404	$ 22,276	$ (872)	-3.9%
Other Revenue	-	-	-	-
Total Operating Revenue	**$ 21,404**	**$ 22,276**	**$ (872)**	**-3.9%**
Personnel costs	$ 799	$ 713	$ (86)	-12.1%
Outside services	89,309	89,498	189	0.2%
Materials and supplies	97	43	(53)	-123.2%
Energy	8,455	9,532	1,077	11.3%
Risk management	-	-	-	-
General & administrative	6	12	6	50.8%
Vehicle/facility leases	11	20	9	46.2%
Administrative Allocation	2,070	2,070	0	0.0%
Total Operating Expenses	**$ 100,746**	**$ 101,888**	**$ 1,142**	**1.1%**
Operating Income (Loss)	**$ (79,343)**	**$ (79,612)**	**$ 270**	**0.3%**
Total Non-Operating Activities	**79,350**	**79,612**	**(262)**	**-0.3%**
Income (Loss) before Capital Contributions	**$ 8**	**$ 0**	**$ 8**	

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OPERATIONS
BUS - CONTRACTED SERVICES (PARATRANSIT)
COMPARISON TO BUDGET - FISCAL YEAR 2024
JUNE 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	BUDGET	VARIANCE	VAR. %
Passenger Revenue	$ 1,444	$ 1,570	$ (126)	-8.0%
Other Revenue	-	-	-	-
Total Operating Revenue	**$ 1,444**	**$ 1,570**	**$ (126)**	**-8.0%**
Personnel costs	$ 174	$ 164	$ (10)	-6.2%
Outside services	17,368	17,958	590	3.3%
Materials and supplies	-	-	-	-
Energy	973	1,021	48	4.7%
Risk management	15	15	-	0.0%
General & administrative	34	11	(24)	-218.9%
Vehicle/facility leases	343	343	0	0.1%
Administrative Allocation	314	314	(0)	0.0%
Total Operating Expenses	**$ 19,221**	**$ 19,826**	**$ 605**	**3.0%**
Operating Income (Loss)	**$ (17,777)**	**$ (18,256)**	**$ 479**	**2.6%**
Total Non-Operating Activities	**17,777**	**18,256**	**(479)**	**-2.6%**
Income (Loss) before Capital Contributions	**$ 0**	**$ 0**	**$ (0)**	**-13.6%**

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OPERATIONS
CORONADO FERRY

COMPARISON TO BUDGET - FISCAL YEAR 2024
JUNE 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	BUDGET	VARIANCE	VAR. %
Passenger Revenue	$ -	$ -	$ -	-
Other Revenue	-	-	-	-
Total Operating Revenue	**$ -**	**$ -**	**$ -**	**-**
Personnel costs	$ -	$ -	$ -	-
Outside services	323	323	-	0.0%
Materials and supplies	-	-	-	-
Energy	-	-	-	-
Risk management	-	-	-	-
General & administrative	-	-	-	-
Vehicle/facility leases	-	-	-	-
Administrative Allocation	-	-	-	0.0%
Total Operating Expenses	**$ 323**	**$ 323**	**$ -**	**0.0%**
Operating Income (Loss)	**$ (323)**	**$ (323)**	**$ -**	**0.0%**
Total Non-Operating Activities	**323**	**323**	**-**	**0.0%**
Income (Loss) before Capital Contributions	**$ -**	**$ -**	**$ -**	**-**

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

ADMINISTRATION
CONSOLIDATED

COMPARISON TO BUDGET - FISCAL YEAR 2024
JUNE 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	BUDGET	VARIANCE	VAR. %
Passenger Revenue	$ -	$ -	$ -	-
Other Revenue	30,498	29,266	1,232	4.2%
Total Operating Revenue	**$ 30,498**	**$ 29,266**	**$ 1,232**	**4.2%**
Personnel costs	$ 29,504	$ 29,833	$ 329	1.1%
Outside services	27,360	27,175	(185)	-0.7%
Materials and supplies	41	336	294	87.7%
Energy	1,243	1,262	19	1.5%
Risk management	674	859	185	21.5%
General & administrative	4,905	5,055	150	3.0%
Vehicle/facility leases	379	320	(59)	-18.5%
Administrative Allocation	(27,006)	(27,006)	(0)	0.0%
Total Operating Expenses	**$ 37,101**	**$ 37,834**	**$ 733**	**1.9%**
Operating Income (Loss)	**$ (6,603)**	**$ (8,567)**	**$ 1,965**	**22.9%**
Total Non-Operating Activities	**17,259**	**8,567**	**8,692**	**101.4%**
Income (Loss) before Capital Contributions	**$ 10,656**	**$ (0)**	**$ 10,656**	

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

OTHER ACTIVITIES
CONSOLIDATED

COMPARISON TO BUDGET - FISCAL YEAR 2024
JUNE 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	BUDGET	VARIANCE	VAR. %
Passenger Revenue	$ -	$ -	$ -	-
Other Revenue	1,013	991	22	2.2%
Total Operating Revenue	**$ 1,013**	**$ 991**	**$ 22**	**2.2%**
Personnel costs	$ 568	$ 554	$ (13)	-2.4%
Outside services	14	58	44	75.8%
Materials and supplies	0	1	0	2.7%
Energy	5	7	2	31.0%
Risk management	50	89	40	44.3%
General & administrative	58	70	12	17.3%
Vehicle/facility leases	7	6	(1)	-15.4%
Administrative Allocation	(12)	(12)	0	0.0%
Total Operating Expenses	**$ 690**	**$ 774**	**$ 84**	**10.9%**
Operating Income (Loss)	**$ 323**	**$ 217**	**$ 106**	**-48.8%**
Total Non-Operating Activities	**(323)**	**(217)**	**(106)**	**48.8%**
Income (Loss) before Capital Contributions	**$ -**	**$ (0)**	**$ 0**	**-**

SAN DIEGO METROPOLITAN TRANSIT SYSTEM
MTS
COMBINED SUBSIDY AND OTHER NON-OPERATING REVENUE AND EXPENSES
COMPARISON TO BUDGET - FISCAL YEAR 2024
JUNE 30, 2024
(in $000's)

	YEAR TO DATE			
	ACTUAL	BUDGET	VARIANCE	VAR. %
Subsidy Revenue				
Federal Revenue	$ 70,141	$ 70,466	$ (326)	-0.5%
FTA Stimulus Funds (CARES/ARP Act)	$ 85,000	$ 85,000	$ -	0.0%
Transportation Development Act	92,972	92,858	114	0.1%
State Transit Assistance	10,089	8,400	1,689	20.1%
State Revenue - Other	4,521	4,500	21	0.5%
TransNet funds	72,662	72,923	(261)	-0.4%
Other Local subsidies	4,563	4,491	72	1.6%
Total Subsidy Revenue	**$ 339,947**	**$ 338,639**	**$ 1,309**	**0.4%**
Other Non-Operating Revenue and Expense				
Investment Earnings	$ -	$ -	$ -	-
Other Non-Operating Income	(30,505)	(30,399)	(106)	0.3%
Other Non-Operating Expenses	(36)	(54)	18	-32.9%
Total Other Non-Operating Revenue Revenue and Expense	**$ (30,541)**	**$ (30,453)**	**$ (88)**	**0.3%**
Total Subsidy and Non-Operating Revenue and Expense	**$ 309,406**	**$ 308,185**	**$ 1,220**	**0.4%**

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

MTS
CONTINGENCY RESERVE BALANCE

JUNE 30, 2024
(in $000's)

Balance, June 30, 2023			**$ 44,963**		
Current Year Adjustments:					
FY 2024 Net Income	$	8,799			
Interest & Other Adjustments	$	(407)			
Transfer to CIP	$	(2,084)		$	(12,595)
Self Insurance Retention Increase	$	(2,500)			
Net Adjustments:			**$ 3,807**		
Balance, June 30, 2024			**$ 48,770**		
FY25 Operating Expense Budget			**$ 448,225**		
FY25 Operating Budget Adjustments:					
Debt Service	$	-			
FHV Admin/SD&AE	$	(946)			
Transnet Funded Operations	$	(49,585)			
Net Adjustments:			**$ (50,531)**		
Adjusted FY25 Operating Expense Budget			**$ 397,694**		
Contingency Reserve % of MTS Operating Expense Budget			**12.3%**		

SAN DIEGO METROPOLITAN TRANSIT SYSTEM

MTS
RESERVE BALANCES
JUNE 30, 2024

Title	Amount	Explanation
Contingency	$ 48,770,348	For ongoing operations, future matching of grants; target is 12.5% of operating budget per Policy 36
Operating Deficit	$ 87,148,038	For ongoing operations, specifically for funding projected structural deficits in operating budget until depleted
FHV Administration	1,000,686	For ongoing operations and future capital improvement needs
SD&AE	1,229,609	Established from 1984 state payments for storm damage, restriced for repair/improvement of line
Insurance	7,500,000	Established for potential future liability claims, minimum $2 million per Policy 46
Billboard San Diego	548,073	Per agreement with city, used for improvements to right of way
Billboard Chula Vista	2,825,634	Per agreement with city, used for improvements to right of way
Total	**$ 149,022,388**	

FY 24 Operating Budget – June 2024 Financial Review

Joint Audit Oversight &
Executive Committee

CONSOLIDATED MTS OPERATIONS

COMPARISON TO BUDGET – JUNE 30, 2024 - FY 2024

TOTAL OPERATING REVENUES ($000's)

	ACTUAL	BUDGET	VARIANCE	VAR %
Fare Revenue	$ 72,404	$ 74,558	$ (2,154)	-2.9%
Other Operating Revenue	$ 34,512	$ 31,158	$ 3,354	10.8%
Operating Revenue	**$ 106,915**	**$105,716**	**$ 1,200**	**1.1%**

- Fare Revenue
  - Revenue favorable to prior year by $4.9M (7.2%)
  - Ridership favorable to the prior year by 7.2M passengers (10.5%)
  - Average fare $0.96 versus $0.99 prior year (-3.0%)
- Other Operating Revenue
  - Favorable interest revenue, rental income, and gain on sale of assets (land)

CONSOLIDATED MTS OPERATIONS

COMPARISON TO BUDGET – JUNE 30, 2024 - FY 2024

TOTAL OPERATING EXPENSES ($000's)

	ACTUAL	BUDGET	VARIANCE	VAR %
Personnel Costs	$ 176,442	$177,948	$ 1,506	0.8%
Purchased Transportation	$ 101,919	$103,215	$ 1,296	1.3%
Other Outside Services	$ 50,184	$ 49,640	$ (544)	-1.1%
Energy	$ 44,489	$ 48,056	$ 3,567	7.4%
Other Expenses	$ 34,488	$ 35,042	$ 554	1.6%
Operating Expenses	**$ 407,522**	**$413,901**	**$ 6,378**	**1.5%**

- Personnel – favorable cost recovery within Trolley operations (flood related), paid absences within Bus
- Purchased Transportation – favorable for both Fixed Route and Paratransit
- Other Outside Services – unfavorable legal costs within Admin, repair/maintenance costs within Trolley
- Energy – favorable CNG and electricity due to commodity rates
- Other – favorable risk management costs, office equipment purchases in IT

CONSOLIDATED MTS OPERATIONS

COMPARISON TO BUDGET – JUNE 30, 2024 - FY 2024

TOTAL OPERATING ACTIVITIES ($000's)

	ACTUAL	BUDGET	VARIANCE	VAR %
MTS Operating Revenue	$ 106,915	$ 105,716	$ 1,200	1.1%
MTS Operating Expenses	$ 407,522	$ 413,901	$ 6,378	1.5%
Total Net Operating Variance	**$ (300,607)**	**$ (308,185)**	**$ 7,578**	**2.5%**

- Net operating income favorable $7.6M through June

CONSOLIDATED MTS OPERATIONS

COMPARISON TO BUDGET – JUNE 30, 2024 - FY 2024

SUBSIDY REVENUE CATEGORY DESCRIPTIONS

- Federal
  - Recurring FTA funds for preventive maintenance and rural ops (5307, 5337, 5311)
- Federal Stimulus Funds
  - FTA CARES Act – provided $220M of federal stimulus funds for MTS appropriated in March 2020
  - FTA ARP Act – provided $140M of federal stimulus funds for MTS appropriated in March 2021
  - $360M in total - $312.6M drawn through June 30, 2024, $47.4M remaining
- Transportation Development Act (TDA)
  - 1/4 percent of regional sales tax assessed in region and administered by SANDAG and County

CONSOLIDATED MTS OPERATIONS

COMPARISON TO BUDGET – JUNE 30, 2024 - FY 2024

SUBSIDY REVENUE CATEGORY DESCRIPTIONS

- Transnet
  - ½ cent sales tax in San Diego County to fund transportation projects
  - MTS receives formula share and reimbursement for Transnet funded operations
- State Transit Assistance (STA)
  - State sales tax on diesel fuel distributed based on population and agency revenue
- Senate Bill 125 TIRCP (SB125)
  - $4 billion in State TIRCP funding distributed to transit agencies on a population-based formula
  - Received first payment in September

CONSOLIDATED MTS OPERATIONS

COMPARISON TO BUDGET – JUNE 30, 2024 - FY 2024

TOTAL NON-OPERATING REVENUES AND EXPENSES ($000'S)

	ACTUAL	BUDGET	VARIANCE	VAR %
Federal (Recurring)	$ 70,141	$ 70,466	$ (326)	-0.5%
Federal Stimulus (Non-recurring)	$ 85,000	$ 85,000	$ -	0.0%
TDA	$ 92,972	$ 92,858	$ 114	0.1%
TransNet	$ 72,662	$ 72,923	$ (261)	-0.4%
STA	$ 10,089	$ 8,400	$ 1,689	20.1%
SB125 TIRCP (Non-recurring)	$ 4,521	$ 4,500	$ 21	0.5%
Other	$ 4,563	$ 4,491	$ 72	1.6%
Subsidy Revenue	**$ 339,947**	**$ 338,639**	**$ 1,309**	**0.4%**
Reserves	$ (30,505)	$ (30,399)	$ (106)	0.3%
Debt Service Expenses	$ (36)	$ (54)	$ 18	-32.9%
Other Non-Operating Revenue and Expenses	**$ (30,541)**	**$ (30,453)**	**$ (88)**	**0.3%**
Total Non-Operating Revenues and Expenses	**$ 309,406**	**$ 308,185**	**$ 1,220**	**0.4%**

- STA – actuals came in higher than initial estimates
- No Debt Service expenses going forward (POBs)
- Contributed $30.5M to reserves – $30.2M to operating deficit reserve, $217K to FHV Admin/SDAE

CONSOLIDATED MTS OPERATIONS

COMPARISON TO BUDGET – JUNE 30, 2024 - FY 2024

TOTAL REVENUES LESS EXPENSES ($000'S)

	ACTUAL	BUDGET	VARIANCE	VAR %
Operating Revenues	$ 106,915	$ 105,716	$ 1,200	1.1%
Recurring Subsidy	250,426	249,139	1,287	0.5%
Total Recurring Revenues	**$ 357,341**	**$ 354,854**	**2,487**	**0.7%**
Total Expenses	**$ 407,559**	**$ 413,955**	**$ 6,396**	**1.5%**
Structural Deficit	**(50,218)**	**(59,101)**	**8,883**	**15.0%**
Reserves	(30,505)	(30,399)	106	0.3%
Federal Stimulus (Non-recurring)	85,000	85,000	-	0.0%
SB-125 Funding	4,521	4,500	21	0.5%
Revenues Less Expenses	**$ 8,799**	**$ 0**	**$ 8,799**	

- Structural deficit of $50.2M, still expect to hit fiscal cliff in FY28
- Total favorable variance of $8.8M when combining operating and non-operating revenues and expenses

CONSOLIDATED MTS OPERATIONS

COMPARISON TO BUDGET – JUNE 30, 2024 - FY 2024

CONTINGENCY RESERVE BALANCE ($000'S)

- Board policy for the contingency reserve balance
  - Target set at 12.5% of the Operating Expense Budget
  - FY25 Target of $49.7M
  - Reserve Balance: $45.0M balance at start of FY24
- FY24 Results
  - $8.8M excess revenue over expenses in FY24
  - $8.4M after interest adjustment

- Proposed allocation:
  - $2.1M in land proceeds sale to FY26 Capital Improvement Program
  - $2.5M to increase Liability Insurance Self-Insured Retention from $5.0M to $7.5M
  - Remaining $3.8M to contingency reserve
    - Contingency Reserve would be at $48.8M, or 12.3% of FY25 operating budget
    - $87.1M in Operating Budget Deficit Reserve as of June 30, 2024
      - Will start spending operating deficit reserve in FY25

STAFF RECOMMENDATION

That the Executive Committee forward a recommendation to the Board of Directors to approve the allocation of excess revenues over expenses in FY24 to the following:

- Allocate $2.1M in land sale proceeds to MTS Capital Improvement Program (CIP) for programming in FY 2026
- Allocate $2.5M to increase Self-Insured Retention (SIR) from $5.0M to $7.5M in accordance with MTS' Excess General Liability Insurance program
- Allocate remaining $3.8M to contingency reserve

Metropolitan Transit System

Board of Directors

Agenda

November 14, 2024 at 9:00 a.m.

In-Person Participation: James R. Mills Building, 1255 Imperial Avenue, 10th Floor Board Room, San Diego CA 92101

Teleconference Participation: (669) 254-5252; Webinar ID: 160 280 5839, https://www.zoomgov.com/j/1602805839

NO.	ITEM SUBJECT AND DESCRIPTION	ACTION
1.	**Roll Call**	
2.	**Public Comments** This item is limited to five speakers with two minutes per speaker. Others will be heard after Board Discussion items. If you have a report to present, please give your copies to the Clerk of the Board.	
	CONSENT ITEMS	
3.	**Approval of Minutes** Action would approve the October 17, 2024 Board of Director meeting minutes.	Approve
4.	**Chief Executive Officer (CEO) Report**	Informational
5.	**Regional Transit Management System (RTMS) Mount Woodson Radio Tower – Site Lease Amendment** Action would authorize the Chief Executive Officer (CEO) to execute Amendment No. 1 to MTS Doc. No. G1332.0-10, with American Tower Corporation, to accept the renewal of the remaining five (5) year term, for a total cost of $167,001.84.	Approve
6.	**Adoption of the 2025 San Diego Metropolitan Transit System (MTS) Executive Committee and Board of Directors Meeting Schedule** Agenda Item will be provided prior to Board Meeting.	Approve
7.	**Construction Management (CM) Services for South Bay Zero Emission Bus (ZEB) Overhead Charging Infrastructure Installation – Work Order Agreement** Action would authorize the Chief Executive Officer (CEO) to execute Work Order WOA2501-CM012 under MTS Doc. No. G2501.0-21, with TRC Engineers Inc. (TRC), for CM services for the Imperial Avenue Division (IAD)	Approve

ZEB Overhead Charging Infrastructure Construction Project in the amount of $1,317,825.71.

8. **Social Equity Listening Tour (SELT) Bus Stop Shelter Upgrades Design Services – Work Order Agreement** — Approve

Action would authorize the Chief Executive Officer (CEO) to execute Work Order No. WOA353-AE-34 under MTS Doc. No. PWL353.0-22, with Dokken Engineering (Dokken), in the amount of $688,221.76 to provide design services for upgrading twenty-eight (28) existing bus stops to accommodate shelters.

9. **On-Board Video Surveillance System (OBVSS) Services for San Diego Metropolitan Transit System Bus Fleet – Contract Amendment** — Approve

Action would authorize the Chief Executive Officer (CEO) to execute Amendment No. 2 to MTS Doc. No. B0733.0-, with Luminator Technology Group (LTG), for a sole source amendment for the migration from the current Vehicle Information Management (VIM) software to the Managing Safety Efficiency in Transit (mSET) software for a total cost of $623,436.00.

10. **San Diego and Arizona Eastern Railway Company (SD&AE) – Quarterly Reports from the SD&AE Board of Directors Meeting on October 8, 2024** — Receive

Action would receive the reports to the SD&AE Board of Directors at its meeting on October 8, 2024, for the San Diego and Imperial Valley Railroad (SD&IV), Pacific Southwest Railway Museum Association (Museum), and Desert Line activities for information.

11. **Kearny Mesa Division (KMD) Chassis Wash Lift Replacement – Contract Award** — Approve

Action would authorize the Chief Executive Officer (CEO) to execute MTS Doc No. PWB402.0-24, with Southwest Lift & Equipment, Inc., in the amount of $356,908.00 for the replacement of the existing chassis wash lift for KMD.

12. **Light Rail Vehicle (LRV) Digital Monitor Display Program – Contract Award** — Approve

Action would authorize the Chief Executive Officer (CEO) to: 1) Execute MTS Doc. No. G2899.0-24, with Maestronic USA Inc. (Maestronic), for a LRV Digital Monitor Display Program for a two (2) year base period with three (3) 1-year options, for a total of five (5) years, at a cost of $1,708,591.05 (inclusive of CA 7.750% tax); and 2) Exercise the option years at the CEO's discretion.

13. **Investment Report – Quarter Ending September 30, 2024** — Informational

14. **On-Call Card Access Reader Services – Amendment** — Approve

Action would authorize the Chief Executive Officer (CEO) to: 1) Ratify Amendment No. 1 to MTS Doc. PWG340.0-22, with Electro Specialty Systems (ESS), for additional new installations (contract years 1-3) and maintenance funding (all contract years) in the amount of $82,478.76; and 2) Execute Amendment No. 2 to MTS Doc. No. PWG340.0-22, with ESS, in the amount of

$240,000.00 for estimated new installation funding and maintenance for the remainder of the contract.

15. **Board Policy No. 30 (Investment Policy) – Policy Revision** — Approve
Action would approve and adopt the updated Board Policy No. 30 (Investment Policy).

16. **Orange Line Improvement Project Phases 1 & 2 – Overhead Contact System (OCS) Poles – Contract Award** — Approve
Agenda Item will be provided prior to Board Meeting.

17. **66th Street Track Repair – Work Order Agreement** — Approve
Agenda Item will be provided prior to Board Meeting.

PUBLIC HEARING

18. **Hearing to consider adoption of a Resolutions of Necessity and authorization of condemnation proceedings to acquire Assessor's Parcel Nos. 541-611-27 and 541-611-31 in the City of San Diego for the Clean Transit Advancement Campus (CTAC) Project (Project). (2/3 Vote Required by Code Civil Procedure section 1245.360)** — Approve
Agenda Item will be provided prior to Board Meeting.

DISCUSSION ITEMS

19. **Appointment of Ad Hoc Nominating Committee for Recommending Appointments to MTS Committees for 2025 (Sharon Cooney)**
Agenda Item will be provided prior to Board Meeting.

20. **Audit Results and Draft of Fiscal Year 2024 Annual Comprehensive Financial Report (ACFR) (Erin Dunn with Coley Delaney of The Pun Group)**
Agenda Item will be provided prior to Board Meeting.

21. **Fiscal Year (FY) 2024 Final Operating Budget Results (Gordon Meyer)**
Agenda Item will be provided prior to Board Meeting.

22. **America Plaza Pedestrian Enhancements – Contract Award**
Agenda Item will be provided prior to Board Meeting.

OTHER ITEMS

23. **Chair, Board Member and Chief Executive Officer's (CEO's) Communications**

24. **Remainder of Public Comments Not on The Agenda**

This item is a continuation of item No. 2 (Public Comment), in the event all speakers who request to comment on item No. 2 are not called. If all Public Comment is accepted during item No. 2, no additional public comment will be accepted under this item.

ADJOURNMENT

25. Next Meeting Date

The next Board of Director's meeting is scheduled for December 19, 2024 at 9:00am.

26. Adjournment

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 4

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

Chief Executive Officer (CEO) Report

AGENDA ITEM WILL BE PROVIDED BEFORE BOARD MEETING

1255 Imperial Avenue, Suite 1000, San Diego, CA 92101-7490 • (619) 231-1466 • sdmts.com

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 5

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

Regional Transit Management System (RTMS) Mount Woodson Radio Tower – Site Lease Amendment

RECOMMENDATION:

That the San Diego Metropolitan Transit System (MTS) Board of Directors authorize the Chief Executive Officer (CEO) to execute Amendment No. 1 to MTS Doc. No. G1332.0-10 (in substantially the same format as Attachment A), with American Tower Corporation, to accept the renewal of the remaining five (5) year term, for a total cost of $167,001.84.

Budget Impact

The total contract cost for this amendment is estimated to be $167,001.84. The contract will be funded by San Diego Transit Corporation (SDTC) Transportation Operating Budget account 202014-233000. The renewal term costs are summarized below:

Term	Year #	Total Amount
December 1, 2024 – November 30, 2025	21	$31,426.34
December 1, 2025 – November 30, 2026	22	$32,406.21
December 1, 2026 – November 30, 2027	23	$33,378.40
December 1, 2027 – November 30, 2028	24	$34,379.75
December 1, 2028 – November 30, 2029	25	$35,411.14
	Total	**$167,001.84**

DISCUSSION:

RTMS is a radio/CAD AVL system that monitors the location of MTS and NCTD buses and allows communication between the buses and dispatch. This is a core system to regional bus operations. Radio site leases, spread strategically throughout the county to ensure full radio coverage, are a required component of the RTMS.

The RTMS project was implemented by the San Diego Association of Governments (SANDAG) as a regionally significant project. Part of that SANDAG project included entering into radio site

leases. Once SANDAG completed the installation phase, some site leases were assigned to MTS and/or North County Transit District (NCTD). One such assignment is SANDAG agreement #5000301, entered between SANDAG and SpectraSite Communications, Inc., executed on October 15, 2004 for radio tower access at Mt. Woodson in the city of Poway. The term of the contract was a five (5) base year term with four (4) 5-year renewal terms (25 years total), with the final option period expiring on November 30, 2029.

This agreement was assigned by SANDAG to MTS on July 14, 2010, as MTS Doc. No. G1332.0-10. MTS provides oversight of the Mt. Woodson location and subsequent administration of the site operator, American Tower Corporation, who acquired SpectraSite in late 2005. The site requires constant and careful oversight as well as maintenance to ensure the RTMS system remains fully functional to mitigate the risk of a system failure, which would drastically affect MTS's operational continuity. To ensure the site operator provides continuous service to the site and the RTMS system, the agreement provides annual payments to American Tower Corporation for rent, energy fees, operations, and maintenance.

Therefore, staff recommends that the MTS Board of Directors authorize the CEO to execute Amendment No. 1 to MTS Doc. No. G1332.0-10 (in substantially the same format as Attachment A), with American Tower Corporation, to exercise of the remaining five (5) year option, for a total cost of $167,001.84.

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachment: A. Draft MTS Doc. No. G1332.1-19

Metropolitan Transit System

Amendment 1

November 14, 2024 MTS Doc No. G1332.1-10

MOUNT WOODSON RADIO TOWER SITE LEASE AGREEMENT

American Tower Corporation
Nathaniel Ritzenthaler
Senior Counsel
10 Presidential Way
Woburn, MA, 01801

This shall serve as Amendment No.1 to the original agreement G1332.0-10 as further described below.

SCOPE

This Amendment confirms the fourth (4th) and final five (5) year renewal term. The renewal term shall cover from December 1, 2024, through November 30, 2029.

SCHEDULE

Lease agreement shall be extended to November 30, 2029.

PAYMENT

The cost for the renewal term shall be as follows:

Term	Year #	Annual Total Amount
December 1, 2024 – November 30, 2025	21	$31,426.34
December 1, 2025 – November 30, 2026	22	$32,406.21
December 1, 2026 – November 30, 2027	23	$33,378.40
December 1, 2027 – November 30, 2028	24	$34,379.75
December 1, 2028 – November 30, 2029	25	$35,411.14
	Total	$167,001.84

This contract amendment shall authorize additional costs not to exceed $167,001.84. This amount shall not be exceeded without prior written approval from MTS.

Please sign and return the copy to the Contract Specialist at MTS. All other terms and conditions shall remain the same and in effect. Retain the other copies for your records.

Sincerely,

Sharon Cooney, Chief Executive Officer

Agreed:

Nathaniel Ritzenthaler, Senior Counsel
American Tower Corporation

Date: _____

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 6

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

Adoption of the 2025 San Diego Metropolitan Transit System (MTS) Executive Committee and Board of Directors Meeting Schedule

AGENDA ITEM WILL BE PROVIDED BEFORE BOARD MEETING

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Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 7

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

Construction Management (CM) Services for South Bay Zero Emission Bus (ZEB) Overhead Charging Infrastructure Installation – Work Order Agreement

RECOMMENDATION:

That the San Diego Metropolitan Transit System (MTS) Board of Directors authorize the Chief Executive Officer (CEO) to execute Work Order WOA2501-CM012 under MTS Doc. No. G2501.0-21 (in substantially the same format as Attachment A), with TRC Engineers Inc. (TRC), for CM services for the Imperial Avenue Division (IAD) ZEB Overhead Charging Infrastructure Construction Project in the amount of $1,317,825.71.

Budget Impact

The total cost for this contract is estimated to be $1,317,825.71. The contract will be funded by the Capital Improvement Project (CIP) 3009119701 – IAD Battery Electric Bus (BEB) Charging Infrastructure.

DISCUSSION:

As MTS transitions to a ZEB fleet, it needs to install large scale charging infrastructure at each of its bus maintenance divisions in advance of the buses being delivered. In order to accommodate continued operations, funding availability, and the gradual delivery of buses, overhead charging infrastructure will be installed in rolling phases at each location. Today's proposed action relates to the first phase at IAD.

The design for the IAD ZEB Phase I Overhead Charging Infrastructure project has been completed and the construction phase of the project is currently being advertised with an anticipated contract award date of December 2024. This recommended Work Order contract will provide CM services to augment MTS staff oversight of the construction contractor. The project involves civil, structural, and electrical improvements to the MTS IAD to install an overhead charging gantry system and chargers to support up to forty (40) BEB.

MTS requires CM services to assist staff with the coordination, control, and oversight of the construction contractor from beginning of the work through completion and closeout. The

proposed Work Order for CM services includes resident engineering, field inspection, office engineering, project scheduling analysis, geotechnical testing and observations, hazardous materials testing, and Quality Assurance (QA) source and field inspections.

On January 11, 2021, the San Diego Association of Governments (SANDAG) and MTS issued a joint Request for Statement of Qualifications (RFSQ) for On-Call CM Services. The RFSQ resulted in the identification of six (6) firms qualified to perform CM services; the MTS Board approved this panel of On-Call CM Services firms on July 29, 2021 (AI 16). Tasks are assigned to the firms through a work order process.

On June 28, 2024, MTS issued a Request for Proposals (RFP) to all firms.

On July 30, 2024, MTS received one (1) proposal from the following firm:

Firm Name	Firm Certification
TRC	None

An evaluation panel was comprised of MTS representatives, and the proposals were evaluated based on the following criteria.

Criteria	Points
Project Team	60
Project Team's Capabilities	30
Schedule	10
Total Possible Score	**100**

On August 15, 2024, the selection committee evaluated the initial proposals and scored as follows:

Ranking	Proposer Name	Total Score
1	TRC	74.67

On August 24, 2024, MTS requested clarifications and revised proposal from TRC.

On September 10, 2024, the selection committee evaluated the revised proposal based and scored as follows:

Ranking	Proposer Name	Total Score
1	TRC	89.00

As a result of the evaluations, TRC was deemed qualified firm to perform the services.

TRC's initial proposed amount for the services was $1,467,639.52. Through negotiations, staff was able to reduce the cost by $149,813.81, a 10.21% savings to MTS. The Independent Cost Estimate (ICE) for the services was $893,479.22. Based on the level of effort and proposed classifications, TRC's final cost proposal in the amount of $1,317,825.71 was determined to be fair and reasonable.

For this project TRC will utilize the following subconsultants:

Subconsultant Name	Subconsultant Certification	Subconsultant Amount
Leighton Consulting (Now Verdantas)	None	$91,506.71

Therefore, staff recommends that the MTS Board of Directors authorize the CEO to execute Work Order WOA2501-CM012 under MTS Doc. No. G2501.0-21 (in substantially the same format as Attachment A), with TRC, for CM services for the IAD ZEB Overhead Charging Infrastructure Construction Project in the amount of $1,317,825.71.

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachment: A. Draft Work Order WOA2501-CM012

Metropolitan Transit System

November 14, 2024

MTS Doc No. G2501.0-21
WOA2501-CM012

TRC Engineers Inc
Chris Mockus
Senior Vice President
4393 Viewridge Ave. Ste. A
San Diego, CA 92123

Dear Mr. Mockus:

Subject: WOA2501-CM12 TO MTS DOC. NO. G2501.0-21, CONSTRUCTION MANAGEMENT SERVICES FOR IMPERIAL AVENUE DIVISION (IAD) ZERO EMISSION BUS (ZEB) OVERHEAD CHARGING

This letter shall serve as our agreement WOA2501-CM12 to MTS Doc No. G2501.0-21 as further described below.

SCOPE OF SERVICES

This Scope of Services shall provide construction management services for the IAD ZEB Overhead Charging project (Attachment A and A1). Federal terms apply.

SCHEDULE

The Schedule for this work order shall be from the date of the Notice to Proceed through the completion of construction, which is anticipated to be 290 calendar days from NTP and an additional 30 calendar days for each of the 3 additive/alternates. These services will follow MTS construction services agreement PWB411.0-25.

PAYMENT

The total value of this contract including this amendment shall be $1,317,825.71(Attachment B). This amount shall not be exceeded without prior written approval from MTS.

Please sign below, and return the document to the Contracts Specialist at MTS. All other terms and conditions shall remain the same and in effect.

Sincerely,

Sharon Cooney, Chief Executive Officer

Agreed:

Chris Mockus, Project Manager
TRC Engineers Inc.

Date: _____

Attachments: Attachment A, Scope of Services
Attachment A1, Consultant's Proposal
Attachment B, Negotiated Fee Proposal

ATTACHMENT A
SCOPE OF SERVICES

TITLE: IMPERIAL AVENUE DIVISION (IAD) ZERO EMISSION BUS (ZEB) OVERHEAD CHARGING **WOA #:** WOA2501-CM12

I. PROJECT DESCRIPTION

The IAD ZEB Overhead Charging – Phase 1 generally consists of civil, structural and electrical improvements to the MTS Imperial Avenue Division located at 100 16th St., San Diego 92101. This first phase of work will provide overhead charging capabilities for thirty (30) battery electric buses on an overhead steel garnty system and the installation of an overhead steel gantry system for ten (10) future buses. Construction services consists of installation of new primary switchgear, transformers, LV swichbaord, site electrical duct bank, new gas service, backup gas generator, solar panels, battery electric storage systems, and charging equipment installed overhead on the new steel gantry system. The total estimate including all three (3) additive/alternates is ~$22M.

The selected Consultant for this work order, may be awarded follow-on work for subsequent construction management services (if, any) in the form of an amendment(s) to the original work order. However, MTS reserves the right to award additional construction management services for this project (if, any) to another qualified firm.

II. SCOPE OF WORK

The scope of work shall consist of the following services which will be conducted in accordance with the Master On-call Agreement, this scope of work, and the construction contract documents.

TASK 1.0 Project/Work Order Manager

This task includes:

1.1 Manage CM contract budget and schedule
1.2 Verify that the assigned field personnel are trained in the skills that are needed to manage each task
1.3 Administer personnel action, coordinate personnel matters with MTS' Project Manager
1.4 Review monthly invoices prior to submission to MTS
1.5 Manage and track all consultant costs and "burn rates" as related to the overall contract amount and notify MTS Project Manager of any potential overages.

Task 2.0 Construction Phase Services

Consultant shall oversee and monitor construction activities performed by the contractor per project plans and specifications, including periodic job site safety reviews. (However, Monitoring of construction contractor for job site safety and safety of transit patrons and public during construction period, including for non-completed work and work in progress. Consultant shall observe site and public safety conditions when on site, and address issues with contractor when observed.)

Key staff shall include:

- Project Manager (PM)
- Resident Engineer (RE)
- Office Engineer (OE)/Project Engineer (PE)/Assistant Resident Engineer

- Scheduling Engineer (SE)
- Electrical and Communications Inspector
- Civil/Structural Steel/Other Discipline Specific Inspector as Needed
- Storm Water Inspector

2.1 Resident Engineer (RE)

The RE assigned to this Project shall work under the direction of MTS Project Manager. The RE shall be responsible for the pre-construction meeting and project set-up, Request for Information (RFI) and submittal log coordination with the Designer, contract change order (CCO) review and processing, weekly progress meetings, quality assurance (QA) Inspection oversight and post construction, project closeout activities.

Other duties shall include:

2.1.1 Perform QA inspection of the construction work to verify general compliance with the contract documents

2.1.2 Prepare daily reports noting construction work description, materials, quantities, pertinent decisions.

2.1.3 Perform inspections of the ongoing work

2.1.4 Perform up to four source inspection visits, inspections, and documentation for manufacture of the structural steel and other fabrications

2.1.5 Regular tasks include:

2.1.5.1 For time and material (T&M) CCOs, keep a daily record of contractor's equipment, labor, and material on tentative agreements

For lump sum (LS) CCOs, prepare independent cost estimate (ICE), negotiate contractor proposed change orders, and reach a fair and reasonable lump sum price.

For unit price (UP) CCOs, field measure and verify quantities to ensure the proposed costs match actual quantities

Negotiate, track, log, and finalize CCOs by compiling the potential CCOs into one contract CCOs and submit to MTS Project Manager using MTS forms and templates. Each CCO is to have an independent cost estimate, record of negotiation, and scope of work.

2.1.5.2 Obtain regular photo documentation

2.1.5.3 Arrange for material tests for soils, concrete, hot mix asphalt, and other materials incorporated in the work, on an as-needed basis

2.1.5.4 Identify non-compliant work to the Contractor and report to the MTS Project Manager

2.1.5.5 Maintain accounting of daily quantities of contract bid item or CCO work performed. Assist MTS Project Manager in reviewing Contractor's payment application and assist in determining quantities to be included for payment in the monthly progress payment.

2.1.5.6 If observed construction work does not meet contract or CCO requirements, prepare, and submit Non-Conformance Report (NCR) to the MTS Project Manager

2.1.5.7 Attend weekly progress meetings, as well as additional meetings as requested by the MTS Project Manager

2.1.5.8 Monitor the construction progress with the approved construction schedule and advise the MTS Project Manager of any inconsistencies or non-conformance with critical path activities

2.1.6 Coordinate construction activities with MTS operations

2.1.7 Support MTS Project Manager in management of the construction contract

2.1.8 Coordinate with Design Team to resolve issues related to any changes to the construction contract.

2.1.9 Work with Office Engineer (OE) to prepare agenda, RFI and Submittal logs for weekly progress meeting

2.2 Office Engineer

2.2.1 Perform part-time contract administration duties

2.2.2 Assist with progress pay estimates as requested

2.2.3 Assist with CCOs as requested

2.2.4 Manage RFI and submittal process, and support RFI and submittal reviews

2.2.5 Maintain project files using a standard filing system, or MTS preferred system and transmit all project related documentation to MTS at project closeout

2.3 Scheduling Engineer

2.3.1 Review and comment on Contractor's Critical Path Method (CPM) baseline schedule and the Contractor's monthly CPM schedule updates

2.3.2 Perform independent Time-Impact Analysis, if necessary

2.3.3 Analyze and assess project schedule to determine if concurrent delays exist

2.4 Electrical and Communication Inspector

2.4.2 Review submittals for electrical elements of the work as requested

2.4.3 Review electrical phasing, construction work plans, and installations

2.4.4 Perform field inspections for electrical installations, including trenching, conduit, conductors, switchgear, transformer, panels, lighting, switchboards, charging equipment, charging pantographs, photovoltaic system, communication system, and all related components.

2.4.5 Coordinate with SDGE staff, ensure SDGE related work is installed per SDGE requirements, including switchgear install, switchgear pad, and gas work.

2.4.6 Oversee testing and activation

2.4.7 Support the commissioning process with the third party charge management software and charging equipment manufacturers. Charging equipment will be purchased by MTS and installed by the contractor doing the IAD ZEB Charging project.

2.4.8 Being that MTS is exempt from local ordinances there will not be a building inspector to sign off on the electrical work. Electrical inspector is to create a Letter of Release and send to SDGE in order for SDGE to set the electrical meter and possibly the gas meter.

2.5 Civil or Other Discipline Inspector

2.5.2 Review submittals related to the work, as requested
2.5.3 Review construction work plans and cutover plans for signal installations
2.5.4 Perform field inspections for signal installations, including conduits, foundations, signal cases, track circuits, switch machines and other signal devices
2.5.5 Oversee testing for signal installations and cutovers
2.5.6 Perform tasks provided in “Field Inspection Staff”

2.6 Materials Sampling and Testing

Perform material sampling and testing to verify conformance with the plans and specifications. Material testers shall be capable of assisting in all aspects of material testing and source inspection. Sampling and testing frequencies shall be as specified in the contract documents and/or as directed by MTS. Tasks include:

2.6.1 Perform R-value and relative compaction testing of subgrade materials
2.6.2 Perform other testing as requested by the Resident Engineer or MTS
2.6.3 Test reports shall be distributed to the Resident Engineer. Suspect or failing tests will be reported to the Assistant Resident Engineer as soon as the relevant data or results are available.
2.6.4 Hazardous material monitoring and testing services. Services may be performed, as requested by MTS, and as needed, for an additional fee

2.7 Stormwater Permit Compliance Reporting

2.7.1 Attend Pre-Construction meeting to discuss NPDES and Environmental requirements for the project, per MTS Contract Documents, Section 18, as indicated below. Furthermore, Consultant shall ensure that the Contractor complies with all terms and conditions of MTS Contract Documents, Section 18, sub-sections 18.1 – 18.11.

Contractor shall obtain coverage for the Project under the State Water Resources Control Board (State Board) Water Quality Order No. 2022-0057-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activity, NPDES Permit No. CAS000002 (Construction General Permit) or any amendment, renewal or reissuance thereof, for all projects that involve construction on or disturbance of one acre or more of land or which are part of a larger common area of development.

For projects that disturb less than one acre of land, Contractor shall implement pollution prevention measures to control runoff, including but not limited to controls for erosion, sediment, dewatering pollution, source, and run-on and runoff; soil stabilization, protection of riparian and wetland vegetation and habitat, preventing non-stormwater discharges, final site stabilization, and other measures appropriate to control pollutants on a dynamic and changing site.

Consultant shall ensure that the Contractor submits all documents required by the MTS Contract Documents for review and approval prior to submission of the documents to any regulatory agency, including but not limited to any notice of intent,

notice of termination, site maps, photos, SWPPP, monitoring reports and annual reports. Consultant shall confirm with MTS that the appropriate post-construction design standards are implemented and shall consult MTS's Post Construction Stormwater Management Manual and submit all required documentation before finalizing any post construction stormwater measures.

In addition to compliance with the Construction General Permit, Contractor shall comply with the lawful requirements of any applicable municipality, MTS, drainage agency, and other federal, state, or local agency regarding discharges of storm water or non-stormwater to the storm drain system or other watercourses under their jurisdiction, including applicable requirements in storm water management programs.

2.7.2 Review the project Water Pollution Control Program (WPCP)/Stormwater Pollution Prevention Plan (SWPPP) submitted by the Contractor and provide comments and recommendations for revisions.
If the project's disturbance is less than one acre, Consultant shall ensure that the Contractor's WPCP is developed using the MTS WPCP template.

2.7.3 Provide support with obtaining the project Notice of Intent (NOI) with the State Water Resource Control Board's (SWRCB) online SMARTS database, if required.

2.7.4 Attend regular Contractor status meetings as needed to discuss NPDES issues

2.7.5 Review and comment on amendments to the project SWPPP/WPCP submitted by the Contractor

2.7.6 Provide oversight compliance inspections to the project RE and staff on an approved schedule (based on permit requirements which could include weekly, pre storm, during storm, and post storm inspections)

2.7.7 Review project submittals, including but not limited to contractor BMP weekly inspection reports, sampling results, corrective action reports, and other documentation required by the project specifications.

2.7.8 Assist with uploading required data such as Ad Hoc reports to the SWRCB's SMARTS database

2.7.9 Assist with compiling data and reports for the Annual Report (contractor responsibility) and assist with uploading Annual Report data to the SWRCB's SMARTS database, if required.

2.7.10 Assist with developing and receiving SWRCB/San Diego RWQCB approval of the Project's Notice of Termination.

2.7.11 Conduct quarterly non-stormwater inspections and additional site inspections as directed by Resident Engineer. Review project records and field conditions for compliance with San Diego RWQCB requirements and compliance.

III. PERIOD OF PERFORMANCE

The construction duration is 290 calendar days from NTP and an additional 30 calendar days for each of the 3 additive/alternates. It is anticipated that there may be some long lead times on equipment, so the constrcution start date will be delayed until the delivery dates are known and the work can-back in to the delivery dates in order to create a continous project. It is anticpated the work will be awarded in June of 2024, but actual start date of construction could be several months later depending on lead times.

IV. DELIVERABLES

1. Monthly updates to the CPM Schedule

2. Inspection reports, inspection daily diaries, and pay estimates in accordance with MTS procedures
3. Meeting agendas, RFI, and Submittal Logs
4. Project records in accordance with MTS procedures or Caltrans categorical filing system

V. SCHEDULE OF SERVICES/MILESTONES/DELIVERABLES

A. Milestones/Deliverables Schedule

Milestone/Deliverable	Due Date
CPM Schedule Updates	Monthly through Pre-Construction
Project Management/Coordination/ Inspection Services	NTP to 380 calendar days of construction and 30 days of closeout

B. Milestones/Deliverables Schedule

Milestone/Deliverable	Due Date
Daily Reports	Weekly throughout construction
All project documents	At project closeout
Invoices	Monthly

VI. MATERIALS TO BE PROVIDED BY MTS AND/OR THE OTHER AGENCY

1. Project plans, technical specifications, special provisions, and all supporting contract documents
2. Applicable permits
3. Traffic Control plans

VII. SPECIAL CONDITIONS

Any condition listed below applies solely to this Work Order and does not otherwise alter the Agreement or other Work Orders.

VIII. MTS ACCEPTANCE OF SERVICES:

Contractor shall not be compensated at any time for unauthorized work outside of this Work Order. Contractor shall provide notice to MTS' Project Manager upon 100% completion of this Work Order. Within five (5) business days from receipt of notice of Work Order completion, MTS' Project Manager shall review, for acceptance, the 100% completion notice. If Contractor provides final service(s) or final work product(s) which are found to be unacceptable due to Contractors and/or Contractors subcontractors negligence and thus not 100% complete by MTS' Project Manager, Contractor shall be required to make revisions to said service(s) and/or work product(s) within the Not to Exceed (NTE) Budget. MTS reserves the right to withhold payment associated with this Work Order until the Project Manager provides written acceptance for the 100% final completion notice. Moreover, 100% acceptance and final completion will be based on resolution of comments received to the draft documents and delivery of final documentation which shall incorporate all MTS revisions and comments.

Monthly progress payments shall be based on hours performed for each person/classification identified in the attached Fee Schedule and shall at no time exceed the NTE. Contractor shall only be compensated for actual performance of services and at no time shall be compensated for services for which MTS does not have an accepted deliverable or written proof and MTS acceptance of services performed.

IX. DEFICIENT WORK PRODUCT

Throughout the construction management and/or implementation phases associated with the services rendered by the Contractor, if MTS finds any work product provided by Contractor to be deficient and the deficiently delays any portion of the project, Contractor shall bear the full burden of their deficient work and shall be responsible for taking all corrective actions to remedy their deficient work product including but not limited to the following:

- Paying applicable delay fees,
- Revising provided documents,

At no time will MTS be required to correct any portion of the Contractors deficient work product and shall bear no costs or burden associated with Contractors deficient performance and/or work product.

X. DELIVERABLE REQUIREMENTS

Contractor will be required to submit any and all documentation required by the Scope of Work. The deliverables furnished shall be of a quality acceptable to MTS. The criteria for acceptance shall be a product of neat appearance, well-organized, and procedurally, technically and grammatically correct. MTS reserves the right to request a change in the format if it doesn't satisfy MTS's needs. All work products will become the property of MTS. MTS reserves the right to disclose any reports or material provided by the Contractor to any third party.

Contractor shall provide with each task, a work plan showing the deliverables schedule as well as other relevant date needed for Contractor's work control, when and as requested by MTS.

Contractor's computer data processing and work processing capabilities and data storage should be compatible with Windows compatible PC's, text files readable in Microsoft Word, and standard and customary electronic storage. Contractor shall maintain backup copies of all data conveyed to MTS.

Contractor shall provide MTS with hard copy or electronic versions of reports and/or other material as requested by MTS.

XI. PRICING

MTS shall reimburse the Contractor for actual costs of Work Order Agreements (including labor costs, employee benefits, overhead, and other direct costs applicable to the specific Work Order Agreement) incurred by the Contractor in performance of the work, in an amount established in the Work Order Agreement (WOA). Actual costs shall not exceed the estimated wage rates established in the negotiations between the Parties.

Fees and all other charges will be billed as identified in the WOA, and the net amount shall be due at the time of billing, unless otherwise specified.

XII. PREVAILING WAGE

Prevailing wage rates apply to certain personnel for these services? X Yes ☐ No

Exhibits: A, MTS IAD ZEB 100% Specs 2023-0901

EXHIBIT A
MTS IAD ZEB 100% SPECS 2023-0901

Technical Specifications

MTS – Imperial Avenue Division Zero Emission Bus Overhead Charging – Phase I

DIVISION 1	GENERAL REQUIREMENTS
01 23 00	Alternates
01 71 23	Construction Staking and Surveying
DIVISION 2	EXISTING CONDITIONS
02 41 19	Demolition
DIVISION 3	CONCRETE
03 10 00	Concrete Forming and Accessories
03 20 00	Concrete Reinforcing
03 30 00	Cast-in-Place Concrete
DIVISION 5	METALS
05 12 00	Structural Steel Framing
05 21 00	Steel Joist Framing
05 31 00	Steel Decking
05 51 00	Metal Stairs
DIVISION 9	FINISHES
09 91 13	Exterior Paint
DIVISION 10	SPECIALTIES
10 56 00	Storage Assemblies
DIVISION 11	EQUIPMENT
11 05 11	Requirements for Owner Furnished Contractor Installed Bus Charging
11 96 00	General Shop Equipment
DIVISION 12	FURNISHINGS
12 57 83	Custom Industrial Furniture
DIVISION 13	SPECIAL CONSTRUCTION
13 34 19	Pre-Engineered Metal Building Systems
DIVISION 23	HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)
23 05 00	Common Work Results for HVAC
23 05 19	Meters and Gages for HVAC Piping
23 05 23	General Duty Valves for HVAC Piping
23 05 29	Hangers and Supports for HVAC Piping and Equipment
23 11 23	Facility Natural Gas Piping
DIVISION 26	ELECTRICAL
26 05 05	General Provisions for Electrical Systems

Date: 1 September 2023 – 100% CDs Submission

26 05 13	Medium Voltage Cables
26 05 19	Low-Voltage Electrical Power Conductors and Cables
26 05 26	Grounding And Bonding For Electrical Systems
26 05 29	Hangers and Supports for Electrical Systems
26 05 33	Raceways and Boxes for Electrical Systems
26 05 36	Cable Trays
26 05 43	Underground Ducts & Raceways for Electrical Systems
26 05 53	Identification for Electrical Systems
26 05 73	Electrical System Study
26 11 16	Secondary Unit Substation
26 12 16	Substation Transformers - Dry-Type
26 13 13	Metal Enclosed MV Switchgear
26 24 13	Switchboards
26 24 16	Panelboards
26 27 26	Wiring Devices
26 31 00	Photovoltaic System
26 31 01	Battery Energy Storage System
26 32 13	Gas-Engine Driven Generator Sets
26 37 13	Microgrid Energy Management System
26 41 13	Lightning Protection for Structures
26 43 13	Surge Protection Devices
26 56 00	Exterior Lighting
DIVISION 28	ELECTRONIC SAFETY AND SECURITY
28 33 00	Fuel Gas Detection and Alarm
DIVISION 31	EARTHWORK
31 20 00	Excavation
31 23 33	Gas Line Trenching, Backfill, and Resurfacing
31 63 29	Drilled Concrete Piers and Shaft
DIVISION 32	EXTERIOR IMPROVEMENTS
32 11 23	Aggregate Base Courses
32 12 16	Asphalt Paving
32 13 13	Vehicular Concrete Paving
32 17 23	Parking Striping
32 31 13	Bollards and Bollard Covers
DIVISION 44	POLLUTION CONTROL EQUIPMENT
44 13 73	Catalytic Reduction Equipment

Date: 1 September 2023 – 100% CDs Submission

SECTION 01 23 00
ALTERNATES

PART 1 – GENERAL

The provisions of the Contract, including General and Special Conditions and the requirements of MTS General Conditions, apply to the Work in this Section.

1.01 SUMMARY

A. Section includes description of all alternates in the project.

1.02 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.

2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.03 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule and clouded and identified as elements of alternate work on the drawings contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 SCHEUDLE OF ALTERNATES

A. Alternate No 1: Battery Energy Storage System. Battery energy storage system, additional low voltage switchboard on Substation A, and below-grade conduit from Vault-3 to battery energy storage system. As indicated on the drawings and in sections

26 31 01 BATTERY ELECTRICAL SUPPLY SYSTEM

B. Alternate No. 2: Photovoltaic System. As indicated on the drawings and in sections

26 31 00 PHOTOVOLTAIC SYSTEM

C. Alternate No. 3: Permanent Standby Generator. Substation A Transformer, (one) low voltage switchboard, duct bank section A2, permanent standby generator and associated equipment. As indicated on the drawing and in sections

23 05 00 COMMON WORK RESULTS FOR HVAC

23 05 19 METERS AND GAGES FOR HVAC PIPING

23 05 23 GENERAL-DUTY VALVES FOR HVAC PIPING

23 05 29 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

23 11 23 FACILITY NATURAL-GAS PIPING

26 32 13 GAS-ENGINE-DRIVEN GENERATOR SETS

28 33 00 FUEL GAS DETECTION AND ALARM

D. Alternate No. 4: Earthwork for contaminated soils. work includes loading, hauling, and disposing to local landfill and loading, hauling, and disposing to California hazardous approved site.

31 20 00 EXCAVATION

END OF SECTION

SECTION 01 71 23

CONSTRUCTION STAKING AND SURVEYING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Construction Staking and Surveying

1.2 RELATED SECTIONS

Not Used

1.3 REFERENCE STANDARDS

A. Caltrans Standard Specifications, 2018 Edition

1. Section 5-1.26, "Construction Surveys"

2. Caltrans Surveys Manual, Chapter 12, dated November 2012

1.4 SUBMITTALS

Not Used

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 CONSTRUCTION STAKING AND SURVEYING

A. Construction staking shall be in conformance with Chapter 12 of the Caltrans Surveys Manual, dated November 2012. Legible copies of all construction operations staking sheets shall be provided to Engineer two days before construction work is started.

B. All field construction surveying required for accurate location and the construction of the various items of work under the contract shall be performed and furnished by the Contractor.

C. The contractor shall be responsible for performing a site verification survey to confirm the existing grades and conditions at the site prior to any grading or construction operations. The survey data shall be overlaid electronically, in AutoCAD format, on the original ground as shown on the project plans, and any variations brought to the attention of the Engineer.

D. The Contractor shall notify the Engineer, in writing, 48 hours in advance of any construction staking.

E. The Contractor shall replace any disturbed existing property corner markers, monuments, and local agencies' well monuments disturbed during construction operations. These new markers,

monuments, and well monuments shall be documented by a record of survey map or corner record prepared in accordance with Section 8771 of the Business and Professions Code and all applicable laws and regulations and filed in the Office of the County Recorder of San Diego County at the Contractor's expense.

F. The Contractor shall be responsible for preparing and filing with the San Diego County surveyor a Corner Record of the references to existing monuments within the area of each street or highway to be reconstructed under this contract, prior to any reconstruction, as required by Section 8771 of the Business and Professions Code (January 1, 1995).

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Construction Staking and Surveying will be measured for payment as a lump sum.

4.2 PAYMENT

A. Construction Staking and Surveying furnished and completed in accordance with the Contract Documents will be paid at the Contract Price, as listed on the Bid Item List. This price shall include full compensation for furnishing all labor materials, tools, equipment, supplies, supervision, and incidentals, and doing the work, as specified in the Contract Documents, and as directed by the Engineer.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pavement Demolition

B. Removal of Above Ground Surface Improvements

1.2 RELATED SECTIONS

Not Used

1.3 REFERENCE STANDARDS

A. Caltrans Standard Specifications, 2018 Edition

1. Section 5-1.36, "Property and Facility Preservation"

2. Section 10-6, "Watering"

3. Section 18, "Dust Palliative"

1.4 SUBMITTALS

A. Submit a demolition work plan to the Engineer detailing the procedures planned and proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, careful removal of materials to be demolished, protection of property which is to remain undisturbed, proper disposal of generated material, and timely coordination with MTS for the disconnection of utility services. The plan shall include a detailed description of the methods and equipment to be used for each operation, hazardous materials disposal, disposal facilities selected, and the sequence of operations.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 DEMOLITION

A. Remove Existing Asphalt. Existing asphalt pavement, including base material, shown on the plans to be removed shall be sawcut and removed to bottom of existing pavement surface. The adjacent 2 feet will be milled to a depth indicated on plans. Resulting holes and depressions shall be repaved per the lines and grade established by the Engineer. Residue from saw cutting operations shall be removed from the pavement surface by vacuuming or other approved method and shall not be allowed to flow across the pavement nor be left on the surface of the pavement. Residue from saw cutting operations shall be disposed of outside the MTS property.

B. Remove Existing Concrete. Removal of existing concrete, including base material, to the limits as shown on the plans. Removal shall conform to Section 15-1.03B, "Removing Concrete" of the Caltrans Standard Specifications and these Special Provisions. Concrete shall be removed to the bottom of the existing pavement section without damaging portions of existing concrete to remain in place by sawcutting the concrete at the limits of removal shown on the Plans or ordered by the Engineer. Demolition shall consist of performing all work necessary to demolish, remove and dispose of existing concrete pavement, all as shown on the plans and specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer, and for doing all the work that may be required to construct and maintain the facilities within the limits of work including temporary pavement. The joint between any surfacing to be removed and surfacing which is to remain in place shall be cut to a neat line with a power-driven saw to full depth prior to removal operations. Residue from saw cutting operations shall be removed from the pavement surface by vacuuming or other approved method and shall not be allowed to flow across the pavement nor be left on the surface of the pavement. Residue from saw cutting operations shall be legally disposed of outside of the MTS property.

C. Remove Wheel Stops. Wheel stops shall be removed and disposed.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Sawcut shall be measured by lineal foot of sawcut to a length and depth prescribed on the construction plans.

B. Remove Existing Asphalt shall be measured by the square foot of asphalt removed to a depth of 20 inches below existing grade and horizontally to the limits shown in the construction plans.

C. Remove Existing Concrete Pavement shall be measured by the square foot of concrete removed to a depth of 12 inches below existing grade and horizontally to the limits shown in the construction plans.

D. Removal of wheel shop shall be measured by each wheel stop, as identified on the construction plans.

4.2 PAYMENT

A. Sawcut shall be paid by the lineal foot. This shall include full compensation for all the work, labor, equipment and incidentals required to remove, stockpile and legally dispose of as required.

B. Remove Existing Asphalt shall be paid by the square foot. This shall include full compensation for all the work, labor, equipment and incidentals required to remove asphalt pavement and base, stockpile, and legally dispose of as required.

C. Remove Existing Concrete shall be paid by the square foot. This shall include full compensation for all the work, labor, equipment, and incidentals required to remove asphalt pavement and base, stockpile, and legally dispose of as required.

END OF SECTION

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Form-facing material for cast-in-place concrete.

2. Shoring, bracing, and anchoring.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Exposed surface form-facing material.

2. Concealed surface form-facing material.

3. Form ties.

4. Form-release agent.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Minutes of preinstallation conference.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork in accordance with ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."

2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.

2. Furnish in largest practicable sizes to minimize number of joints.

3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:

a. Plywood, metal, or other approved panel materials.

b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

1) APA Plyform Class I, B-B or better; mill oiled and edge sealed.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 RELATED MATERIALS

A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2. Form release agent for form liners shall be acceptable to form liner manufacturer.

C. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301 (ACI 301M).

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M) and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.

C. Limit concrete surface irregularities as follows:

1. Surface Finish-1.0: ACI 117 Class D, 1 inch (25 mm).

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.

2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.

2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips.

2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.

2. Locate temporary openings in forms at inconspicuous locations.

I. **Chamfer** exterior corners and edges of permanently exposed concrete.

J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.

2. Obtain written approval of owner's representative prior to forming openings not indicated on Drawings.

K. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.

2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

3. Place joints perpendicular to main reinforcement.

4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

L. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

M. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

N. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3. Clean embedded items immediately prior to concrete placement.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing agency to perform field tests and inspections and prepare test reports.

1. Employment of Agency in no way relieves Contractor of obligation to perform work in accordance with the requirements in the contract documents.

B. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.

2. Welded-wire reinforcement.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.

2. Bar supports.

3. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.

2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of the Engineer.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

B. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

2. Mechanical splice couplers.

C. Mill certificates showing that all materials are sourced from the United States or any US territories. See section 2.2 below.

D. Field quality-control reports.

E. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed.

B. Headed-Steel Reinforcing Bars: ASTM A970/A970M.

C. Epoxy-Coated Reinforcing Bars:

1. Steel Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed bars.

2. Epoxy Coating: ASTM A775/A775M with less than 2 percent damaged coating in each 12-inch (305-mm) bar length.

D. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

E. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A coated, Type 1, plain steel.

2.2 SOURCE OF MATERIALS

A. The major quantities of steel and iron material that is permanently incorporated into the special trackwork shall consist of American-made materials.

B. Minor amounts of foreign steel and iron may be utilized in this project provided the cost of the foreign material used does not exceed one-tenth of one percent (i.e. 0.1 percent) of the total contract cost or $2,500.00, whichever is greater.

C. American-made material is defined as the material sourced domestically and having all manufacturing processes occurring domestically. This indicates that a domestic product is a manufactured steel material that was produced in one of the 50 States, the District of Columbia, Puerto Rico, or in the territories and possessions of the United States.

D. Manufacturing begins with the initial melting/mixing and continues through the final coating stage. Any process which modifies the chemical content, the physical size or shape, or the final finish is considered a manufacturing process. This includes but not limited to rolling,

extruding, machining, bending, grinding, drilling, welding, and coating. The action of applying a coating to steel or iron is also considered a manufacturing process. Coating includes epoxy coating, galvanizing, aluminizing, painting, and any other coating that protects or enhances the value of steel or iron.

E. The following are considered to be steel manufacturing processes:

1. Production of steel by any of the following processes:

a. Open hearth furnace.

b. Basic oxygen.

c. Electric furnace.

d. Direct reduction.

2. Rolling, heat treating, and any other similar processing.

3. Fabrication of the products.

F. American-made requirements do not apply to raw materials, scrap (recycled steel or iron), pig iron, and processed/pelletized/reduced iron ore.

G. A certification of materials origin shall be required as requested for any items comprised of, or containing, steel or iron materials prior to such items being incorporated into the steel reinforcement.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.

B. Mechanical Splice Couplers: ACI 318 (ACI 318M) Type 1 or Type 2, same material of reinforcing bar being spliced; tension-compression type.

C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch (1.2908 mm) in diameter.

1. Finish: Plain or ASTM A884/A884M, Class A, Type 1, epoxy coated, with less than 2 percent damaged coating in each 12-inch (305-mm) wire length.

2.4 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.

2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.

2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch (25 mm), not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318 (ACI 318M).

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches (610 mm), whichever is greater.

2. Stagger splices in accordance with ACI 318 (ACI 318M).

3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.

G. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches (305 mm).

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches (50 mm) for plain wire and 8 inches (200 mm) for deformed wire.

3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.

4. Lace overlaps with wire.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by owner's representative.

1. Place joints perpendicular to main reinforcement.

2. Continue reinforcement across construction joints unless otherwise indicated.

3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117 (ACI 117M).

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel-reinforcement placement.

2. Steel-reinforcement mechanical splice couplers.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 316329 "Drilled Piers and Shafts" for pier foundations.

2. Section 032000 “Concrete Reinforcing”

3. Section 032000 “Concrete Forming and Accessories”

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, and other pozzolans materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.

2. Fly ash.

3. Aggregates.

4. Admixtures:

a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

5. Vapor retarders.

6. Curing materials.

7. Joint fillers.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.

2. Minimum 28-day compressive strength.

3. Durability exposure class.

4. Maximum w/cm.

5. Slump limit.

6. Air content.

7. Nominal maximum aggregate size.

8. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.

9. Intended placement method.

10. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

a. Location of construction joints is subject to approval of the owner’s representative.

D. For concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.

2. Location within Project.

3. Exposure Class designation.

4. Formed Surface Finish designation and final finish.

5. Curing process.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.

2. Admixtures.

3. Curing compounds.

4. Vapor retarders.

5. Joint-filler strips.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.

2. Fly ash.

3. Blended hydraulic cement.

4. Aggregates.

5. Admixtures:

C. Research Reports: For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.

D. Preconstruction Test Reports: For each mix design.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:

a. Admixture dosage rates.

b. Slump.

c. Air content.

d. Seven-day compressive strength.

e. 28-day compressive strength.

B. Alternatively, provide standard mixes from the ready-mix plant for specified mixes.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301 (ACI 301M).

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 306.1.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M).

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II, gray.

2. Fly Ash: ASTM C618, Class C or F.

B. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:

a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.

b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.

c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. (2.37 kg/cu. m) for moderately reactive aggregate or 3 lb./cu. yd. (1.78 kg/cu. m) for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301 (ACI 301M).

2. Maximum Coarse-Aggregate Size: ASTM C33 size #467 1-1/2 inch nominal.

3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C260/C260M.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride [in steel-reinforced concrete].

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.

2. Retarding Admixture: ASTM C494/C494M, Type B.

3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.

5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.

6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

E. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.3 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50 deg F (10 deg C): Black.

b. Ambient Temperature between 50 deg F (10 deg C) and 85 deg F (29 deg C): Any color.

c. Ambient Temperature Above 85 deg F (29 deg C): White.

C. Curing Paper: Eight-feet- (2438-mm-) wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

D. Water: Potable or complying with ASTM C1602/C1602M.

E. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

F. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.4 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

2.5 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301 (ACI 301M).

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete and concrete with a w/cm below 0.50.

2.6 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for slabs, piers, grade beams, and tie beams.

1. Exposure Class: ACI 318 (ACI 318M) S3.

2. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.

3. Maximum w/cm: 0.45.

4. Slump Limit: 5 inches (125 mm), plus or minus 1 inch (25 mm) plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site.

5. Air Content: 6% plus or minus 1.5 %.

6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.2 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by owner's representative.

2. Place joints perpendicular to main reinforcement.

a. Continue reinforcement across construction joints unless otherwise indicated.

b. Do not continue reinforcement through sides of strip placements of floors and slabs.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.

2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.

2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.3 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.

2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify owner's representative and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by owner's representative in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M), but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.

2. Deposit concrete to avoid segregation.

3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301 (ACI 301M).

   a. Do not use vibrators to transport concrete inside forms.

   b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.

   c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.

   d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.

2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

3. Maintain reinforcement in position on chairs during concrete placement.

4. Screed slab surfaces with a straightedge and strike off to correct elevations.

5. Level concrete, cut high areas, and fill low areas.

6. Slope surfaces uniformly to drains where required.

7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.

8. Do not further disturb slab surfaces before starting finishing operations.

3.4 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 (ACI 301M) Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

   a. Patch voids larger than 1-1/2 inches (38 mm) wide or 1/2 inch (13 mm) deep.

   b. Remove projections larger than 1 inch (25 mm).

   c. Tie holes do not require patching.

d. Surface Tolerance: ACI 117 (ACI 117M) Class D.

e. Apply to all formed concrete surfaces.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.

2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.5 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Broom Finish: Apply a broom finish to exterior concrete paving in bus storage areas and areas leading to and from bus storage.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

2. Coordinate required final finish with owner's representative before application.

3.6 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.

2. Mix, place, and cure concrete, as specified, to blend with in-place construction.

3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.7 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 (ACI 301M) and ACI 306.1 for cold weather protection during curing.

2. Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.

3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1,) before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.

2. If forms remain during curing period, moist cure after loosening forms.

3. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

a. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.

b. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.

c. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

1) Recoat areas subject to heavy rainfall within three hours after initial application.

2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Begin curing immediately after finishing concrete.

3.8 TOLERANCES

A. Conform to ACI 117 (ACI 117M).

3.9 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.

2. Testing agency shall immediately report to owner’s representative, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.

3. Testing agency shall report results of tests and inspections, in writing, to Owner, owner's representative, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

    a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

        1) Project name.

        2) Name of testing agency.

        3) Names and certification numbers of field and laboratory technicians performing inspections and testing.

        4) Name of concrete manufacturer.

        5) Date and time of inspection, sampling, and field testing.

        6) Date and time of concrete placement.

        7) Location in Work of concrete represented by samples.

        8) Date and time sample was obtained.

        9) Truck and batch ticket numbers.

        10) Design compressive strength at 28 days.

        11) Concrete mixture designation, proportions, and materials.

        12) Field test results.

        13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.

        14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.

2. Verification of use of required design mixture.

3. Concrete placement, including conveying and depositing.

4. Curing procedures and maintenance of curing temperature.

5. Batch Plant Inspections: On a random basis, as determined by owner's representative.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M:

   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.

   b. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.

   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064/C1064M:

   a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C31/C31M:

   a. Cast and laboratory cure two sets of three 6-inch (150 mm) by 12-inch (300 mm) or 4-inch (100 mm) by 8-inch (200 mm) cylinder specimens for each composite sample.

   b. Cast, initial cure, and field cure two sets of three standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C39/C39M.

   a. Test one set of three laboratory-cured specimens at seven days and one set of two specimens at 28 days.

   b. Test one set of two three field-cured specimens at seven days and one set of two specimens at 28 days.

c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa) if specified compressive strength is 5000 psi (34.5 MPa), or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi (34.5 MPa).

9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by owner's representative but will not be used as sole basis for approval or rejection of concrete.

10. Additional Tests:

a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by owner's representative.

b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by owner's representative.

1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 (ACI 301M), section 1.6.6.3.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.10 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.

2. Diaper hydraulic equipment used over concrete surfaces.

3. Prohibit vehicles from interior concrete slabs.

4. Prohibit use of pipe-cutting machinery over concrete surfaces.

5. Prohibit placement of steel items on concrete surfaces.

6. Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.

2. Shrinkage-resistant grout.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.

2. High-strength, bolt-nut-washer assemblies.

3. Anchor rods.

4. Threaded rods.

5. Forged-steel hardware.

6. Shop primer.

7. Galvanized-steel primer.

8. Etching cleaner.

9. Galvanized repair paint.

10. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Mill test reports for structural-steel materials, including chemical and physical properties.

C. Mill certificates showing that all materials are sourced from the United States or any US territories. See section 2.2 below.

D. Source quality-control reports.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.

2. ANSI/AISC 360.

3. ANSI/AISC 341.

4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

1. Option 1: Connection designs have been completed and connections indicated on the Drawings.

C. Moment Connections: Type FR, fully restrained.

D. Construction: Moment frame in N-S and E-W direction.

2.2 SOURCE OF MATERIALS

A. The major quantities of steel and iron material that is permanently incorporated into the special trackwork shall consist of American-made materials.

B. Minor amounts of foreign steel and iron may be utilized in this project provided the cost of the foreign material used does not exceed one-tenth of one percent (i.e. 0.1 percent) of the total contract cost or $2,500.00, whichever is greater.

C. American-made material is defined as the material sourced domestically and having all manufacturing processes occurring domestically. This indicates that a domestic product is a manufactured steel material that was produced in one of the 50 States, the District of Columbia, Puerto Rico, or in the territories and possessions of the United States.

D. Manufacturing begins with the initial melting/mixing and continues through the final coating stage. Any process which modifies the chemical content, the physical size or shape, or the final finish is considered a manufacturing process. This includes but not limited to rolling, extruding, machining, bending, grinding, drilling, welding, and coating. The action of applying a coating to steel or iron is also considered a manufacturing process. Coating includes epoxy coating, galvanizing, aluminizing, painting, and any other coating that protects or enhances the value of steel or iron.

E. The following are considered to be steel manufacturing processes:

1. Production of steel by any of the following processes:

a. Open hearth furnace.

b. Basic oxygen.

c. Electric furnace.

d. Direct reduction.

2. Rolling, heat treating, and any other similar processing.

3. Fabrication of the products.

F. American-made requirements do not apply to raw materials, scrap (recycled steel or iron), pig iron, and processed/pelletized/reduced iron ore.

G. A certification of materials origin shall be required as requested for any items comprised of, or containing, steel or iron materials prior to such items being incorporated into the structural steel.

2.3 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992/A992M Grade 50 (Grade 345).

B. Channels, Angles: ASTM A36/A36M.

C. Plate and Bar: ASTM A36/A36M.

D. Welding Electrodes: Comply with AWS requirements.

2.4 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH (ASTM A563M, Class 10S), heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1 (Type 8.8-1), compressible-washer type with plain finish.

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, round head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH (ASTM A563M, Class 10S), heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Plain.

2.5 RODS

A. Headed Anchor Rods: ASTM F1554, Grade 36, weldable, straight.

1. Finish: Plain.

B. Steel Primer:

1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.6 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

2.8 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Pretensioned.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.9 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).

2. Surfaces to be field welded.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 3.

C. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

2. Bolted Connections: Inspect and test shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E165/E165M.

b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

c. Ultrasonic Inspection: ASTM E164.

d. Radiographic Inspection: ASTM E94/E94M.

4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M.

5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.

2. Weld plate washers to top of baseplate.

3. Pretension anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Pretensioned.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.

2. Verify weld materials and inspect welds.

3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1) Liquid Penetrant Inspection: ASTM E165/E165M.

2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

3) Ultrasonic Inspection: ASTM E164.

4) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION

SECTION 052100

STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. LH-series long-span steel joists.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

1. Include layout, designation, number, type, location, and spacing of joists.

2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Manufacturer certificates.

C. Mill Certificates: For each type of bolt.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 STEEL JOISTS

A. Long-Span Steel Joist: Manufactured steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated on Drawings.

2.2 PRIMERS

A. Primer:

1. SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.3 STEEL JOIST ACCESSORIES

A. Bridging:

1. Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

2. Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

3. Fabricate as indicated on Drawings and according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

B. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Plain.

C. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.4 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories.

B. Apply one coat of shop primer to joists and joist accessories.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.

2. Space, adjust, and align joists accurately in location before permanently fastening.

3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

C. Field weld joists to supporting steel framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

END OF SECTION

SECTION 05 31 00

STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Noncomposite form deck.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Noncomposite form deck.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Welding certificates.

2. Product Certificates: For each type of steel deck.

B. Test and Evaluation Reports:

1. Product Test Reports: For tests performed by a qualified testing agency, indicating that power-actuated mechanical fasteners comply with requirements.

2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

D. Qualification Statements: For welding personnel and testing agency.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding code:

a. AWS D1.3/D1.3M.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

2.2 NONCOMPOSITE FORM DECK

A. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite deck panels used as a form to comply with SDI NC, with the minimum section properties indicated, and with the following:

1. Galvanized- and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 (230) G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

a. Color: Gray top surface with white underside.

2. Profile Depth: 1-1/2 inches (38 mm)].

3. Design Uncoated-Steel Thickness: 0.0179 inch (0.45 mm).

4. Span Condition: As indicated.

5. Side Laps: Overlapped.

2.3 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI standards for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch (1.52 mm) thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.

I. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.

J. Galvanizing Repair Paint: ASTM A780/A780M.

K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install in accordance with deck manufacturer's written instructions.

3.2 INSTALLATION OF FLOOR DECK

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 3/4 inch (19 mm), nominal.

2. Weld Spacing:

   a. Weld edge ribs of panels at each support. Space additional welds an average of 16 inches (400 mm) apart, but not more than 18 inches (460 mm) apart.

3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches (1 m), and as follows:

1. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of [1-1/2 inches (38 mm), with end joints as follows:

1. End Joints: Lapped.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure in accordance with SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, in accordance with SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.3 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

B. Repair Painting:

1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation and apply repair paint.

2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.

   a. Field welds will be subject to inspection.

2. Steel decking will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 05 51 00

METAL STAIRS

PART1 - GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Structural steel stair framing and supports.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

C. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

D. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

E. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

F. AWS D1.1/D1.1M - Structural Welding Code - Steel.

G. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

H. SSPC-SP 2 - Hand Tool Cleaning.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Design Data: As required by authorities having jurisdiction.

1.04 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.

1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.

2. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.

3. Dimensions: As indicated on drawings.

4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.

5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.

6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:

1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.

a. Welded Joints: Continuously welded and ground smooth and flush.

b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.

c. Exposed Edges and Corners: Eased to small uniform radius.

d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.

1. Concrete Depth: 1-1/2 inches, minimum.

2. Tread Pan Material: Steel sheet.

3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch minimum.

4. Concrete Reinforcement: Welded wire mesh.

5. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.

1. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.

2. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: Rolled steel channels.

1. Stringer Depth: 10 inches.

2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel pipe railings.

H. Finish: Shop- or factory-prime painted.

2.03 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: See Section 055213.

B. Guards: Pipe railings, see Section 055213.

2.04 MATERIALS

A. Steel Sections: ASTM A 36/A 36M.

B. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.

1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).

2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial

steel).

C. Concrete Reinforcement: Mesh type as detailed, galvanized.

2.05 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.

2.06 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.

1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.

2. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete with setting templates.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OFSECTION

SECTION 09 91 13

EXTERIOR PAINTING

PART 1 - GENERAL

The provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Surface preparation and the application of the specified paint systems on the following exterior substrates:

1. All exterior steel and iron items and surfaces (with or without shop applied primers) and exterior galvanized metal surfaces, including all structural steel, steel joist framing, steel decking, steel fabrications and miscellaneous steel.

2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Work does not include surface preparation and application of paint system to pre-finished exterior metal items, finished metal surfaces, operating parts, and labels.

1. Prefinished exterior metal items include:

a. Pre-finished standing seam metal roofs.

b. Pre-finished metal wall panels.

c. Pre-finished mechanical, electrical and lighting equipment and equipment enclosures

2. Finished metal surfaces include the following:

a. Anodized aluminum.

b. Stainless steel.

c. Chromium plate.

d. Copper and copper alloys.

e. Bronze and brass.

3. Operating parts include moving parts of operating equipment and the following:

a. Valve and damper operators.

b. Linkages.

c. Sensing devices.

d. Motor and fan shafts.

e. Pantographs

C. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.02 RELATED REQUIREMENTS

A. For Work indicated under 1.01 of this Specification Section and further addressed in other Specification Sections:

1. 05 12 00 – Structural Steel Framing

2. 05 21 00 – Steel Joist Framing

3. 05 31 00 – Steel Decking

1.03 DEFINITIONS

A. AMPP/SSPC: Association for Materials Protection and Performance / Society for Protective Coatings.

B. MPI: Master Painters Institute.

C. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

F. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

G. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

H. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.04 ALTERNATIVE BIDS

A. Refer to Division 1 - General Requirements for possible effect on Work of this Section.

1.05 QUALITY ASSURANCE

A. All paints shall conform to ASTM D3960 Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings and applicable Federal, State, and local codes and ordinances.

B. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

C. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

D. Mockups: Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in Painting and Decorating Contractors of America PDCA P5. Duplicate finish of approved sample Submittals.

1. Engineer will select one surface to represent surfaces and conditions for application of each type of coating and substrate.

2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.

a. After finishes are accepted, Engineer will use the room or surface to evaluate coating systems of a similar nature.

b. Approval of mockup shall include the surface cleaning and preparation procedure that were implemented at the specific mockup location

3. Final approval of colors will be by Owner from benchmark samples.

E. Surface cleaning and preparation procedures required prior to applying paint shall be the responsibility of the paint system manufacturer.

1.06 STANDARD AND REGULATORY REQUIREMENTS

A. Paint and necessary surface preparations indicated within this specification section shall comply with all applicable national, state and local codes and regulations. Additional, more specific compliance requirements shall include, but not necessarily be limited to the following:

1. California Green Building Standards (CalGreen), most recent edition.

2. MPI Architectural Painting Specification Manual, most recent edition.

3. SSPC-SP5/NACE 1: Surface Preparation Standard White Metal Blast Cleaning.

4. SSPC-SP10/NACE 2: Surface Preparation Standard Near-White Metal Blast Cleaning.

5. SSPC-SP16: Surface Preparation Standard SSPC-SP 16 – Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steel, and non-Ferrous Metals.

6. ASTM A780: Practice for Repair of Damage and Uncoated Areas of Hot-Dip Galvanized Coatings.

7. PDCA-P1: Painting and Decorating Contractors of America.

1.07 SUBMITTALS

A. Product Data: For each paint system indicated, include block fillers and primers.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

3. Provide information indicating compliance of each joint sealant product with the most recent edition of California Green Building Standards (CalGreen) VOC limits.

B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.

2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application. Use same designations indicated on Drawings and in schedules. Include color designations.

3. Submit two 8-inch by 12-inch Samples for each type of finish coating for Engineer's review of color and texture only.

C. Qualification Data: For Applicator.

D. Maintenance Material Submittal

1. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

a. Paint: 5 gallons of each material and color applied.

1.08 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Manufacturers listed for each equipment item may bid without submittal for that item. Manufacturers not listed shall submit for approval in accordance with "Instructions to Bidders". Prior to procurement, submittals for each equipment item by Mark Number shall be provided in accordance with Division 1 - General Requirements.

1.09 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, function and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not necessarily limited to, abnormal deterioration of finish.

D. Submit warranties in accordance with Notice to Bidders and Special Provisions of these specifications.

E. All paint, paint accessories, and other finish components specified herein shall be readily available locally in the United States.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.

2. Product description (generic classification or binder type).

3. Manufacturer's stock number and date of manufacture.

4. Contents by volume, for pigment and vehicle constituents.

5. Thinning instructions.

6. Application instructions.

7. Color name and number.

8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F and a maximum ambient temperature of 95 deg F, or as otherwise recommended by the product manufacturer. Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.11 PROJECT FIELD CONDITIONS

A. Apply all products specified herein according to manufacturer’s recommended instructions for project field conditions. Where manufacturer’s instructions on project field conditions are not available, follow the instruction provided below. Where there is a conflict between the instructions below and manufacturer’s recommended instructions, the manufacturer’s recommended instructions shall prevail.

1. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

2. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

3. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

    a. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.01 GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

3. Painting system shall be designed and intended for use in protecting metals from corrosion in a marine (coastal) environment.

C. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

2.02 MANUFACTURERS

A. Sherwin Williams 101 W. Prospect Ave., Cleveland, OH 44115

B. Benjamin Moore & Co., 101 Paragon Drive, Montvale, NJ 07645

C. US Technical Coatings, 1000 McFarland 400 Blvd., Alpharetta, GA 30004

D. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not necessarily limited to, products listed in these specifications for the paint category indicated.

2.03 PAINT SYSTEMS

A. Paint System Components: Paint shall include a three part paint system consisting of the components listed below, and accessories.

1. Inorganic solvent based zinc rich primer, designed and intended for protection of industrial steel exposed to fresh and/or salt water conditions. Volume solids 76% +/-2%. Meets AASHTO M-300 specification, SSPC-Paint 20, SSPC Paint 29..

2. High solids epoxy designed and intended for protection of industrial steel exposed to fresh and/or salt water conditions. Volume solids 72% +/-2%..

3. High solids, tin free, silica free aliphatic polyurethane, designed and intended for protection of industrial steel exposed to fresh and/or salt water conditions. Volume solids 68% +/-2%.

4. Block fillers, compatible with the selected manufacturer's paint system and produced by the same manufacturer of the paint system.

B. Colors: As indicated on the Drawings and/or as selected by Owner from Manufacturer's standard range of colors.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for application of the Paint System.

B. Review other Sections in which primers are provided to determine compatibility of the total system for various substrates. Furnish information on characteristics of finish materials that can be used to determine compatible primers.

C. Verify with the Applicator and Paint System Manufacturer the suitability and compatibility of the Paint System with substrates, including surface conditions and compatibility with existing finishes and primers.

D. Obtain written verification of compatibility and suitability of primed substrates with the Paint System from the Paint System Manufacturer and submit to Owner prior to application of the Paint System.

E. Notify Engineer about anticipated problems when using the materials specified over substrates primed by others.

F. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with Paint System manufacturer's written instructions and recommendations, and MPI Architectural Painting Specification Manual as applicable, to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Determine compatibility and suitability of any shop primers with the Paint System prior to Preparation, as indicated in 3.01 of this specification section.

D. Cleaning: Clean surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified

1. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, and grease.

2. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

E. Surface Preparation: Prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. As necessary, provide barrier coats or tie-coats over incompatible primers or completely remove existing primer and re-prime, per Paint System manufacturer’s written recommendations. All barrier coats, tie-coats or re-prime coats shall be compatible with the Paint System. Paint System manufacturer shall provide written verification of compatibility.

2. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with The Society for Protective Coating’s (SSPC) recommendations.

a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 5/NACE No. 1, SSPC-SP10/NACE No.2.

b. Treat existing painted surfaces with surface preparation methods recommended by coating manufacturer and in accordance with the coating schedule.

3. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods. Use Oakite Cleaner LTS or equal for pretreatment of any non-primed galvanized metal before finish painting.

a. Prepare all galvanized and non-ferrous metals in accordance with SSPC-SP16 Surface Preparation of Galvanized Steel, Stainless Steel and Non-Ferrous Metals. Achieve minimum 1.5 mil uniform anchor profile.

b. Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780 – Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

F. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

2. Blend material before application to produce a mixture of uniform density. Blend as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

3. Use only thinners approved by paint manufacturer and only within recommended limits.

G. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.03 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.

2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

3. Provide finish coats that are compatible with primers used.

4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

6. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.

7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.

9. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.

2. Omit primer over metal surfaces that have been shop primed and touchup painted with a primer that has been determined to be compatible with the Paint System.

3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.

2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.

3. Spray Equipment: Use airless or conventional spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed to outdoor weather conditions.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated metal piping.

2. Uninsulated plastic piping.

3. Pipe hangers and supports.

4. Tanks that do not have factory-applied final finishes.

5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.

6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.

7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

G. Electrical items to be painted include, but are not limited to, the following:

1. Switchgear.

2. Panelboards.

3. Electrical equipment that is indicated to have a factory-primed finish for field painting.

H. Block Fillers: Apply block fillers compatible to the Paint System to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and either has not been prime coated by others, or that has been determined to have a compatible paint / primed surface for the Paint System primer. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.04 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.

2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Engineer, and leave in an undamaged condition.

D. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

E. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in Painting and Decorating Contractors of America PDCA P1.

3.06 EXTERIOR PAINTING SCHEDULE

A. Steel and Iron Substrates:

1. Epoxy Based Industrial Coating System:

a. Prime Coat: Solvent based three-part, inorganic zinc rich coating.

1) Sherwin Williams Zinc Clad II Plus, or equal

b. Coat: Primer, high solids fast cure epoxy mastic, anti-corrosive for metal in a marine environment

1) Sherwin Williams Macropoxy 646 Fast Cure Epoxy, or equal.

c. Topcoat: High Solids Polyurethane, gloss or semi gloss.

1) Sherwin Williams Acrolon 7300 or equal

B. Galvanized-Metal Substrates:

1. Epoxy Based Industrial Coating System:

a. Prime Coat: Primer, high solids fast cure epoxy, anti-corrosive for metal in a marine environment

1) Sherwin Williams Macropoxy 646 Fast Cure Epoxy, or equal.

b. Topcoat: High Solids Polyurethane, gloss or semi gloss.

1) Sherwin Williams Acrolon 7300 or equal. , or equal.

END OF SECTION

SECTION 10 56 00

STORAGE ASSEMBLIES

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Equipment items as listed below by Equipment Mark Number:

1. CABINET, FLAMMABLE MATERIALS, LARGE
Equipment Mark Number: 1140

2. CABINET, STORAGE, SHOP, 24 INCH
Equipment Mark Number: 1190

3. DESK, STAND-UP
Equipment Mark Number: 1220

4. RACK, TIRE, BUS/TRUCK, 2 TIER
Equipment Mark Number: 1635

B. Installation of equipment with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Utilities to be roughed in at location recommended by manufacturer.

1.02 ALTERNATIVE BIDS

A. Refer to Division 1 - General Requirements for possible effect on Work of this Section.

1.03 QUALITY ASSURANCE

A. Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.

1.04 STANDARD AND REGULATORY REQUIREMENTS

A. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic, fire, and racking codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

1.05 SUBMITTALS

A. Refer to Sheet Q.14 Equipment Schedule for submittal requirements listed in the “Submittals” column of the equipment list. In the event of conflict between Sheet Q.14 Equipment Schedule and the following expanded submittal descriptions, Sheet Q.14 Equipment Schedule is to govern.

B. Product Data:

1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.

2. All Product Data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories will be a cause for rejection.

3. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

C. Operation and Maintenance Manual:

1. Provide a Complete parts list, operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:

a. Description of system and components.

b. Manufacturer's printed operating instructions.

c. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

d. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

2. Assemble and provide copies of manual in 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

D. Shop Drawings: Submit shop drawings in accordance with Division 1 -General Requirements of these specifications. Refer to Sheet Q.14 Equipment Schedule for the equipment mark numbers requiring shop drawings.

1. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for the submitted equipment. The drawings shall further include dimensions from structural elements or architectural grid lines, operational clearances, locations of any utility service connection points, mounting requirements, and structural supports required for the submitted equipment.

E. Required Documents for Permit and Local Jurisdictional Approval: Where required by local jurisdiction and/or code officials, the contractor/supplier shall be responsible for producing and submitting all documentation required for obtaining any and all applicable approvals related to the specified equipment. This documentation may include, but may not be limited to,

engineered signed and stamped plans, details, anchorage layouts for storage equipment, as well as racks to show compliance with locally adopted ASCE, seismic, fire, and other codes. A copy of these required documents shall be included with the product submittal to the architect/consultant team for their review.

1.06 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Manufacturers listed for each equipment item may bid without submittal for that item. Manufacturers not listed shall submit for approval in accordance with "Instructions to Bidders". Prior to procurement, submittals for each equipment item by Mark Number shall be provided in accordance with Division 1 - General Requirements.

1.07 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, function and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to loose, damaged and missing parts and abnormal deterioration of finish.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts shall be readily available locally in the United States.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during shipment and storage in humid, dusty conditions. Equipment shall be stored per manufacturer's recommendation.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Mark Number of this specification.

C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.09 LABELING

A. Manufacturer shall securely attach in a prominent location on each major item of equipment a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (U.L.), or other National Recognized Testing Laboratory (NRTL), in

categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

PART 2 - PRODUCTS

2.01 CABINET, FLAMMABLE MATERIALS, LARGE
Equipment Mark Number: 1140

A. General:

1. Description: An upright cabinet with adjustable interior shelves and closeable, lockable doors and handles, designed for the purpose of storing flammable liquids in containers.

2. Compliance: The storage cabinet shall comply with the latest edition of all applicable local, state, and federal codes, including OSHA safety requirements. The storage cabinet shall also comply with the latest editions of the following:

a. NFPA 30: Flammable and Combustible Liquids Code.

b. NFPA 1: Fire Code.

c. International Fire Code.

d. Self-closing models meet UFC 79.

B. Capacities and Dimensions:

1. Storage capacity: Up to nine each, 5 gallon containers. Supports up to 350 pounds.

2. Overall dimensions, nominal:

a. Width: 43 inches.

b. Depth: 18 inches.

c. Height: 65 inches.

3. Shipping weight, nominal: 342 pounds.

C. Features and Construction:

1. Walls and doors: Construction shall consist of double wall 18 gauge sheet steel with 1-1/2 inch air space between inner and outer walls. Doors shall be self-closing at high ambient temperatures, with a 3 point key lock

2. Containment: Cabinet shall have a 2 inch pan-type bottom, raised leakproof sill.

3. Screened flame arrester vent: Two vents per cabinet, one each at left side bottom and right side top, shall be threaded for and provided with 2 inch NPT steel plugs, fire baffle and cap

4. Adjustment: Leveling feet shall be provided at all four corners.

5. Ground: Electrical grounding attachments shall be provided on each side.

6. Closure: Self-closing door with manual latch with fusible link. The spring-loaded fusible link shall melt should the ambient temperature reach 160 degrees Fahrenheit, which will release the latch holding door open.

7. Shelf: Two each adjustable shelves shall be provided between 5-3/8 inches from top and 7-5/16 inches from bottom on 1/2 inch centers.

D. Finish: Durable enamel in safety yellow with "FLAMMABLE - KEEP FIRE AWAY" in minimum 4 inch bright red letters across doors.

E. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

a. Equipto
225 Main Street
Tatamy, PA 18085
Phone: (800) 323-0801
Fax: (888) 859-2121
Website: www.equipto.com

b. Model: FSC45M

2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

a. Lyon Workspace Products
420 North Main
Montgomery, IL 60538
Phone: (630) 892-8941, (800) 433-8488
Fax: (800) 367-6681
Website: www.lyonworkspace.com

b. Republic Storage Systems Company
1038 Beldon Avenue, Northeast
Canton, OH 44705
Phone: (330) 438-5800, (800) 477-1255
Fax: (330) 454-7772
Website: www.republicstorage.com

2.02 CABINET, STORAGE, SHOP, 24 INCH
Equipment Mark Number: 1190

A. Capacities and Dimensions:

1. Shelving: Full width shelves, five each.

2. Shelf capacity: 200 pounds, minimum.

3. Overall dimensions:

   a. Width: 36 inches.

   b. Depth: 24 inches.

   c. Height: 78 inches.

4. Weight: 180 pounds, nominal.

B. Features and Construction:

1. Shelves: Four box edge half-length shelves of 18 gauge steel construction shall be adjustable on maximum 2 inch centers without removing fasteners.

2. Doors: Three point box edge latching doors of 18 gauge steel construction shall have common locks and two keys for each cabinet. Doors shall open a full 180 degrees and be flush mounted when closed with latching actuated by grip-type satin chrome plated steel handle.

3. Base and Body: Base and Body of the cabinet shall be constructed of a minimum 18 gauge steel. The cabinet shall be pedestal mounted for protection from moisture.

4. Assembly: Back, front, and sides shall be flush with no bolt heads on front or sides.

C. Finish: Durable enamel in Owner's choice of manufacturer's standard colors.

D. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

   a. Equipto
   225 Main Street
   Tatamy, PA 18085
   Phone: (610) 253-2775, (800) 323-0801
   Fax: (610) 675-2869
   Website: www.equipto.com

   b. Model: 1715

2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

   a. Lyon Workspace Products
   420 North Main
   Montgomery, IL 60538
   Phone: (630) 892-8941, (800) 433-8488

Fax: (800) 367-6681
Website: www.lyonworkspace.com

b. Republic Storage Systems Company
1038 Beldon Avenue, Northeast
Canton, OH 44705
Phone: (330) 438-5800, (800) 477-1255
Fax: (330) 454-7772
Website: www.republicstorage.com

2.03 DESK, STAND-UP
Equipment Mark Number: 1220

A. General:

1. Description: An upright industrial shop desk of steel construction with sloped writing surface top with paper holder shelf above and sliding shelf and lockabale cabinet compartment below.

B. Capacities and Dimensions:

1. Overall desk dimensions, nominal:

a. Width: 36 inches.

b. Depth: 28 inches.

c. Height: 54 inches.

2. Writing surface front edge height, nominal: 42 inches.

3. Shelf dimensions:

a. Width: 34 inches.

b. Depth: 28 inches.

4. Shelf capacity: 1900 pounds

5. Weight, nominal: 364 pounds.

C. Features and Construction:

1. Overall steel construction to be 12 gauge or better, with edges properly finished to prevent injury.

2. Desk to be supported by 7 gauge legs featuring floor anchoring plates, standing at 6 inches tall to allow for forklift transportation.

3. Cabinet area beneath drawer to have bottom, intermediate shelf, and two doors, one having a plated handle and built-in three point locking device.

4. Cabinet doors to be supported by 8 gauge leaf hinges with stainless steel hinge pins

5. Writing surface to be sloped slightly to front with pencil and paper shelf mounted along and above back edge. Surface shall slope no more than 2 inches from back to front.

D. Finish: Durable enamel in manufacturer's standard color.

E. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

a. Strong Hold
P. O. Box 9043
Louisville, KY 40209
Phone: 800-880-2625
Fax: 502-363-3827
Website: www.strong-hold.com

b. Model: 34-SD-282

2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

a. Republic Storage Systems Company
1038 Belden Avenue, Northeast
Canton, OH 44705
Phone: (330) 438-5800, (800) 477-1255
Fax: (330) 454-7772
Website: www.republicstorage.com

b. Global Equipment Company, Inc.
2505 Mill Center Parkway, Suite 100
Buford, GA 30518
Phone: (770) 822-5600, (888) 978-7759
Fax: (800) 336-3818
Website: www.globalindustrial.com

2.04 RACK, TIRE, BUS/TRUCK, 2 TIER
Equipment Mark Number: 1635

A. General:

1. Description: An adjustable, sectional pallet type rack designed for the storage of materials between two horizontal bars. The rack consists of free standing vertical upright metal members, each one supported by two footings. Each vertical support is connected together by horizontal support bracing at the front and back, and strengthened by diagonal supports at the back. The horizontal support bracings shall also support bus and truck sized tires.

2. Compliance: The rack shall comply with all applicable local, state, and federal codes, including all OSHA requirements. The rack shall also comply with the following:

   a. RMI (Rack Manufacturer Institute) / ANSI (American National Standards Institute) MH16.1 Specification for the Design, Testing and Utilization of Industrial Steel Storage Racks.

   b. For seismic loading, the rack shall comply with the aforementioned RMI / ANSI MH16.1 Specification or with local building and structural seismic codes, whichever is greater.

B. Capacities and Dimensions:

1. Rack storage capacity: 16 tires minimum, type B305/85R22.5 or smaller, stored vertically in a 'side by side' arrangement on each level of the rack.

2. Uprights:

   a. Capacity: Weight: 20,000 pounds, minimum

   b. Dimensions:

      1) Thickness: 3 inches, nominal.

      2) Depth: 30 inches, nominal.

      3) Height: 96 inches, nominal.

3. Beams:

   a. Minimum capacity: 5,000 pounds per pair of beams, minimum.

   b. Dimensions:

      1) Length (Span): 96 inches, nominal.

      2) Height: 4-1/2 inches, nominal.

      3) Thickness: 2-3/4 inches, nominal.

   c. Installed beam height from finished floor (Verify beam heights with Owner prior to installation):

      1) Top beams: 60 inches, nominal.

      2) Second beams: 12 inches, nominal.

4. Overall dimensions:

   a. Width: 100-1/2 inches, nominal.

   b. Depth: 30 inches, nominal.

c. Height: 96 inches, nominal.

C. Features and Construction:

1. Uprights:

a. Construction: Upright frames shall be continuously arc welded, heavy gauge steel box section uprights with deep channel cross and diagonal members.

b. Adjustment: Tapered keyhole slots shall be punched on 2 inch centers on both sides for vertical beam adjustments.

c. Base plate: Heavy gauge steel plates with holes for anchoring to floor shall be arc welded to uprights.

2. Beams:

a. Construction: Beams shall be welded, step-type heavy gauge steel box channel.

b. Attachment: Three high tensile studs shall be provided on each end to engage tapered keyhole slots in uprights, locking flush by means of spring loaded lock snaps.

D. Finish: Durable enamel in Owner's choice of manufacturer's standard colors.

E. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

a. Lyon Workspace Products
420 North Main
Montgomery, IL 60538
Phone: (630) 892-8941, (800) 433-8488
Fax: (630) 892-8966 , (800) 367-6681
Website: www.lyonworkspace.com

b. Model: U3609630 Frames, and B6418096 Beams.

2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

a. Republic Storage Systems Company
1038 Beldon Avenue, Northeast
Canton, OH 44705
Phone: (330) 438-5800, (800) 477-1255
Fax: (330) 454-7772
Website: www.republicstorage.com

b. Edsal Manufacturing Company
4400 South Packers Avenue
Chicago, IL 60609
Phone: (773) 254-0600
Fax: (773) 254-1303
Website: www.edsal.com

PART 3 - EXECUTION

3.01 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match and/or non-interference with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all items.

3.02 INSTALLATION

A. Perform work under direct supervision of Foreman or Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect.

B. Install equipment in accordance with plans, shop drawings, and manufacturer's instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level, plumb and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

3. Anchorage: Attach equipment securely to floor, per manufacturer's instructions and as directed by Architect, to prevent damage resulting from inadequate fastening. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

a. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 TESTING

A. After final installation is complete and prior to authorizing payment, specified equipment shall be checked for compliance with specifications in the presence of the Architect using acceptance procedures provided by the manufacturer.

3.04 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing or installation debris from job site.

D. Notify Architect for acceptance inspection.

3.05 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.

1. CABINET, FLAMMABLE MATERIALS, LARGE
   Equipment Mark Number: 1140
   Hours Required: X

2. CABINET, STORAGE, SHOP, 24 INCH
   Equipment Mark Number: 1190
   Hours Required: X

3. DESK, STAND-UP
   Equipment Mark Number: 1220
   Hours Required: X

4. RACK, TIRE, BUS/TRUCK, 2 TIER
   Equipment Mark Number: 1635
   Hours Required: X

B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION 10 56 00

SECTION 11 05 11

REQUIREMENTS FOR OWNER FURNISHED CONTRACTOR INSTALLED BUS CHARGING EQUIPMENT

PART 1 - GENERAL

The provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Owner Furnished / Contractor Installed (OF/CI) equipment items listed below by Equipment Mark Number:

1. CHARGING CABINET, BATTERY ELECTRIC BUS, 180kW DC POWER
   Equipment Mark Number 8012

2. CHARGING PANTOGRAPH, INVERTED, FACILITY MOUNTED
   Equipment Mark Number 8020

3. BATTERY ELECTRIC BUS CHARGER MANAGEMENT SYSTEM
   Equipment Mark Number 8030

B. Receiving and accepting into possession, relocation/transportation, packing and/or unpacking of the Owner Furnished Equipment indicated above and on the Equipment List in the Drawings.

C. Temporary storage of Owner Furnished Equipment (as needed) in accordance with manufacturer's written instructions, recommendations, and warranties.

D. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, repairs, and incidentals necessary for complete and operational equipment installation.

E. Piping, conduit, wiring, and switching between equipment and utilities.

F. All coordination and scheduling of examination, relocation, installation, and testing of all delineated existing equipment to be relocated as shown in the Equipment Schedule shall be the responsibility of the Contractor.

G. Contractor shall be responsible for repair and/or replacement of all OF/CI equipment during the contractor's period of possession. Decision for repair or replacement of OF/CI equipment shall be by the Owner.

1.02 COORDINATION

A. Contractor shall coordinate OF/CI equipment with Equipment Manufacturer's Representatives.

1. Installation: Coordinate with OF/CI equipment manufacturer's representatives during installation and initial start-up. As needed, request meetings, installation information, and other manufacturer's recommendations from the OF/CI equipment manufacturer's representative. Copy Owner on all requests.

a. For connected OF/CI equipment, coordinate installation with each manufacturer's representative. Schedule meetings with multiple manufacturer's representatives present, as needed, to resolve installation issues.

2. Training: Coordinate and schedule with Owner and OF/CI equipment manufacturer's representatives all training associated with OF/CI equipment. As Owner permits, schedule and conduct all training on-site after successful equipment installation and testing.

a. Coordinate training of connected OF/CI equipment on the same day or within the same week, when possible.

3. Testing: Coordinate, schedule, and perform start up and testing of all OF/CI equipment with Owner and OF/CI equipment manufacturer's representatives.

a. For connected OF/CI equipment, collect and coordinate Manufacturer's recommended testing procedures so that the equipment can be tested both individually and together as a connected system.

b. For OF/CI equipment that involves Owner Vehicles, coordinate and schedule with the Owner use of a vehicle and vehicle operator personnel to perform testing of the OF/CI equipment.

1.03 SUBMITTALS

A. Refer to Sheet Q.1 Equipment Schedule for submittal requirements listed in the "Submittals" column of the equipment list. In the event of conflict between Sheet Q.1 Equipment Schedule and the following expanded submittal descriptions, Section Sheet Q.1 Equipment Schedule is to govern.

B. Test Reports:

1. Prior to start-up and testing, provide OF/CI manufacturer's recommended start up and testing procedures in checklist form for individual testing of OF/CI equipment.

2. Prior to start-up and testing, develop and submit a comprehensive system testing plan based on OF/CI manufacturer's recommendations that include testing of all connected OF/CI equipment items as a single system.

3. Submit for Owner and Engineer's review. Revise as necessary based on Owner and Engineer's review and comment.

4. At a minimum, each test report shall contain the name of the equipment / system being tested, date of testing, attendees, start-up and testing checklist(s), observations and identified issues, next steps and/or course of corrective action.

5. Upon completion of each start-up and test, submit a completed test report for Owner and Engineer's record.

6. Refer to Part 3 of this specification section for additional information on start up and testing.

C. Training: Provide manufacturer's training information in digital format for each OF/CI Equipment Item. Refer to Part 3 of this specification section for additional information on Training.

PART 2 - PRODUCTS

Owner Furnished Contractor Installed (OF/CI) Equipment items are listed in the Equipment List shown in the Drawings and are identified by Equipment Mark Numbers and shall be located/installed as shown on the Drawings and per equipment manufacturer's installation instructions.

PART 3 - EXECUTION

3.01 GENERAL

A. Scheduling: The Contractor shall prepare for approval a schedule indicating dates for accepting into possession each item of OF/CI equipment and the dates the OF/CI equipment will be relocated, installed, and ready for operation.

B. Manufacturer's Documentation: The Contractor shall request from the Owner all manufacturer's written instructions recommendations and warranties related to the OF/CI equipment, storage of the equipment, installation of the equipment, commissioning and/or testing of the equipment, and start-up of the equipment prior to accepting possession. The Contractor shall review be responsible for complying with the manufacturer's written instructions, recommendations, and warranties to the OF/CI equipment during the entirety of the Contractor's period of possession.

C. Receipt / Manifest: The Contractor shall provide the Owner with a written receipt and/or manifest detailing type and quantity of each OF/CI Equipment item. The receipt / manifest shall include readily identifiable name for the item, quantity of each item, and date the item is taken into contractor's possession. The receipt / manifest shall be signed and dated by both the Contractor and the Owner when the OF/CI equipment is taken into possession by the Contractor.

3.02 PREPARATION AND RELOCATION

A. Equipment Examination: Before each OF/CI equipment item is removed from the existing locations, it shall be examined in the presence of the Owner, and any damage shall be recorded. Contractor shall submit a written report noting the condition of all equipment. The report shall be signed and dated by both the Contractor and the Owner. No damaged items shall be removed unless written approval is provided by the Owner. All additional damage shall be the responsibility of the Contractor, and affected parts shall be repaired or replaced.

B. Packing and/or unpacking: Contractor shall review the OF/CI equipment to determine what packing and/or unpacking is reasonably required upon and during accepting it into possession. The Contractor shall provide any necessary packing materials and labor as well as provide any unpacking labor. The Contractor shall properly dispose of packing materials in their own disposal containers for their haul off.

C. Contractor shall be responsible for any equipment and/or vehicles required for moving and relocating OF/CI equipment from Owner's storage facility.

D. When moving equipment, Contractor shall be responsible for removing bolts or fastening devices and disconnecting from existing utilities if needed and as required.

3.03 INSTALLATION

A. Installation Coordination: Contractor shall coordinate installation of all OF/CI equipment with required utility connections, spatial needs, and structural connections prior to installation. Contractor shall follow manufacturer's written instructions for installation and final connection of utilities.

B. Contractor shall provide all miscellaneous hardware and material required for final installation.

C. Perform work under direct supervision of Foreman or Construction Superintendent with authority to coordinate installation of scheduled OF/CI equipment.

D. Install equipment in accordance with plans, shop drawings and manufacturer's instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level, plumb and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

3. Anchorage: Attach equipment securely to floor/foundation, per Construction Documents and Manufacturer's written instructions, to prevent damage resulting from inadequate fastening. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

4. All final utility connections shall be made by the Contractor's qualified personnel or their designated sub-contractor's qualified personnel, and shall be performed in compliance with state and local codes and ordinances and per manufacturer's written instructions.

5. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.04 EQUIPMENT STARTUP

A. Follow all manufacturer's recommended instructions and procedures for individual start up of equipment.

3.05 EQUIPMENT TESTING

A. All, specified equipment shall be tested for compliance with specification in the presence of the Engineer and the Owner using acceptance procedures provided by the manufacturer.

B. Final testing and post installation inspection are required and shall be performed by the manufacturer or the manufacturer's designated representative only. Final testing and inspection shall not be performed by the installer unless the installer is also the manufacturer.

C. Coordinate with the Owner for availability of vehicles and vehicle operator personnel for the purposes of testing equipment. Coordinate testing dates times with the Owner for availability of buses, bus operator(s), and Owner witnesses.

D. Field Testing

1. Field testing shall be performed upon installation at the site to validate each unit operational performance and functionality prior to full energization. The test shall include the following:

   a. Insulation Resistance testing for AC and DC power conductors

   b. Point to point continuity testing between, charger, control module and pantograph

   c. Control systems operational testing (normal and failure mode)

   d. Safety Testing (interlocks)

   e. Rated output tests

   f. Compatible EV field test vehicles as provided by the Owner.

E. Systems testing shall consist of the following:

1. Systems testing shall be performed for each unit after field testing is completed to validate functionality requirements using Owner provided BEBs in coordination with the Charger Management System (CMS) to validate the functionality of the equipment.

2. Prior to testing provide a Systems Testing Plan that includes:

   a. Testing sequential and concurrent charging capabilities.

      1) Validation of charging ratios

   b. Testing local emergency E-Stop

   c. Testing CMS E-stop

   d. Testing Local annunciation

   e. Testing Failure Mode

      1) Regression type testing

   f. Testing data transfer with CMS host provider and bus telematics

   g. Testing Communication and visual charger status indicator lighting

   h. Testing at different times of day and with differing bus starting states of charge, and with either no, or one other bus hooked up to the same charger on another dispenser,

   i. Testing with manual interruption at each spot (each e-stop, CMS e-stop, from the bus itself) and with a pantograph redeployment after the interruption.

F. Manufacturer / Installer shall submit all testing plans and testing schedule for approval 60 days prior to testing. Testing procedures and checklists shall be developed that indicates proper testing of all major functions of the equipment. This procedure and checklist will form the basis of the testing process.

G. Testing shall be witnessed by the Owner or its representatives and shall include signature sign-off that the test were performed in the presence of the Owner's representative.

3.06 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing or installation debris from job site.

D. Notify Owner and Owner's Representative for acceptance inspection.

3.07 TRAINING

A. As specified above, direct the technical representative to provide specified hours of training to Owner's maintenance personnel in operation and maintenance of the following equipment.

1. CHARGING CABINET, BATTERY ELECTRIC BUS, 180kW DC POWER
   Equipment Mark Number 8012
   Hours Required: 8

2. CHARGING PANTOGRAPH, INVERTED, FACILITY MOUNTED
   Equipment Mark Number 8020
   Hours Required: 8

3. BATTERY ELECTRIC BUS CHARGER MANAGEMENT SYSTEM
   Equipment Mark Number 8030
   Hours Required: 8

B. Obtain, from technical representative, a list of Owner's personnel to be trained in the equipment operations and maintenance.

C. Provide a Windows compatible movie file format recording on USB stick of the training session. The training movie can be a recording of a live session or a produced training video

END OF SECTION

SECTION 11 96 00

GENERAL SHOP EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Equipment items as listed below by Equipment Mark Number:

1. CHARGER, BATTERY, FIXED
Equipment Mark Number: 2125

2. VISE, COMBINATION, SWIVEL BASE, 6 INCH
Equipment Mark Number: 2835

3. CART, BATTERY LIFT
Equipment Mark Number: 5015

4. PALLET, CONTAINMENT, HAZARDOUS MATERIALS
Equipment Mark Number: 5785

5. DE-IONIZER, BATTERY WATER
Equipment Mark Number: 9280

B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Piping, wiring, and switching between equipment and utilities.

1.02 ALTERNATIVE BIDS

A. Refer to Division 1 - General Requirements for possible effect on Work of this Section.

1.03 QUALITY ASSURANCE

A. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.

B. Manufacturer's Representative:

1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out and start up.

2. Training: Provide technical representative to train Owner's maintenance personnel in operation and maintenance of specified equipment.

1.04 STANDARD AND REGULATORY REQUIREMENTS

A. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic, fire, and racking codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

B. Permitting: Any individual equipment permits required by the local authority having jurisdiction (AHJ) shall be responsibility of the Contractor. The contractor shall obtain all necessary information, provide all necessary documents, and submit for any and all individual equipment permit as required by the AHJ. Individual equipment permits shall include, but not necessarily be limited to, any deferred equipment submittals, seismic permitting, fire marshal approvals, and equipment installation/start-up permitting.

1.05 SUBMITTALS

A. Refer to Sheet Q.14 Equipment Schedule for submittal requirements listed in the “Submittals” column of the equipment list. In the event of conflict between Sheet Q.14 Equipment Schedule and the following expanded submittal descriptions, Section Sheet Q.14 Equipment Schedule is to govern.

B. Product Data:

1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.

2. All Product Data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories will be a cause for rejection.

3. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

C. Operation and Maintenance Manual:

1. Provide a Complete parts list, operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:

a. Description of system and components.

b. Schematic diagrams of electrical, plumbing and compressed air systems.

c. Manufacturer's printed operating instructions.

d. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

e. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

2. Assemble and provide copies of manual in 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

D. Submit Shop Drawings in accordance with Division 1 -General Requirements of these specifications. Refer to Sheet Q.14 Equipment Schedule for the equipment mark numbers requiring shop drawings.

1. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for the submitted equipment. The drawings shall further include dimensions from structural elements or architectural grid lines, operational clearances, locations of any utility service connection points, mounting requirements, and structural supports required for the submitted equipment.

E. Required Documents for Permit and Local Jurisdictional Approval: Where required by local jurisdiction and/or code officials, the contractor/supplier shall be responsible for producing and submitting all documentation required for obtaining any and all applicable approvals related to the specified equipment. This documentation may include, but may not be limited to, engineered signed and stamped plans, details, anchorage layouts, as well as other documents to show compliance with locally adopted codes. A copy of these required documents shall be included with the product submittal to the architect/consultant team for their review.

1.06 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Manufacturers listed for each equipment item may bid without submittal for that item. Manufacturers not listed shall submit for approval in accordance with "Instructions to Bidders". Prior to procurement, submittals for each equipment item by Mark Number shall be provided in accordance with Division 1 - General Requirements.

1.07 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, function and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to noisy, rough, or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

E. All parts shall be readily available locally in the United States.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during shipment and storage in humid, dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Mark Number of this specification.

C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.09 LABELING

A. Manufacturer shall securely attach in a prominent location on each major item of equipment a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (U.L.), or other National Recognized Testing Laboratory (NRTL), in categories for which standards have been set by that agency and labeled as such in the manufacturer's plans

PART 2 - PRODUCTS

2.01 CHARGER, BATTERY, FIXED
Equipment Mark Number: 2125

A. Capacities and Dimensions:

1. DC output rating: 15 VDC, 30 amps.

2. Charging capacity: 1 to 10, 12 VDC batteries.

3. Charge rates: 16 rates

4. Cabinet Dimensions:

a. Height: 16 inches.

b. Width: 19 inches.

c. Depth: 16 inches.

d. Shipping weight: 64 pounds with accessories.

B. Features and Construction:

1. Cabinet: Charger shall be enclosed in bonderized steel with reinforced frame, suitable for wall mounting.

2. Meters:

   a. Volt meter range: 11 to 17 VDC.

   b. Amp meter range: 0 to 10 amps.

3. Current limiting: Automatic AC line shall have compensation and overload protection.

4. Rectifiers: Hermetically sealed silicone diode shall have full wave rectifiers.

5. Safety features: Safety features shall include automatic surge protection, load and DC voltage regulation.

6. Charging rate controls: The unit shall be equipped with fine and coarse controls.

C. Accessories:

1. Bus bar set: Wood backboard assembly complete with connecting cables, insulated clamp storage bar and 10 pairs of 300 amp rated charging leads premounted at bus bar end with vinyl insulated clamps on other end. Associated No. 6075, quantity one each.

D. Utilities Available: 120 VAC, 10 amps.

E. Finish: Durable enamel in manufacturer's standard color.

F. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

   a. Associated Equipment Corporation
   5043 Farlin Avenue
   St. Louis, MO 63115
   Telephone: (314) 385-5178, (800) 949-1472
   Fax: (314) 385-3254
   Website: www.associatedequip.com

   b. Model: 6065 with Accessories

2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

   a. Christie Automotive Products
   2851 McGaw Avenue
   Irvine, CA 92614
   Telephone: (949) 553-1003, (800) 365-1003
   Fax: (949) 553-2003
   Website: www.christieautomotive.com

a. Clore Automotive
8735 Rosehill Road, Suite 220
Lenexa, KS 66224
Telephone: (800) 328-2921, (913)310-1050
Fax: (913) 310-1075
Website: www.cloreautomotive.com

2.02 VISE, COMBINATION, SWIVEL BASE, 6 INCH
Equipment Mark Number: 2835

A. Capacities and Dimensions:

1. Jaw width: 6 inches.

2. Opening capacity: 5.7 inches.

3. Throat depth: 4.1 inches.

4. Pipe capacity: 1/4 to 3-1/2 inches.

5. Overall dimensions, nominal:

a. Length: 16 inches.

b. Width: 10 inches.

c. Height: 10 inches.

6. Weight, nominal: 61 pounds.

B. Features and Construction:

1. Slide bar: Machined steel slide bar with oil port shall operate in machined channel.

2. Base: 360 degree swivel base shall include locking device.

3. Construction: Cast iron body.

4. Jaws: Include one set of each main and pipe jaw facings. Main jaw and pipe jaw facings shall be replaceable.

5. Wear compensation: Adjustable collar shall eliminate handle slack.

C. Finish: Durable enamel in manufacturer's standard color.

D. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

a. Reed Manufacturing Company
1425 West 8th Street
Erie, PA 16502
Phone: (814) 452-3691, (800) 456 1697
Fax: (814) 455-1697, (800) 456-1697
Website: www.reedmfgco.com

b. Model: 01389-706

2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

a. Ridge Tool Company
400 Clark Street
Elyria, OH 44036
Phone: (800) 474-3443
Website: www.ridgid.com

b. Yost Vises
388 West 24th Street
Holland, MI 49423
Phone: (616) 396-2063
Fax: (616) 396-8276
Website: www.yostvises.com

2.03 CART, BATTERY LIFT
Equipment Mark Number: 5015

A. Capacities and Dimensions:

1. Load capacity: 750 pounds.

2. Lowered height: 5-3/4 inches.

3. Lift: 54 inches.

4. Platform dimensions:

a. Width: 22 inches.

b. Depth: 30 inches.

5. Overall dimensions:

a. Width: 30 inches.

b. Depth: 32 inches.

c. Height: 60-1/2 inches.

6. Weight: 172 pounds.

7. Wheel dimensions:

   a. Width: 2 inches.

   b. Diameter: 8 inches.

B. Features and Construction:

1. Construction: Steel frame and braces shall be welded construction.

2. Table adjustments: Foot operated hydraulic pump shall raise and lower table. Hydraulic pump shall have valve for selection of RAISE or LOWER mode.

3. Wheels: Rubber tread rear tires shall be mounted on metal wheels with roller bearing hubs. Front lower truck frame shall be equipped with two casters for positioning of vehicle.

C. Finish: Durable enamel in manufacturer's standard color.

D. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

   a. Wesco Industrial Products, LLC
   1250 Welsh Road
   Lansdale, PA 19446
   Phone: (215) 699-7031, (800) 445-5681
   Fax: (215) 699-3836
   Website: www.wescomfg.com

   b. Model: DPL-54-2230, Part No. 260010

2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

   a. T & S Equipment Company
   901 Growth Parkway
   Angola, IN 46703
   Phone: (260) 665-9521, (800) 348-0860
   Fax: (260) 665-1339
   Website: www.tseq.com

   b. Global Industrial Equipment
   2505 Mill Center Parkway, Suite 100
   Buford, GA 30518
   Phone: (770) 995-0007, (888) 978-7759
   Fax: (800) 336-3818
   Website: www.globalindustrial.com

2.04 PALLET, CONTAINMENT, HAZARDOUS MATERIALS
Equipment Mark Number: 5785

A. General:

1. Description: A square spill containment pallet composed of fluorinated polyethylene (to resist chlorinated solvents) that includes an integral, fully sealed sump pit located below a support grate. The pallet shall be sized for the storage of up to four, upright, 55 gallon drums and designed to accommodate forklifts for ease of relocation.

2. Compliance: The unit shall comply with all applicable current editions of local, state and federal codes and regulations, including all applicable portions of the following:

a. Container Storage Regulation 40 CFR 264.175 for secondary containment as administered by the EPA.

b. National Pollutant Discharge Elimination System (NPDES) 40 CFR 122.26 for source point pollution prevention into water sources as administered by the EPA.

c. Spill Prevention, Control, and Countermeasures Rule (SPCC) as part of the Clean Water Act as administered by the EPA.

B. Capacity and Dimensions:

1. Load capacity: 6,000 pounds.

2. Containment capacity: 66 gallons, minimum.

3. Storage capacity: 18 square feet or four 55-gallon drums.

4. Overall dimensions:

a. Length: 51 inches.

b. Width: 51 inches.

c. Height: 10 inches.

5. Weight, nominal: 80 pounds.

C. Features and Construction:

1. Pallet Body/Sump: The pallet body/sump shall be of one piece fluorinated polyethylene construction, free of drains, joints, holes, or defects that would allow the passage of fluid to the outside of the pallet.

2. Pallet grating: A removable, non-slip, grate style fluorinated polyethylene pallet floor, either in one piece or in sections, all capable of supporting a total uniform distributed load of 6,000 pounds minimum. Grate openings shall be of sufficient size and spacing to allow spillage to pass through and to be captured in the containment sump.

3. Forklift pockets: Pallet shall be formed with four-way forklift access integral into the body of the pallet to ensure ease of transportation.

D. Finish: Manufacturer's standard color.

E. Manufacturers Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

a. UltraTech International, Inc.
11542 Davis Creek Court
Jacksonville, FL 32256
Phone: (904) 292-9019; (800) 764-9563
Fax: (904) 292-1325
Website: www.spillcontainment.com

b. Model: Ultra-Spill Pallet P4 Fluorinated, part# 1232

2. Other manufacturers: Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers, including the following, may be considered as equal.

a. Chemtech International, Inc.
Westtown Business Center
1568 McDaniel Drive
West Chester, PA 19380
Phone: (888) 709-8070, (610) 566-7177
Fax: (484) 266-7137
Website: www.chemtech-us.com

b. Interstate Products, Inc.
5585 Marquesas Circle Unit 10-C
Sarasota, FL 34233
Phone: (800) 474.7294
Fax: (800) 448.6329
Website: store.interstateproducts.com

2.05 DE-IONIZER, BATTERY WATER
Equipment Mark Number: 9280

A. Capacities and Dimensions:

1. Intermittent flow: 2 GPM.

2. Filter capacity: 600 gallons.

3. Hoses:

a. Input: 3/8 inch by 10 feet long.

b. Output: 3/8 inch by 20 feet long.

B. Overall dimensions:

a. Width: 6 inches.

b. Depth: 6 inches.

c. Height: 44 inches.

d. Weight, nominal: 28 pounds.

C. Features and Construction:

1. Description: De-ionizer shall be a wall-mounted unit capable of processing pressurized domestic water into de-ionized water for use in battery servicing. Unit shall come complete with wall mounting plate, one disposable filter cartridge, purity light, hose hanger, hose quick connects, input/output hoses, and watering gun.

2. Filter: The disposable filter cartridge shall contain beds of cationic and anionic resins that can electrostatically remove dissolved impurities with an output comparable to distilled water.

3. Monitor: The purity light shall be capable of monitoring the conductivity of the output water continuously and signals when filter cartridge has reached the end of its useful life.

D. Accessories:

1. Replacement cartridges, Model PS-600, two each.

2. Battery watering gun: Model GUN-G, one each.

E. Utilities Available:

1. Water: 3/8 inch domestic water supply.

2. Electric: 120 VAC.

F. Manufacturer's Reference:

1. Prime manufacturer: Specifications are based on equipment identified herein by manufacturer's name and model to establish acceptable standards of quality, performance, features, and construction.

a. Philadelphia Scientific
207 Progress Drive
Montgomery, PA 18936
Phone: (215) 616-0390
Fax: (215) 616-0500
Website: www.phlsci.com

b. Model: PS-300 with Accessories

2. Other manufacturers: Above named manufacturer constitutes only known source of equipment specified. Contingent upon compliance with these specifications and documentation requirements set forth in SUBMITTALS, equipment produced by other manufacturers may be considered as equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather.

C. Compare delivered equipment with packing lists and specifications to assure receipt of all items.

3.02 INSTALLATION

A. Perform work under direct supervision of Foreman or Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect.

B. Install equipment in accordance with plans, shop drawings and manufacturer's instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level, plumb and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

3. Anchorage: Attach equipment securely to floor, as directed by Architect, to prevent damage resulting from inadequate fastening. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with all specified features in the presence of the Architect using acceptance procedures provided by the manufacturer.

3.04 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing or installation debris from job site.

D. Notify Architect for acceptance inspection.

3.05 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.

1. CHARGER, BATTERY, FIXED
   Equipment Mark Number: 2125
   Hours Required: X

2. VISE, COMBINATION, SWIVEL BASE, 6 INCH
   Equipment Mark Number: 2835
   Hours Required: X

3. CART, BATTERY LIFT
   Equipment Mark Number: 5015
   Hours Required: X

4. PALLET, CONTAINMENT, HAZARDOUS MATERIALS
   Equipment Mark Number: 5785
   Hours Required: X

5. DE-IONIZER, BATTERY WATER
   Equipment Mark Number: 9280
   Hours Required: X

B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION

SECTION 12 57 83

CUSTOM INDUSTRIAL FURNITURE

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Equipment items as listed below by Equipment Mark Number:

1. WORKBENCH, SEVERE USE
Equipment Mark Number: 1860

2. DROPS, AIR/ELECTRIC, TRAPEZE
Equipment Mark Number: 8190

B. Contractor shall fabricate and provide item per specifications.

C. Contractor shall install equipment with labor, services, and incidentals necessary for complete and operational equipment installation.

1.02 ALTERNATIVE BIDS

A. Refer to Division 1 - General Requirements for possible effect on Work of this Section.

1.03 QUALITY ASSURANCE

A. Experience: Equipment shall be manufactured by a manufacturer of established reputation with a minimum of five years experience performing similar fabrication techniques.

1.04 STANDARD AND REGULATORY REQUIREMENTS

A. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic, fire, and racking codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

1.05 SUBMITTALS

A. Refer to Sheet Q.14 Equipment Schedule for submittal requirements listed in the “Submittals” column of the equipment list. In the event of conflict between Sheet Q.14 Equipment Schedule and the following expanded submittal descriptions, Sheet Q.14 Equipment Schedule is to govern.

B. Submit Shop Drawings in accordance with Division 1 -General Requirements of these specifications. Refer to Sheet Q.14 Equipment Schedule for the equipment mark numbers requiring shop drawings.

1. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for the submitted equipment. The drawings shall further include dimensions from structural elements or architectural grid lines, operational clearances, locations of any utility service connection points, mounting requirements, and structural supports required for the submitted equipment.

1.06 WARRANTY

A. Warrant work specified herein for one year from substantial completion against defects in materials, function and workmanship.

B. Warranty shall include materials and labor necessary to correct defects.

C. Defects shall include, but not be limited to loose, damaged, and missing parts and abnormal deterioration of finish.

D. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment appropriately packaged and/or crated for protection during shipment and storage in humid, dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Mark Number of this specification.

C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

PART 2 - PRODUCTS

2.01 WORKBENCH, SEVERE USE
Equipment Mark Number: 1860

A. Capacities and Dimensions:

1. Capacity: 2,500 pounds.

2. Work surface thickness: 3/8 inch.

3. Overall dimensions:

a. Width: 72 inches.

b. Depth: 32 inches.

c. Height: 34 inches.

B. Features and Construction:

1. Construction:

   a. Legs: Workbench legs shall be fabricated of 3 by 3 by 3/16 inch steel tubing as shown.

   b. Leg braces: Leg braces shall be 3 by 3 by 1/4 inch angle steel with continuous electrical welds to tubing as shown.

   c. Top braces: Top braces shall be 3 by 3 by 1/4 inch angle steel with continuous electrical welds to tubing as shown.

   d. Top: Top shall be 3/8 inch plate steel with 50 percent minimum electrical welds to top braces. Corners of top shall have 2 inch radius as shown for protection of personnel. All edges shall be ground smooth.

   e. Welds: All welds shall conform to American Welding Society standards.

C. Finish: Cover all exposed steel surfaces including both sides of top, braces, and legs with one coat zinc chromate primer and two coats epoxy paint in Owner's choice of colors.

D. Manufacturer's Reference: Fabricated item as shown on Q drawings.

2.02 DROPS, AIR/ELECTRIC, TRAPEZE
Equipment Mark Number: 8190

A. Capacities and Dimensions:

1. Dimensions, frame:

   a. Width: 24 inches.

   b. Depth: 2-1/4 inches.

   c. Height: As shown.

2. Installation height: 78 inches from finish floor to lowest point of assembly, excluding accessories.

B. Features and Construction:

1. Frame: Unit shall be fabricated from 2 by 1 by 1/8 inch rectangular hollow structural steel.

2. Supports: Welded link, 1/4 inch proof coil chain shall be attached to trapeze frame with eyebolts and to overhead structure with appropriate shackles.

3. Welds: Frame welds shall be continuous meeting American Welding Society standards.

4. Electrical:

   a. 120 VAC quadraplex outlet and rigid conduit shall be mounted to frame with U-bolt supports.

b. Connection: Flexible conduit shall be used to connect building and trapeze rigid conduit.

5. Air: Trapeze air piping and principal devices shall be as follows starting at building air piping.

a. Cut-off valve: 3/4 inch, , one each at connection to building air piping.

b. Connection: Flexible air line shall be used to connect building and trapeze piping.

c. Main leg and horizontal manifold: 3/4 inch, black steel pipe.

d. Drain valve: 3/4 inch, , one each at bottom of main leg.

e. Filter/regulator/lubricator: Ingersoll Rand ARO 2000 series Filter, Regulator, and Lubricator (FLR) Combination, model number C38351-810, or approved equal, shall be installed as shown. Together, the FLR Combination shall have the following features:

1) The unit shall have 3/4 inch ports.

2) The unit shall be manual drain type with 3.5 ounce (minimum) metal lubricator bowl, have a sight glass, and have a 5 micron filter.

3) The unit shall be capable of handling an inlet pressure of 250 pounds per square inch (PSI).

4) The unit shall be capable of handling temperatures between 23 and 175 degrees Fahrenheit (F).

5) The unit shall have a 0-140 PSI gauge range.

f. Lubricant oil for Filter/regulator/lubricator: Lubricator shall be filled with oil per manufacturer's recommendations. Oil shall be of a type specifically designed and produced for industrial grade air tool equipment, having an SAE (Society of Automotive Engineers) viscosity grade between 10 and 20, a flashpoint no less than 350 degrees Fahrenheit, and a pour point no higher than -20 degrees Fahrenheit.

g. Quick disconnect couplings: 3/8 inch female quick disconnect coupling, and 1/2 inch female quick disconnect coupling, - shall be installed as shown with elbows as needed for couplings to point downward.

6. Bracing: Piping shall be substantially bracketed to frame including inlet and outlet piping from air filter/lubricator/regulator assembly.

7. Miscellaneous: All materials, fittings, and connectors as required for a complete and operable installation shall be provided by Contractor.

8. ***Data: Terminate utility data line to a single gang surface mount data box with Ethernet jacks and coverplate.***

9. Data box: Surface mount design. Fasten to trapeze frame with screw fasteners. Box shall be capable of securely holding two 8P8C (RJ45) data jacks and compatible cover plate. Box shall be constructed of high-impact, fire retardant plastic, rated/listed by a Nationally Recognized Testing Laboratory (NRTL) to meet UL94V-O standards. Provide gray color.

10. Jacks: Terminate utility data lines with 8P8C (RJ45) CAT 6 Ethernet jack securely mounted within the box. Jacks shall meet be rated/listed by NRTL to meet all ANSI/TIA-568 Specifications for CAT 6 Ethernet. Install per manufacturer's recommendations and industry standards.

11. Coverplate: Provide and install NEMA style single gang box coverplate with two angled, recessed data outlets. Coverplate shall be 304 stainless steel construction, and shall be compatible with data box dimensions and screw hole pattern.

C. Utilities Available:

1. Electrical: 120 VAC, 20 A.

2. Compressed air: 3/4 inch, 150 to 250 PSI.

3. ***Data: 8P8C (RJ45) CAT 6 Ethernet, two connections***

D. Finish: Cover frame with epoxy compatible zinc chromate primer and finish coat of safety yellow epoxy enamel.

E. Manufacturers Reference: Fabricated item as shown on EQ drawings.

PART 3 - EXECUTION

3.01 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match and/or non-interference with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all items.

3.02 INSTALLATION

A. Perform work under direct supervision of Foreman or Construction Superintendent with authority to coordinate installation of scheduled equipment with Architect.

B. Install equipment in accordance with plans, shop drawings and manufacturer's instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level, plumb and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

3. Anchorage: Attach equipment securely to floor, as directed by Architect, to prevent damage resulting from inadequate fastening. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.03 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with specifications in the presence of the Architect using acceptance procedures provided by the manufacturer.

3.04 CLEANUP

A. Touch-up damage to finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing or installation debris from job site.

D. Notify Architect for acceptance inspection.

END OF SECTION 12 57 83

SECTION 13 34 19

PRE-ENGINEERED METAL BUILDING SYSTEMS

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.01 WORK INCLUDED

A. Design, provision, and installation for the pre-engineered metal building system, consisting of the following major component categories:

1. Structural and steel framing components.

2. Metal roof panels and trim.

3. Metal wall panels and trim.

4. Metal building doors and openings.

5. Metal building accessories.

B. Design, provision, and installation for the concrete slab and sub surface foundation for the pre-engineered metal building system.

C. Design, provision, and installation for the electrical system for the pre-engineered metal building system, consisting of the following major component categories:

1. Electrical subpanel(s)

2. Lighting

3. Electrical cabling, wiring, conduits, and outlets.

4. Lightning Protection

D. Design, provision, and installation for the mechanical ventilation system for the pre-engineered metal building system.

E. Design, provision, and installation of waterproofing and flashing at connections with existing building.

F. Design, provision, and installation of galvanized chain link fence and fenceposts protection.

G. Portions of the Work indicated in this specification section are further defined in other Specification Sections. Refer to sub-section 1.02 Related Requirements of this Specification Section for additional information.

H. Portions of the Work indicated in this specification section are further defined in the Drawings. Refer to Drawings for additional information.

I. Design and provide building and building components in accordance with applicable codes, including seismic requirements.

J. All labor, services, and incidentals necessary for complete and properly operational pre-engineered metal building system installation.

1.02 RELATED REQUIREMENTS

A. For Work indicated under 1.01 of this Specification Section and further addressed in other Specification Sections:

1. Design, provision, and installation for the concrete slab and sub surface foundation for the pre-engineered metal building system shall conform to the following Specification Sections:

a. 03 10 00 - Concrete Forming and Accessories

b. 03 20 00 – Concrete Reinforcing

c. 03 30 00 – Cast-In-Place Concrete

d. 05 12 00 – Structural Steel Framing

e. 31 63 29 – Drilled Concrete Piers and Shafts

2. Design, provision, and installation for the electrical system for the pre-engineered metal building system shall conform to the following Specification Sections:

a. 26 05 05 – General Provisions for Electrical Systems

b. 26 05 19 – Low-Voltage Electrical Power Conductors and Cables

c. 26 05 26 – Grounding and Bonding for Electrical Systems

d. 26 05 29 – Hangers and Supports for Electrical Systems

e. 26 05 33 – Raceways and Boxes for Electrical Systems

f. 26 05 43 – Underground Ducts Raceways for Electrical Systems

g. 26 05 53 – Identification for Electrical Systems

h. 26 24 16 – Panelboards

i. 26 27 26 – Wiring Devices

j. 26 41 13 – Lightning Protection for Structures

k. 26 56 00 – Exterior Lighting

3. Design, provision, and installation for a mechanical ventilation system for the pre-engineered metal building system shall conform to the following Specification Sections:

a. 23 05 00 – Common Work Results for HVAC

b. 23 05 29 – Hangars and Supports for HVAC Piping and Equipment

B. For other Specification Sections generally affecting the Work in this Specification Section, at a minimum, refer to the following:

1. 03 30 00 – Cast-In-Place Concrete

2. 26 05 43 – Underground Ducts raceways for Electrical Systems

3. 26 31 00 – Photovoltaic System

1.03 ALTERNATIVE BIDS

A. Refer to Division 1 - General Requirements for possible effect on Work of this Section.

1.04 DEFINITIONS

A. Pre-Engineered Metal Building System: Use of the phase 'Pre-Engineered Metal Building System' within the Contract Documents shall refer to all systems, components, sub-components, and services indicated under sub-section 1.01 Work Included of this Specification Section.

B. Code: Refers to all applicable codes, amendments, ordinances and regulations. Refer to 1.06 Regulatory Requirements and Permitting for additional information.

C. Manufacturer's Engineer of Record: A professional engineer registered to practice with in the State of California and employed by the pre-engineered metal building system manufacturer / installer, responsible for design of the specified pre-engineered metal building system and stamping of design drawings and calculations.

1.05 REFERENCE STANDARDS

A. Refer to other Specification Sections for additional reference standards that may affect Work in this section. See 1.02 Related Requirements in this Section for additional information.

B. American Institute of Steel Construction (AISC):

1. AISC 360 - Specification for Structural Steel Buildings.

2. AISC 341 – Seismic Provisions for Structural Steel Buildings.

3. AISC 303 – Code of Standard Practice for Steel Buildings and Bridges.

4. AISC Design Guide 3 – Serviceability for Steel Buildings

C. American Iron and Steel Institute (AISI):

1. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.

D. American Welding Society (AWS):

1. AWS D1.1 / D1.1M – Structural Welding Code – Steel.

2. AWS D1.3 / D1.3M – Structural Welding Code – Sheet Steel.

E. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):

1. ASHRAE 90.1-2022 - Energy Standard for Buildings Except Low-Rise Residential Buildings (I-P Edition).

F. ASTM International (ASTM):

1. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.

2. ASTM C39/C39M – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

3. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

4. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

5. ASTM G 87 – Standard Practice for Conducting Moist SO2 Tests.

6. ASTM E 96 / E 96M – Standard Test Methods for Water Vapor Transmission of Materials.

7. ASTM B 117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.

8. ASTM A123 – Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

9. ASTM A 153 – Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.

10. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across Specimen.

11. ASTM A 325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

12. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

13. ASTM F 436 - Standard Specification for Hardened Steel Washers

14. ASTM A 475 - Standard Specification for Zinc-Coated Steel Wire Strand.

15. ASTM A 500/A 500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

16. ASTM C 518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

17. ASTM D 522 – Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.

18. ASTM D 523 – Standard Test Method for Specular Gloss.

19. ASTM A 529/A 529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.

20. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts.

21. ASTM A 572/A 572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

22. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

23. ASTM A 653 / A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

24. ASTM A 792 / A 792M – Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

25. ASTM A 992/A 992M - Standard Specification for Structural Steel Shapes.

26. ASTM D 968 – Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.

27. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot- Rolled, Carbon, Structural, High-Strength, Low-Alloy and High-Strength Low-Alloy with Improved Formability and Ultra-High Strength

28. ASTM A 1018/A 1018A - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

29. ASTM C 1363 – Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.

30. ASTM E 1592 – Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

31. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.

32. ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.

33. ASTM D 1929 - Standard Test Method for Determining Ignition Temperature of Plastics.

34. ASTM F 1941 - Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))

35. ASTM E 1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

36. ASTM D 2240 - Standard Test Method for Rubber Property—Durometer Hardness.

37. ASTM D 2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

38. ASTM D 2247 – Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.

39. ASTM D 2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

40. ASTM F 3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

41. ASTM D 3361 – Standard Practice for Unfiltered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

42. ASTM D 4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

G. Metal Building Manufacturers Association (MBMA), MBMA Metal Building Systems Manual.

H. Seismic Design Guide for Metal Building Systems.

I. The Society for Protective Coatings (SSPC):

1. SSPC-Paint 15 - Primer for Use Over Hand Cleaned Steel performs to SSPC-Paint 15 standards.

2. SSPC-SP2 – Hand Tool Cleaning.

J. Underwriters Laboratories (UL):

1. UL 580 – Standard for Tests for Uplift Resistance of Roof Assemblies.

2. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.

3. UL-790 - Standard Test Methods for Fire Tests of Roof Coverings.

4. UL-2218 - Impact Resistance of Prepared Roof Covering Materials.

1.06 REGULATORY REQUIREMENTS AND PERMITTING

A. The Pre-engineered metal building system and all included Work shall conform to the most recent edition of all applicable codes and standards. Applicable codes and standards may include, but are not necessarily limited to, those listed immediately below. Contractor shall be responsible for final determination of all applicable codes and standards.

1. California Building Code.

2. California Electrical Code.

3. California Mechanical Code.

4. California Plumbing Code.

5. California Energy Code.

6. California Existing Building Code.

7. California Green Building Standards Code (CALGreen).

8. City of San Diego adoption of the above-mentioned California Codes, as well as all applicable amendments and ordinances.

B. Permitting: Any permits involving Pre-Engineered Metal Building Systems and related items specified herein required by the local authority having jurisdiction (AHJ) shall be responsibility of the Contractor. The contractor shall obtain all necessary information, provide all necessary documents, and submit for all permits as required by the AHJ. Permits shall include, but not necessarily be limited to, any deferred submittals, seismic permitting, fire marshal approvals, and foundation start-up permitting. All permitting and scheduling of permitting shall be coordinated with the Owner.

1.07 ADMINISTRATIVE REQUIREMENTS

A. Convene preinstallation meeting a minimum of two weeks prior to starting installation of subsurface foundation components of the pre-engineered metal building system. Convene a second preinstallation meeting a minimum of two weeks prior to start of vertical erection of pre-engineered metal building system components.

B. Require attendance of parties directly affecting work of this section, including Contractor, Sub-contractor(s), Engineer, installer, and pre-engineered metal building system manufacturer's representative.

C. Review materials, installation, protection, and coordination with other work and existing site conditions.

1.08 DESIGN REQUIREMENTS

A. Design for the pre-engineered metal building system and all components indicated herein shall be performed by the manufacturer of the pre-engineered metal building system in accordance with all building codes applicable to the location in which the building is to be located. Refer to

1.06 Regulatory Requirements and Permitting in this Specification Section for governing codes and responsibility of final determination of applicability of all governing codes and standards.

B. General Design Basis:

1. Use standards, specifications, recommendations, findings, and interpretations of professionally recognized groups as basis for establishing design, drafting, fabrication, and quality criteria, practices, and tolerances for all Work indicated in this Specification Section.

   a. Refer to 1.02 Related Requirements of this Specification Section, and the individual Specification Sections listed therein, for additional Design Requirements related to components of the Work.

2. Design building and structures in accordance with MBMA Practices and Manual including fabrication and erection tolerances, and AISC Code of Standard Practice for Steel Buildings and Bridges.

3. Design structural mill sections and welded plate sections in accordance with AISC 360, ASD Method.

4. Design the lateral force resisting systems and related components for seismic loads in accordance with AISC 341.

5. Design cold-formed steel structural members and panels in accordance with AISI S-100.

6. Design all bolted joints in accordance with RCSC Specification.

7. Refer to Drawings for additional basis of design information and requirements.

C. Specific Design Criteria:

1. Design Loads:

   a. Pre-engineered metal building system supplier / installer shall determine and apply design loads based on and in a method consistent with Code requirements, best engineering practice, using the information contained within the contract documents, and manufacturer's standard design practices.

   b. Design loads include dead loads, roof live loads, wind loads, seismic loads, collateral loads, auxiliary loads, floor live loads and applied or specified loads, as defined by Code and standard engineering practice.

      1) Additional Dead Loads: shall include photovoltaic panels and photovoltaic equipment, as indicated in the Contract Documents.

      2) Collateral Load: in pounds per square foot shall be applied to the entire structure to account for the weight of additional permanent materials other than the building system, such as sprinklers, mechanical systems, electrical systems, hung partitions, and ceilings.

a) This allowance does not include the weight of hung equipment weighing 50 pounds or more.

b) Equipment loads of 50 pounds or more are indicated on the Drawings and the structure shall be strengthened as required.

c) The magnitude and approximate location of concentrated loads greater than 50 pounds are indicated on the Drawings.

3) Load Combinations: Load combinations used to design primary and secondary structural members shall be in accordance with the governing code.

c. Allowable Deflection of Structural Members and Building Components:

1) Maximum deflection of main roof framing members due to total load shall not exceed L/180, or as otherwise shall not exceed what is determined to be allowable per Code.

2) Maximum deflection due to snow loads, wind loads and lateral deflections of roof panels, wall panels, girts, and purlins shall not exceed what is determined to be allowable per Code.

3) Use of composite stiffness for deflection calculations is permitted only when actual calculations for the stiffness are included with the design for the specific project.

4) Calculations for maximum deflections shall be included in the submitted design data.

2. Occupancy Category: S-1 Storage Moderate Hazard (Tire Storage)

3. Insulation requirements for the pre-engineered metal building system shall be provided by the applicable energy code.

4. Climatic Zone: 7

1.09 SUBMITTALS

A. Comply with Division 1 – General Requirements of these specifications.

B. Refer to 1.02 Related Requirements of this Specification Section, and the individual Specification Sections listed therein, for additional submittal requirements related to components of the Work.

1. The submittal requirements listed below supplement, and do not supersede, other submittal requirements listed in the Contract Documents, including related submittal requirements listed in other specification sections.

C. Submittals Due at Time of Bid or Prior:

1. Dealer Certification: Submit certification one week before bid date that the pre-engineered metal building system supplier and metal roof system supplier is a manufacturer's authorized and franchised dealer of the system to be furnished.

    a. Certification shall state date on which authorization was granted.

2. Installer Certification: Submit certification one week before bid date that the pre-engineered metal building system and roof system installer has been regularly engaged in the installation of building systems of the same or equal construction to the system specified.

3. Warranty Documentation: Submit warranties specified herein.

4. Design Certification: Submit written "Certificate of design and manufacturing conformance" prepared and signed by the Manufacturer's Engineer of Record, registered to practice in the State of California verifying that the pre-engineered metal building system design and metal roof system design (including subsurface foundations, concrete slab, panels, clips, support system components, and connections to existing building) will meet indicated loading requirements and codes of authorities having jurisdiction.

    a. Certification shall reference specific dead loads, live loads, snow loads, wind loads/speeds, tributary area load reductions (if applicable), concentrated loads, collateral loads, seismic loads, end-use categories, governing code bodies, including year, and load applications.

    b. Submit certification one week before bid date on the metal building system manufacturer's letterhead.

D. Pre-Construction/Installation Submittals

1. Product Data:

    a. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.

    b. Product Data: Submit pre-engineered metal building system manufacturer's product information, specifications, and installation instructions for building components and accessories.

    c. Warranties: Submit all required Manufacturer's, Installers', and Contractor warranties for the Metal Building System and components indicated in the Work.

2. Shop Drawings:

    a. Sub-Surface Foundation and Slab Drawings: Submit drawings indicating location, size, depth, materials, and details of all sub-surface foundations. Indicate specific conformance with soils / geotechnical reports. Indicate slab dimensions, details, and finishes.

b. Steel Erection Drawings: Submit pre-engineered metal building system manufacturer's erection drawings, including plans, elevations, sections, and details, side wall and endwall elevations, subsurface foundations, concrete slab layout, roof framing, transverse cross-sections, covering and trim details, anchor bolt layouts, connections to existing building, and accessory installation details to clearly indicate proper assembly of building components. Steel Erection Drawings shall be coordinated with Sub-Surface Foundation and Slab Drawings.

c. Structural Design Calculations for both Sub-Surface Foundation / Slab and Steel: sealed and signed by the Manufacturer's Engineer of Record, a professional engineer (or engineers) licensed in the State of California and in accordance with applicable state law.

3. Testing Certifications and Reports:

a. Submit certification verifying that the metal standing seam roof system has been tested and approved by Underwriter's Laboratory as Class 90, having been tested in accordance with U.L. 580 Test Procedure for Uplift Resistance of Roof Assemblies.

b. Submit certification verifying that the metal standing seam roof system has been tested in accordance with ASTM E 1592 test protocols.

c. Provide Material Test Reports for all steel material used in the manufacture of primary and secondary framing members, panels and bolts included in the Work, and when required by ASTM A 6/A 6M.

d. Provide Material Test Reports for all steel material used in the manufacture of primary and secondary framing members, panels and bolts specified in this section and when required by ASTM A 6/A 6M.

e. Provide Material Test Reports for all concrete material used in the construction of the pre-engineered metal building slab and sub-surface structure and when required by ASTM C39.

4. Required Documents for Permit and Local Jurisdictional Approval: Where required by local jurisdiction and/or code officials, the contractor/supplier shall be responsible for producing and submitting all documentation required for obtaining all applicable approvals related to the specified equipment.

a. This documentation may include, but may not be limited to, engineered signed and stamped plans, details, layouts, as well as other documents to show compliance with locally adopted codes.

b. A copy of these required documents shall be sent to the architect/engineer consultant team for their review.

5. Manufacturer Installation Manual: Submit manual indicating preparation instructions and recommendations, storage and handling requirements and recommendations, and installation methods for the pre-engineered metal building system and components.

6. Samples:

   a. Submit color chips to Owner for roof and wall panels showing manufacturer's full range of available colors and patterns for each finish product. Provide copy to architect / engineer consultants.

   b. After Owner's color selection, submit samples to Owner representing actual product, color, and patterns. Provide copy to architect / engineer consultants.

7. Quality Control Submittals:

   a. IAS AC472 Certificate for each facility involved in the design and fabrication of the pre-engineered metal building system.

   b. Certified Erector Certificate issued to the erector by the manufacturer.

E. Post Construction / Closeout Submittals:

1. Operation and Maintenance Manual:

a. Provide complete operating instructions and maintenance manual including, but not necessarily limited to:

1) Description of system and components.

2) Manufacturer's printed operating instructions (as applicable).

3) Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

4) Copies of all warranties.

5) List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source (as applicable).

b. Assemble and provide copies of manual in 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

2. As-built drawings of pre-engineered metal building system and components, as indicated in the Work. As built drawings shall include, at a minimum, the following modifications to the originally submitted shop drawings:

a. Any modifications and/or changes made during permitting and/or construction as a result of changes and modifications required by any AHJ, required by the Owner, required as a matter of coordination, required by responses and answers to RFIs, returned Shop Drawing markups, change orders or revisions, in-field modifications and changes.

b. As-built drawings shall also include project name, north arrow, scale of drawing, location of the pre-engineered metal building system on the overall site and proximity to adjacent buildings structures and large equipment, area of the pre-engineered metal building system in square feet, overall dimensions including eave heights, roof slope.

1.10 QUALITY ASSURANCE

A. Manufacturer’s Qualifications:

1. Manufacturer regularly engaged, for past 10 years, in manufacture of metal building systems of similar type to that specified.

2. Manufacturer shall have in their employ an engineer licensed in the State of California and regularly employed in the structural engineering and design of pre-engineered metal

building systems or similar for the past 10 years and whose responsibilities include the design of the specified pre-engineered metal building system and stamping of design drawings and calculations.

B. Installer's Qualifications:

1. Installer regularly engaged, for past 5 years, in installation of pre-engineered metal building systems of similar type to that specified.

2. Employ persons trained and certified for installation of pre-engineered metal building systems by the pre-engineered metal building system manufacturer.

3. Certificate of design and manufacturing conformance:

a. Pre-engineered metal building system manufacturer shall submit written certification prepared and signed by a Professional Engineer, registered to practice in the State of California verifying that subsurface foundations, concrete slab, building system design and metal roof system design (including panels, clips, and support system components) meet indicated loading requirements and codes of authorities having jurisdiction.

b. Certification shall reference specific dead loads, live loads, snow loads, wind loads/speeds, tributary area load reductions (if applicable), concentrated loads, collateral loads, seismic loads, end-use categories, governing code bodies, including year, and load applications.

c. Certificate shall be on metal building system manufacturer’s letterhead.

d. Refer to Submittals article of this specification section.

C. Material Testing:

1. Provide Material Test Reports for all steel material used in the manufacture of primary and secondary framing members, panels and bolts specified in this section and when required by ASTM A 6/A 6M.

2. Provide Material Test Reports for all concrete material used in the construction of the pre-engineered metal building slab and sub-surface structure and when required by ASTM C39.

3. Refer to 1.02 Related Requirements of this Specification Section, and the individual Specification Sections listed therein, for additional material testing submittal requirements related to components of the Work.

D. Manufacturer's Representative:

1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to installation.

1.11 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Manufacturers not listed shall submit for approval in accordance with "Instructions to Bidders".

1.12 WARRANTY

A. Manufacturer's Materials and Workmanship Warranty: Provide warranty on manufacturer's standard form that indicates manufacturer shall repair and replace metal building systems components due to failure resulting from either materials and/or workmanship for a period of one year, starting from the date of Substantial Completion.

B. Weathertightness Warranty: Provide warranty on manufacturer's standard form, that indicates manufacturer agrees to repair or replace metal building system components that fail to remain weathertight, including leaks, without monetary limitation, for a minimum of 10 years from date of Substantial Completion. Warranty shall be signed by both the metal roof system manufacturer and the metal roof system installer.

C. Panel Finish Warranty: Provide warranty on manufacturer's standard form that indicates Manufacturer agrees to repair or replace metal panels that evidence deterioration of factory-applied finish within the specified number years (below) from date of Substantial Completion, including:

1. Acrylic Coated 'Galvalume': Product will not rupture, fail structurally, or perforate within period of 20 years due to normal atmospheric corrosion.

2. Fluoropolymer Two-Coat System (PVDF):

a. Color fading in excess of 5 Hunter units per ASTM D 2244 for 25 years.

b. Chalking in excess of No. 8 rating per ASTM D 4214 for 25 years.

c. Failure of adhesion, peeling, checking, or cracking for 40 years.

D. Metal building system manufacturer shall provide a written warranty for 25 years against perforation of metal roof panels due to corrosion under normal weather and atmospheric conditions.

1. Warranty shall be signed by metal roof system manufacturer.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling Requirements:

1. Store and handle materials in accordance with manufacturer's instructions.

2. Keep materials in manufacturer's original, unopened containers and packaging until installation.

3. Do not store materials directly on ground.

4. Store materials on flat, level surface, raised above ground, with adequate support to prevent sagging.

5. Protect materials and finish during storage, handling, and installation to prevent damage.

PART 2 - PRODUCTS

2.01 PRE-ENGINEERED METAL BUILDING SYSTEM MANUFACTURERS

A. Empire Steel Buildings. 5230 Carroll Canyon Rd. San Diego, CA 92121. Phone 800.905.3443. Website www.empirebuilt.com.

B. Metallic Building Systems (Cornerstone Building Brands). 7301 Fairview Street, Houston, TX 77041. Phone 866.800.6353. Website www.metallic.com.

C. Butler Manufacturing, P.O. Box 419917 Kansas City, Missouri 64141. Phone 816.968.3000. Website www.butlermfg.com.

2.02 BUILDING DESCRIPTION

A. Single slope building with roof cantilever on a single, long side. Abuts existing building.

B. Building Dimensions: As indicated on the Drawings.

2.03 PRIMARY STRUCTURAL AND FRAMING MEMBERS

A. General: Framing to be single slope clear span rigid frame with cantilever at one side. Primary frame columns and roof beams to be tapered or straight. Bracing to be standard X-bracing unless otherwise required by constraints of the project. Design in accordance with locally adopted building codes and industry standards and best practices.

B. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 75 percent.

C. Hot-rolled shapes: Steel, ASTM A 36 or ASTM A 992, minimum yield of 36 ksi (248 MPa) or 50 ksi (345 MPa).

D. Built-up sections:

1. Design in accordance with AISC Specification for Structural Steel Buildings.

2. Webs:

a. Steel, ASTM A 1011 or ASTM A1018, SS or HSLAS, Grade 55 (380) for webs 3/16 inch (4.76 mm) thick and thinner.

b. Steel, ASTM A 572 Grade 50 (340) or ASTM A572 Grade 55 (380) or ASTM A 529 Grade 55 for webs thicker than 3/16 inch (4.76 mm).

3. Flanges: Steel, ASTM A 529 Grade 55 (380) or ASTM A 572 Grade 50 (340) or 55 (380).

E. Round tube: Steel, ASTM A 500, Grade B or C with minimum yield strength of 42 ksi (290 MPa).

F. Square and rectangular tube: Steel, ASTM A 500, Grade B or C, minimum yield strength of 42 ksi (290 MPa).

G. Cold-formed C sections: Steel, ASTM A 1011, Grade 55 (380), or ASTM A 653, Grade 55 (380). Design in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members

H. X-bracing: Steel, ASTM A 529 or A 572 for rod bracing 36 ksi (248 MPa) or 50 ksi (345 MPa), ASTM A 36 for angle bracing or ASTM A 475 for cable bracing.

I. Finish: Gray Shop Coat. Shop coat only intended to provide temporary protection during transportation and erection.

2.04 SECONDARY STRUCTURAL AND FRAMING MEMBERS

A. Recycled Content: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Roof and wall purlins, girts, and eave struts: Steel, ASTM A 1011 Grade 55 (380), or ASTM A 653, Grade 55 (380).

1. Thickness: 14 gauge: 0.067 inch minimum uncoated thickness.

C. Spandrel Beams: Steel, ASTM A 36/A 36M or ASTM A 992/A 992M wide flange shapes, minimum yield 50 ksi for support of wall systems provided by others, as required by design.

D. Finish: Gray Shop Coat. Shop coat only intended to provide temporary protection during transportation and erection.

2.05 ANCHOR BOLTS AND BOLTS

A. Rigid Frame Connections: Provide High Strength Bolts, Nuts and Washers:

1. Bolts: Steel, ASTM F 3125 Grade A325 Heavy Hex Structural Type I.

2. Washers: ASTM F 436 Type 1 Hardened Steel.

3. Nuts: ASTM A 563 Grade C Heavy Hex. Nuts shall be wax coated by emulsion such that the torque required to complete a Rotational Capacity (RC) test shall be reduced by 40 percent from the un-waxed state.

4. Coating: Hot-Dipped Galvanized per ASTM A153.

B. Other Connections: Provide High Strength or Machine Bolts as required by manufacturer design:

1. High Strength Bolts and Nuts:

a. Bolts: ASTM F 3125 Grade A325 Heavy Hex Structural Type I.

b. Nuts: ASTM A 563 Grade C Heavy Hex.

c. Coating: ASTM F 1941 Electrodeposited Yellow Zinc.

2. Machine Bolts:

a. Bolts: ASTM A 307 Grade Carbon Steel.

b. Nuts: ASTM A 563 Grade A Hex Nut.

c. Coating: ASTM F 1941 Electrodeposited Clear Zinc.

2.06 STANDING SEAM METAL ROOF

A. General: Design of metal building roof and the pre-engineered metal building systems shall be such as to avoid roof penetrations where possible.

1. Where roof penetrations are determined to be necessary, the location of the penetration shall be coordinated to occur in the middle flat portion of a single panel, and not interrupting or near a standing seam joint.

2. Where a roof penetration may span multiple panels, the penetration location shall be coordinated so that edges running parallel to the standing steam panel direction are located in the middle flat portion of individual panels, and not interrupting or near a standing seam joint.

B. Assembly Performance Requirements: Provide roof products and assemblies meeting or exceeding the requirements listed below, or per Code, whichever is the more restrictive requirement.

1. Class 90 rated and listed in accordance with UL-580 for Wind Uplift.

2. Class A rated and listed in accordance with UL-790 for External Fire.

3. Class 4 rated and listed in accordance with UL-2218 for Impact Resistance.

C. Standing Seam Panels:

1. Type: Single skin panels with concealed fastener clips, designed to form 360 degree Pittsburgh seam upon completion of installation.

2. Panel Strength: Determine and certify panel strength as follows:

a. Positive Loading (Toward Panel Supports): Determine in accordance with AISI S100.

b. Negative Loading (Away from Panel Supports): Determine in accordance with ASTM E 1592.

3. Panel profile: Double-Lok:

a. Panel Type: Trapezoidal machine seamed, 1/2:12 minimum roof slope (refer to Drawings)

b. Panel width: 24 inches wide x 3 inches high.

c. Thickness: 24 gauge.

d. Finish: “Galvalume Plus” pre-finished panels consisting of approximately 45 percent zinc and 55 percent aluminum, with a clear acrylic coating.

e. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 1680 at a pressure differential of +/- 1.57 psf.

f. Water Infiltration: No uncontrollable water leakage when tested to ASTM E 1646 at a 20 psf pressure differential when sprayed with 5 gallons of water per hour per square foot of specimen area.

D. Accessories:

1. Pipe flashing (where required).

2. Roof curbs (where required).

a. Finish: Unpainted Galvalume.

3. Roof Vents (where required).

a. Finish: Unpainted Galvalume.

4. Eave trim condition: standard gutters and downspouts.

a. Size of gutter and downspouts, as well as number and placement of downspouts to be determined by pre-engineered metal building manufacturer in accordance with applicable codes.

b. Finish: Color matches wall panels.

5. Thermal breaks: Insulating thermal breaks at roof attachments if and where required by code. Insulating value and/or thermal resistivity per code.

6. Roof and wall flashing between existing building and new pre-manufactured metal building.

7. Flexible expansion joint between existing building and new pre-manufactured metal building.

8. Joint fillers, sealants, backer rods, as required.

2.07 WALL PANELS

A. Assembly Performance Requirements: Provide assemblies that function as exterior walls that meet the following requirements:

1. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 283 at a pressure differential of +/- 1.57 psf (75 Pa).

2. Water Infiltration: No uncontrollable water leakage when tested to ASTM E 331 at a 6.24 psf pressure differential when sprayed with 5 gallons of water per hour per square foot of specimen area.

B. Through-Fastened Panels:

1. Panel type: Single skin ribbed panels with exposed fasteners.

2. Panel strength: Determine in accordance with AISI S100.

3. Panel type: Steel, ASTM A892, “PBR” profile 12 inch x 1 inch with 1-1/4 inch ribs x 12 inch centers, 24 gauge thickness.

4. Exterior finish: Polyvinylidene fluoride (PVDF) resin finish, Kynar 500, Hylar 5000, or equal.

5. Interior finish: 0.5 mil total dry film thickness consisting of primer coat and wash coat of manufacturer's standard light-colored acrylic or polyester backer finish.

6. Color: Selected from manufacturer standard colors.

7. Panel fasteners: Stainless steel, self-drilling with sealing washer.

8. Sealants and closures:

a. Side-laps: Factory applied, hot melt, foam-able mastic.

b. End-laps: Field-applied non-skinning sealant.

9. Flexible expansion joint between existing building and new pre-manufactured metal building.

2.08 DOORS AND LOUVERS

A. Personnel Doors:

1. Size: 3 feet by 7 feet for single doors, 6 feet by 7 feet for double doors (consisting of two 3 feet by 7 feet doors), or as otherwise indicated on Drawings.

2. Elevation: As indicated on Drawings.

3. Type: Insulated.

4. Hardware:

   a. Cylindrical lockset.

   b. Exit device, as required by code.

   c. Weather stripping and threshold.

   d. Closers.

   e. Kick plate.

   f. Latch guard.

   g. Chain stops.

5. Frame type: Hollow metal framed openings.

6. Door assembly: 'Knocked down' for field assembly.

7. Finish: zinc rich corrosion resistant primer with finish coat in owner's choice of manufacturer's standard colors.

B. Louvers:

1. Source: By metal building manufacturer.

2. Size: To be selected from available sizes and sized in accordance with mechanical ventilation requirements.

3. Type: Fixed.

4. Frame type: Self framing.

5. Provide with bird and insect screen.

6. Finish: Match adjacent wall color.

C. Overhead Door:

1. Manufacturer: Overhead Door Corporation, Lewisville, TX. Phone: 800-275-3290. Website: www.overheaddoor.com, or equal.

2. Size: As indicated on Drawings.

3. Elevation: As indicated on Drawings.

4. Type: Motorized, 18 gauge galvanized steel slat roll-up door.

5. Finish: Manufacturer's standard zinc rich corrosion resistant powder coat finish with four year warranty, in manufacturer's standard color as selected by the owner.

6. Warranty for door and operator: 3 years or 500,000 cycles, whichever is first.

7. Controls: Wall mounted Open/Close/Stop push button.

8. Photo electric beam to stop and/or reverse downward direction of door when an object crosses the door opening path.

9. Motor: direct drive integrated gear motor/brake assembly sized for the door and opening. Include manual corrosion resistant hand chain for door operation in case of power outage.

2.09 INSULATION

A. Manufacturer: Metal Building Insulation, Littleton, CO. Phone 303.867.1179. Website: www.metalbuildinginsulation.com; or equal.

B. Product: Continuous roll fiberglass insulation blankets with reinforced white vinyl backing.

1. Install without gap or spaces and tape seams with matching vinyl tape to provide continuous thermal barrier.

2. Thickness and R-value to conform with requirements of California Building Code and California Energy Code, but not to be less than 2 inches thick.

3. Tabs to interconnect insulation blankets with each other.

4. Support straps at regular, equal intervals (minimum 4 feet) to support insulation blankets. Fasten straps to secondary structure by means of self-tapping stainless steel screws.

2.10 GALVANIZED FENCES AND FENCE POSTS

A. Manufacturer: As selected by Pre-engineered metal building contractor.

B. Location and purpose: Interior perimeter of Pre-engineered metal building, refer to drawings. Locate away from wall to allow fencing to properly protect walls from tire handling.

C. Steel Chain Link Fabric: Height 6 feet, maximum 6 feet wide. 2inch mesh size, 9 gauge, zinc-coated steel fabric: ASTM A392 hot dipped galvanized, standard knuckle and twist fabric selvage.

D. Round steel pipe and rail: Schedule 40 standard weight pipe, in accordance with ASTM F1083, 1.8 oz/ ft² hot dip galvanized zinc exterior and 1.8 oz/ft² hot dip galvanized zinc interior coating. Locate at six foot intervals or less, on center. Line posts and end/corner posts regular grade with minimum steel yield strength of 30,000 pounds per square inch.

1. Include Top, bottom and intermediate horizontal rails, 1.660 in. OD: Schedule 40 standard weight pipe, in accordance with ASTM F1083, 1.8 oz/ ft² hot dip galvanized zinc exterior and 1.8 oz/ft² hot dip galvanized zinc interior coating.

E. Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, Rail Sleeves: In compliance to ASTM F626, pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz/ft².

F. Concrete for post footings shall have a 28-day compressive strength of 2,500 psi. (17.2 MPa).

1. Fabric Selection Table: Steel chain link mesh sizes and gauges produced in one piece widths 3 feet (910 mm) to 12 feet (3660 mm)

2.11 CONCRETE SLAB, CONCRETE REINFORCING, AND SUB-SURFACE FOUNDATIONS

A. Design: Pre-engineered metal building supplier / installer shall be responsible for design and provision of the concrete slab and related sub-surface foundations in accordance with applicable codes and industry standards.

B. Investigation: Investigate existing building, existing building structure and sub-structure to determine any impacts on pre-engineered metal building and/or pre-engineered metal building slab or substructure. Inform Owner and Engineer of any issues which may adversely impact the pre-engineered metal building, slab, and/or sub-structure.

C. Coordinate necessary soil preparation with General Contractor prior to work.

D. Schedule all drilling, reinforcing, and pouring of slab and sub-surface foundation with Owner and General Contractor to avoid interference with other on-site activities.

2.12 FABRICATION

A. General:

1. Shop-fabricate framing members for field bolted assembly.

2. Surfaces of bolted connections: Smooth and free from burrs and distortions.

3. Shop connections to conform to manufacturer's standard design practices.

4. Mark framing members with identifying mark.

5. Welding to conform to AWS D1.1 and AWS D1.3 as applicable.

B. Primary Framing:

1. Plates, stiffeners, and related members: Factory welded base plates, splice plates, cap plates, and stiffeners into place on structural members.

2. Bolt holes and related machining: Shop fabricate base plates, splices and flanges to include bolt connection holes. Shop-fabricate webs to include bracing holes.

3. Secondary structural connections (purlins and girts): Ordinary (not pretensioned) bolted connections with welded clips.

4. Welding inspection: Per IAS AC472 Part A.

C. Zee Purlins:

1. Fabricate purlins from cold-formed Z-shaped sections with stiffened flanges.

2. Size flange stiffeners to comply with requirements of AISI S100.

3. Purlin flanges unequal in width for easier nesting during erection.

4. Purlins pre-punched at factory to provide for field bolting to rigid frame clips.

D. Eave Struts:

1. Fabricate eave struts from cold-formed unsymmetrical C-shaped sections with stiffened flanges.

2. Size flange stiffeners to comply with requirements of AISI S100.

3. No welded splices permitted.

4. Eave Struts pre-punched at factory to provide for field bolting to rigid frame clips.

E. Girts: Simple or continuous span as required by design. Connection bolts will install through webs, not flanges.

F. Bracing:

1. Diagonal Bracing:

a. Diagonal bracing in roof and sidewalls may be used to resist longitudinal loads in structure when panel diaphragm cannot be used.

b. Furnish to length and equipped with hillside washers and nuts at each end.

c. Bracing may consist of rods threaded at each end or galvanized cable with suitable threaded end anchors.

d. If load requirements dictate, bracing may be of structural angle or pipe, bolted in place.

2. Special Bracing:

a. When diagonal bracing is not permitted in sidewall use rigid frame type portal or fixed base column.

b. Shear walls may be used where adequate to resist applied wind or seismic forces.

3. Flange Braces: Brace compression flange of primary framing laterally with angles connecting to purlin or girt webs so that flange compressive stress is within allowable limits for any combination of loading.

4. Bridging:

a. Laterally brace top chord of long bay purlins with horizontal bridging if roof system being used will not supply adequate lateral support to top chord.

5. Horizontally bridge bottom chord for lateral bracing. One row of bolted diagonal bridging required for long span purlins 40 feet long and longer.

G. Standing Seam Panels:

1. Provide factory fabricated and finished metal panels and accessories meeting performance requirements, indicated profiles and structural requirements.

2. Fabricate metal joints configured to accept applied sealant providing weathertight seal and preventing metal to metal contact and minimizing noise resulting from thermal movement.

3. Fabricate panels in continuous lengths for full length of detailed runs, except where otherwise indicated on drawings.

4. Sheet Metal Flashing and Trim: Fabricate or install flashing and trim to comply with manufacturer's written instructions and construction drawings.

5. Configure roof panels with interlocking edges with factory applied hot-melt mastic inside female seam. Female side snaps over male side and when seamed creates continuous lock, forming 360 degree Pittsburgh seam.

6. Notch panels at factory at both ends so that field installation can commence or terminate from either end of building.

7. Maximum panel length: 45 feet unless otherwise indicated.

H. End Laps:

1. Fabricate with 16 gauge backup plates and eight end lap joint fasteners installed in six pre-punched holes in flat and in dimples in trapezoidal legs.

2. Apply mastic between panels and secure with self-drilling fasteners through panels and backup plate.

3. Through roof fasteners may be used only at end laps and eaves.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine area to receive metal building system.

B. Clean areas prior to installation.

C. Notify Architect/Engineer of conditions that would adversely affect installation or subsequent use.

D. Do not begin installation until unacceptable conditions are corrected.

3.02 ERECTION OF STRUCTURAL STEEL FRAMING SYSTEM

A. Erect structural steel framing system in accordance with the Drawings and metal building system manufacturer's erection drawings.

B. Fit members square against abutting components.

C. Position members plumb, square, and level.

D. Temporarily brace members until permanently fastened.

E. Do not splice load bearing members.

F. Align and adjust various members forming parts of a complete frame or structure after assembly but before fastening.

G. Welding to conform to AWS D1.1.

H. Fixed Column Bases: Grout flush with floor line after structural steel erection is complete.

I. Field Modifications:

1. Require approval of metal building system manufacturer.

2. Responsibility of building erector.

3.03 INSTALLATION OF METAL ROOF

A. Install roof in accordance with metal roof manufacturer's and metal building system manufacturer's instructions.

B. Install roof system weathertight.

C. Position panel clips for proper, regular attachment to primary and secondary structure.

D. Position and properly align panels prior to attachment.

E. Field seam panel side laps by self-propelled and portable electrical lock-seaming machine.

1. Machine field forms the final 180 degrees of a 360-degree Pittsburgh double-lock standing seam.

2. Factory apply side lap sealant.

F. Panel End Laps: Minimum of 6 inches, sealed with sealant (weather sealing compound), and fastened together by clamping plates.

1. Sealants: Contain hard nylon beads, which prevent mastic from flowing out due to clamping actions.

2. Join panel laps by 2-piece clamped connection consisting of a bottom reinforcing plate and a top panel strap.

3. Locate panel end laps directly over, but not fastened to, supporting secondary roof structural member and stagger, to avoid 4-panel lap-splice condition.

3.04 INSTALLATION OF METAL WALL PANELS

A. Install wall panels in accordance with metal building system manufacturer's instructions.

B. Install wall system weathertight.

C. Verify structural system is plumb before wall panels are attached.

D. Align and attach wall panels in accordance with erection drawings furnished by metal building system manufacturer.

E. Install side laps with minimum of 1 full corrugation.

F. Seal wall panels at base with metal trim.

G. Exterior Trim: Apply same finish as exterior color of wall panels, except the following:

1. Gutters, Downspouts, Eave Trim, Gable Trim, Door-Side Flashings, and Header Flashings: "Kynar 500" or "Hylar 5000" fluoropolymer (PVDF) coating in manufacturer's standard color.

2. Windows: Factory paint aluminum extrusions (thermally broken).

H. Flashings, Trim, Closures, and Similar Items: Install as indicated on erection drawings furnished by metal building system manufacturer.

3.05 INSTALLATION OF INSULATION

A. Insulation Installation: Install insulation in accordance with metal building system manufacturer's instructions.

3.06 PROTECTION

A. Protect installed metal building system to ensure that, except for normal weathering, metal building system will be without damage or deterioration at time of Substantial Completion.

3.07 ADJUSTMENT

A. Touch up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 13 34 19

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

B. The requirements of this Section apply to all sections of Division 23.

C. Definitions:

1. Exposed: Piping, ductwork, and equipment exposed to view in finished rooms.

2. Exterior: Piping, ductwork, and equipment exposed to weather be it temperature, humidity, precipitation, wind, or solar radiation.

D. Abbreviations/Acronyms:

1. ac: Alternating Current

2. AC: Air Conditioning

3. ACU: Air Conditioning Unit

4. ACR: Air Conditioning and Refrigeration

5. AI: Analog Input

6. AISI: American Iron and Steel Institute

7. AO: Analog Output

8. ASJ: All Service Jacket

9. AWG: American Wire Gauge

10. BACnet: Building Automation and Control Networking Protocol

11. BAg: Silver-Copper-Zinc Brazing Alloy

12. BAS: Building Automation System

13. BCuP: Silver-Copper-Phosphorus Brazing Alloy

14. bhp: Brake Horsepower

15. Btu: British Thermal Unit

16. Btu/h: British Thermal Unit Per Hour
17. CDA: Copper Development Association
18. C: Celsius
19. CD: Compact Disk
20. CFM: Cubic Foot Per Minute
21. CH: Chilled Water Supply
22. CHR: Chilled Water Return
23. CLR: Color
24. CO: Carbon Monoxide
25. COR: Contracting Officer's Representative
26. CPD: Condensate Pump Discharge
27. CPM: Cycles Per Minute
28. CPVC: Chlorinated Polyvinyl Chloride
29. CRS: Corrosion Resistant Steel
30. CTPD: Condensate Transfer Pump Discharge
31. CTPS: Condensate Transfer Pump Suction
32. CW: Cold Water
33. CWP: Cold Working Pressure
34. CxA: Commissioning Agent
35. dB: Decibels
36. dB(A): Decibels (A weighted)
37. DDC: Direct Digital Control
38. DI: Digital Input
39. DO: Digital Output
40. DVD: Digital Video Disc
41. DN: Diameter Nominal

42. DWV: Drainage, Waste and Vent
43. EPDM: Ethylene Propylene Diene Monomer
44. EPT: Ethylene Propylene Terpolymer
45. ETO: Ethylene Oxide
46. F: Fahrenheit
47. FAR: Federal Acquisition Regulations
48. FD: Floor Drain
49. FED: Federal
50. FG: Fiberglass
51. FGR: Flue Gas Recirculation
52. FOS: Fuel Oil Supply
53. FOR: Fuel Oil Return
54. FSK: Foil-Scrim-Kraft facing
55. FWPD: Feedwater Pump Discharge
56. FWPS: Feedwater Pump Suction
57. GC: Chilled Glycol Water Supply
58. GCR: Chilled Glycol Water Return
59. GH: Hot Glycol Water Heating Supply
60. GHR: Hot Glycol Water Heating Return
61. gpm: Gallons Per Minute
62. HDPE: High Density Polyethylene
63. Hg: Mercury
64. HOA: Hands-Off-Automatic
65. hp: Horsepower
66. HPS: High Pressure Steam (414 kPa (60 psig) and above)
67. HPR: High Pressure Steam Condensate Return

68. HW: Hot Water
69. HWH: Hot Water Heating Supply
70. HWHR: Hot Water Heating Return
71. Hz: Hertz
72. ID: Inside Diameter
73. IPS: Iron Pipe Size
74. kg: Kilogram
75. klb: 1000 lb
76. kPa: Kilopascal
77. lb: Pound
78. lb/hr: Pounds Per Hour
79. L/s: Liters Per Second
80. L/min: Liters Per Minute
81. LPS: Low Pressure Steam (103 kPa (15 psig) and below)
82. LPR: Low Pressure Steam Condensate Gravity Return
83. MAWP: Maximum Allowable Working Pressure
84. MAX: Maximum
85. MBtu/h: 1000 Btu/h
86. MBtu: 1000 Btu
87. MED: Medical
88. m: Meter
89. MFG: Manufacturer
90. mg: Milligram
91. mg/L: Milligrams Per Liter
92. MIN: Minimum
93. MJ: Megajoules

94. ml: Milliliter
95. mm: Millimeter
96. MPS: Medium Pressure Steam (110 kPa (16 psig) through 414 kPa (60 psig))
97. MPR: Medium Pressure Steam Condensate Return
98. MW: Megawatt
99. NC: Normally Closed
100. NF: Oil Free Dry (Nitrogen)
101. Nm: Newton Meter
102. NO: Normally Open
103. NOx: Nitrous Oxide
104. NPT: National Pipe Thread
105. NPS: Nominal Pipe Size
106. OD: Outside Diameter
107. OSD: Open Sight Drain
108. OS&Y: Outside Stem and Yoke
109. PC: Pumped Condensate
110. PID: Proportional-Integral-Differential
111. PLC: Programmable Logic Controllers
112. PP: Polypropylene
113. PPE: Personal Protection Equipment
114. ppb: Parts Per Billion
115. ppm: Parts Per Million
116. PRV: Pressure Reducing Valve \
117. PSIA: Pounds Per Square Inch Absolute
118. psig: Pounds Per Square Inch Gauge
119. PTFE: Polytetrafluoroethylene

120. PVC: Polyvinyl Chloride
121. PVDC: Polyvinylidene Chloride Vapor Retarder Jacketing, White
122. PVDF: Polyvinylidene Fluoride
123. rad: Radians
124. RH: Relative Humidity
125. RO: Reverse Osmosis
126. rms: Root Mean Square
127. RPM: Revolutions Per Minute
128. RS: Refrigerant Suction
129. RTD: Resistance Temperature Detectors
130. RTRF: Reinforced Thermosetting Resin Fittings
131. RTRP: Reinforced Thermosetting Resin Pipe
132. SCFM: Standard Cubic Feet Per Minute
133. SPEC: Specification
134. SPS: Sterile Processing Services
135. STD: Standard
136. SDR: Standard Dimension Ratio
137. SUS: Saybolt Universal Second
138. SW: Soft water
139. SWP: Steam Working Pressure
140. TAB: Testing, Adjusting, and Balancing
141. TDH: Total Dynamic Head
142. TEFC: Totally Enclosed Fan-Cooled
143. TFE: Tetrafluoroethylene
144. THERM: 100,000 Btu
145. THHN: Thermoplastic High-Heat Resistant Nylon Coated Wire

146. THWN: Thermoplastic Heat & Water-Resistant Nylon Coated Wire

147. T/P: Temperature and Pressure

148. USDA: U.S. Department of Agriculture

149. V: Volt

150. VAC: Vacuum

151. VA: Veterans Administration

152. VAC: Voltage in Alternating Current

153. VA CFM: VA Construction & Facilities Management

154. VA CFM CSS: VA Construction & Facilities Management, Consulting Support Service

155. VAMC: Veterans Administration Medical Center

156. VHA OCAMES: Veterans Health Administration - Office of Capital Asset Management Engineering and Support

157. VR: Vacuum condensate return

158. WCB: Wrought Carbon Steel, Grade B

159. WG: Water Gauge or Water Column

160. WOG: Water, Oil, Gas

1.2 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. HVAC Mechanical Systems Welding: Before any welding is performed, Contractor shall submit a certificate certifying that welders comply with the following requirements:

1. Qualify welding processes and operators for piping according to ASME BPVC Section IX. Provide proof of current certification.

2. Comply with provisions of ASME B31 series "Code for Pressure Piping".

3. Certify that each welder and welding operator has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.

4. All welds shall be stamped according to the provisions of the AWS or ASME as required herein and by the associated code.

D. Electrical Characteristics for Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

E. Meet all Owner, OSHA, state, and local safety requirements.

F. To meet the Owner goals of safety, reliability, serviceability, and efficient operation.

G. All work to meet local plumbing code. In the case of discrepancies between the project contract documents and the local code, the most stringent shall govern.

H. Comply with most current edition of Owner Design Standards.

I. All materials and installations shall meet applicable FM Global requirements.

J. Complete Project Closeout list, Pre-Occupancy checklist, and Project Turnover checklist prior to project turnover to Owner.

K. Mechanical, electrical and associated systems shall be safe, reliable, efficient, durable, easily and safely operable and maintainable, easily and safely accessible, and in compliance with applicable codes as specified. The systems shall be comprised of high quality institutional-class and industrial-class products of manufacturers that are experienced specialists in the required product lines. All construction firms and personnel shall be experienced and qualified specialists in industrial and institutional HVAC.

L. Equipment Vibration Tolerance:

1. Refer to Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT. Equipment shall be factory-balanced to this tolerance and re-balanced on site, as necessary.

2. After HVAC air balance work is completed and permanent drive sheaves are in place, perform field mechanical balancing and adjustments required to meet the specified vibration tolerance.

M. Products Criteria:

1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years (or longer as specified elsewhere). The design, model and size of each item shall have been in satisfactory and efficient operation on at least three installations for approximately three years. However, digital electronics devices, software and

systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years. See other specification sections for any exceptions and/or additional requirements.

2. Refer to all other sections for quality assurance requirements for systems and equipment specified therein.

3. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.

4. The products and execution of work specified in Division 23 shall conform to the referenced codes and standards as required by the specifications. Local codes and amendments shall be enforced, along with requirements of local utility companies. The most stringent requirements of these specifications, local codes, or utility company requirements shall always apply. Any conflicts shall be brought to the attention of the COR.

5. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be of the same manufacturer and model number, or if different models are required they shall be of the same manufacturer and identical to the greatest extent possible (i.e., same model series).

6. Assembled Units: Performance and warranty of all components that make up an assembled unit shall be the responsibility of the manufacturer of the completed assembly.

7. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.

8. Use of asbestos products or equipment or materials containing asbestos is prohibited.

N. HVAC Equipment Service Providers: Service providers shall be authorized and trained by the manufacturers of the equipment supplied. These providers shall be capable of responding onsite and provide acceptable service to restore equipment operations within 8 hours of receipt of notification by phone, e-mail or fax in event of an emergency, such as the shutdown of equipment; or within 24 hours in a non-emergency. Submit names, mail and e-mail addresses and phone numbers of service personnel and companies providing service under these conditions for (as applicable to the project): fans, air handling units, chillers, cooling towers, control systems, pumps, critical instrumentation, computer workstation and programming.

O. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the COR with submittals. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause

for rejection of the material and removal by the Contractor and no additional cost or time to the Government.

P. Execution (Installation, Construction) Quality:

1. Apply and install all items in accordance with manufacturer's written instructions. Refer conflicts between the manufacturer's instructions and the contract documents to the COR for resolution. Provide written hard copies and computer files on CD or DVD of manufacturer's installation instructions to the COR with submittals prior to commencing installation of any item. Installation of the item will not be allowed to proceed until the recommendations are received and approved by the Owner. Failure to furnish these recommendations is a cause for rejection of the material.

2. All items that require access, such as for operating, cleaning, servicing, maintenance, and calibration, shall be easily and safely accessible by persons standing at floor level, or standing on permanent platforms, without the use of portable ladders. Examples of these items include, but are not limited to, all types of valves, filters and strainers, transmitters, control devices. Prior to commencing installation work, refer conflicts between this requirement and contract documents to the COR for resolution. Failure of the Contractor to resolve or point out any issues will result in the Contractor correcting at no additional cost or time to the Owner.

3. Complete coordination/shop drawings shall be required in accordance with Article, SUBMITTALS. Construction work shall not start on any system until the coordination/shop drawings have been approved by the Owner/Engineer.

4. Workmanship/craftsmanship will be of the highest quality and standards. The Owner reserves the right to reject any work based on poor quality of workmanship this work shall be removed and done again at no additional cost or time to the Government.

Q. Upon request by the Owner, provide lists of previous installations for selected items of equipment. Include contact persons who will serve as references, with current telephone numbers and e-mail addresses.

1.3 STANDARD AND REGULATORY REQUIREMENTS

A. All materials, design, fabrication, assembly and test procedures shall be in accordance with the requirements of all applicable codes, standards or regulations having jurisdiction over the work.

B. Reference to any code, standard or regulation shall mean the latest published editions, including addenda, supplements and revisions thereto, which are in effect when the purchase order is awarded.

C. In the event of conflict between codes, standards or regulations, the conflict shall be referred to the Engineer for resolution.

D. The organizations having jurisdiction include, but are not limited to, the following:

1. ANSI American National Standards Institute
2. ASME American Society of Mechanical Engineers
3. EPA Federal, State and Local Environmental Protection Agencies
4. IBC International Building Code, New Jersey Edition
5. ISA Instrument Society of America.
6. NEC National Electrical Code.
7. NEMA National Electric Manufacturer's Association.
8. NFPA National Fire Protection Association.
9. OSHA Regulations of the Occupations Safety and Health Administration.
10. UL Underwriter's Laboratories Inc.
11. The state, county or municipal laws and regulations governing the location where the equipment is to be installed.

E. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic and fire codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

1.4 SUBMITTALS

A. Refer to Drawing Q9.06 Shop Equipment Schedule for submittal requirements listed in the "Submittals" column of the equipment list. In the event of conflict between Drawing Q9.06 Shop Equipment Schedule and the following expanded submittal descriptions, Drawing Q9.06 Shop Equipment Schedule is to govern.

B. Product Data:

1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.
2. All Product Data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories will be a cause for rejection.
3. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

C. Operation and Maintenance Manual:

1. Provide a Complete parts list, operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:

a. Description of system and components.

b. Schematic diagrams of electrical, plumbing and compressed air systems.

c. Manufacturer's printed operating instructions.

d. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

e. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

2. Assemble and provide copies of manual in 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

D. Shop Drawings: Submit in accordance with Division 1 -General Requirements of these specifications. Refer to Drawing Q9.06 Shop Equipment Schedule for the equipment mark numbers requiring shop drawings.

1. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for the submitted equipment. The drawings shall further include dimensions from structural elements or architectural grid lines, operational clearances, locations of any utility service connection points, mounting requirements, and structural supports required for the submitted equipment.

1.5 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Manufacturers listed for each equipment item may bid without submittal for that item. Manufacturers not listed shall submit for approval in accordance with "Instructions to Bidders". Prior to installation, submittals for each equipment item by Mark Number shall be provided in accordance with Division 1 - General Requirements.

1.6 WARRANTY

A. The Manufacturer shall warrant that all materials and equipment furnished under this contract will be new and of good quality, free from defects in design, workmanship, and materials.

B. Each item of equipment, or part thereof, proving to be defective within the specified period of the warranty shall be replaced, free of defect, without cost to the Owner.

C. The warranty period shall be the Manufacturer's standard warranty period, but not less than a minimum of twelve (12) months after startup, or 18 months after delivery of the equipment at the site (whichever comes first)..

D. Warranty shall include materials and labor necessary to correct defects.

E. Defects shall include, but not be limited to noisy, rough, or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

F. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

G. All parts shall be readily available locally in the United States.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Piping, duct, equipment, and associated accessories kept on-site should be stored off the ground on skids, ends should be capped or sealed, and these items should be covered with plastic to prevent fouling or contact with excessive moisture. Piping, duct, and equipment should be cleaned of debris inside and out before installation and should be kept clean and protected throughout construction.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Mark Number of this specification.

C. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.8 LABELING

A. Manufacturer shall securely attach in a prominent location on each major item of equipment a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (U.L.), or other National Recognized Testing Laboratory (NRTL), in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers, subject to compliance with requirements of this specification, are as follows:

1. Miratech
2. Steuler
3. Johnson Matthey
4. Peerless Mfg.

2.2 Selective Catalytic Reduction System

A. SCR Reactor Vessel

1. The SCR catalyst reactor housing shall be fabricated from non-scaling heat resistant stainless steel, of rigid reinforced construction. The SCR catalyst reactor housing shall be equipped with ANSI flanges at both ends. The SCR housing and all components in contact with engine exhaust shall be suitable for continuous operation at the maximum engine exhaust temperature without scaling, deformation or any other physical damage for the life of the system.
2. The SCR reactor housing shall be equipped with insulation supports. Insulation shall be supplied and installed by others.
3. The SCR reactor housing shall be designed to be mounted horizontally in the engine exhaust gas duct and be supported from overhead. The SCR supporting steel shall be provided by Supplier.
4. The reactor housing shall be equipped with sample gas ports, maintenance and inspection doors for easy access and catalyst bed loading and unloading, instrumentation connections and other connections as deemed necessary by the Supplier.
5. The SCR vessel catalyst core shall consist of an adequate number of layers of catalyst material, with room for one (1) additional layer of material in the reactor housing. Each layer of catalyst material shall be of a modular design. Catalyst modules shall be of size and weight to facilitate manual loading.
6. The catalyst shall be type as recommended by the SCR manufacturer and shall be designed for operation at the maximum and minimum exhaust temperatures achievable by the engine.

B. Catalytic System Accessories

1. The SCR system shall include a static exhaust gas mixer to be mounted upstream of the SCR catalyst reactor housing. The mixer shall insure full and complete mixing of the atomized injected reducing agent with the engine exhaust gas under all engine load conditions. The static mixer shall be fabricated from non-scaling heat resistant stainless steel. The static mixer shall be equipped with a stainless steel injection lance, through which the atomized reducing agent is introduced into the exhaust stream. The static mixer shall be equipped with ANSI flanges at both ends.

2. The static mixer shall be equipped with insulation supports. Insulation shall be supplied and installed by others.

3. The SCR system shall be supplied with a reducing agent storage, injection and control system which shall included but not necessarily limited to the follow: Urea storage tank, metering/injection pump, dosing box, atomizing air compressor, and all appurtenances required to form a complete and operable system. The capacity shall by as recommended by the SCR supplier.

4. The reducing agent metering and control system shall be capable of insuring, that the maximum ammonia slip to atmosphere from the SCR system does not exceed the limits specified in Attachment No. 2 under all engine operation conditions. Use of an oxidation catalyst mounted downstream of the SCR catalyst to eliminate excess ammonia slip to atmosphere is prohibited.

5. Compressed air system, for urea atomization shall be provided by the Supplier.

6. The Urea/water solution shall be directed into the exhaust gas stream by means of a metered injection nozzle system.

7. The Supplier shall provide one (1) 6500 gallon, polyethylene storage tank for urea/water solution. The tank shall be installed outdoors and be of vertical design. The Urea tank should be manufactured from High Density Cross linked Polyethylene. It should be one piece seamless molded designed with wall thicknesses conforming to ASTMD-1998 standards for liquid storage. Must have low temperature impact resistance and U.V. stabilized. Insulation should be at least 2" thick and the heat tracing should be monitored by a separate control panel. The control panel shall operate through the use of dual 115V thermostats. The urea mixture must be maintained above 40 degrees F at all times to avoid the potential for crystallization. Accessories included with the tank:

   a. Ultrasonic Level Indication

   b. High/Low Level Alarms

   c. Integrated Heat Tracing and Insulation for outdoor installation

   d. Fill system with vacuum break

C. Piping/Tubing

1. All Urea solution and compressed air pipe/tube materials and components shall be stainless steel. Minimum tube size shall be 1/2 inch nominal. Minimum tubing thickness is 0.063 of an inch.

2. Stainless steel tubing sizes shall be limited to 1" and below. Carbon steel, cast, ductile, or malleable iron piping material shall not be used

3. All stainless steel Urea piping shall be welded. Threaded connections shall be minimized. Pipe threads shall conform to ANSI B2.1, Taper Pipe Threads. Taper threaded connections are unacceptable in stainless steel.

2.3 INSTRUMENTATION AND CONTROLS

A. PLC based, closed loop analysis and reactant injection system to maximize reactant injection efficiency by continuously sampling and analyzing the treated exhaust gas.

B. The SCR control system shall be equipped with an interface display and with a serial interface to permit communication and monitoring of the SCR system from the CUP master control system (MCS). The Supplier shall provide and configure the Modbus communications interface, provide programming of all parameters required to effectively monitor the SCR system from the MCS.

C. Completely pre-wired Control panel, built in accordance to manufacturer standards, with UL listed components, shall be provided.

D. The SCR control system shall be equipped to provide the following functions:

1. Continuous monitoring of the temperature downstream of the SCR (SCR discharge connection)

2. Continuous monitoring of the urea flow rate (gal/hr)

E. The Temperature and Urea flow information shall be continuously stored in an electronic data storage for the EPA compliance record.

2.4 FINISHES

A. All carbon steel surface and equipment shall be primed and finished painted in accordance with manufacturer's standards. In the absences of specific manufacturer's standards, prime paint with a Zinc rich primer (dry film thickness - 2.0 mils min, 2.5 mils max), finish coat shall be of Aliphatic Polyurethane (dry film thickness - 2.0 mils min, 2.5 mils max) or standard manufacturer epoxy paint.

B. Stainless steel components shall not be painted.

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate location of rough-in work and utility stub-outs to assure match with equipment to be installed.

B. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all items.

3.2 INSTALLATION

A. Perform work under direct supervision of Foreman or Construction Superintendent with authority to coordinate installation of scheduled equipment with Engineer.

B. Install equipment in accordance with plans, shop drawings and manufacturer's instructions:

1. Positioning: Place equipment in accordance with any noted special positioning requirements generally level, plumb and at right angles to adjacent work.

2. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging equipment or adjacent work.

3. Anchorage: Attach equipment securely to floor, per manufacturer's instructions and as directed, specified, or detailed by the Structural Engineer for general anchorage and seismic bracing conditions, to prevent damage resulting from inadequate fastening. Installation fasteners shall be installed to avoid scratching or damaging adjacent surfaces.

4. Upon completion of work, finish surfaces shall be free of tool marks, scratches, blemishes, and stains.

3.3 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with all specified features in the presence of the Engineer using acceptance procedures provided by the manufacturer.

3.4 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing or installation debris from job site.

D. Notify Engineer for acceptance inspection.

3.5 TRAINING

A. Direct the technical representative to provide specified hours of training to designated Owner's maintenance personnel in operation and maintenance of the following equipment. Coordinate, with Owner, training schedule and list of personnel to be trained.

1. VAULT/RECEIVER, FAREBOX, MOBILE BIN
Equipment Mark Number: 7800
Hours Required: 1

2. DATA COLLECTION AND REPORTING SYSTEM, FAREBOX
Equipment Mark Number: 7820
Hours Required: 1

B. Obtain, from technical representative, a list of Owner's personnel trained in equipment operations and maintenance.

END OF SECTION

SECTION 23 05 19

METERS AND GAUGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

B. Equipment and all necessary accessories as designated in this section shall include the following.

1. Bimetallic-actuated thermometers

2. Thermowells.

3. Dial-type pressure gauges.

4. Gauge attachments.

5. Test plugs.

6. Test plug kit.

1.2 QUALITY ASSURANCE

A. Instruments shall be factory calibrated for the temperature and pressure of the systems in which they are installed.

B. B. Pressure gauges shall be manufactured in accordance with ANSI Specification B-40-1 Grade 2A.

1.3 STANDARD AND REGULATORY REQUIREMENTS

A. All materials, design, fabrication, assembly and test procedures shall be in accordance with the requirements of all applicable codes, standards or regulations having jurisdiction over the work.

B. Reference to any code, standard or regulation shall mean the latest published editions, including addenda, supplements and revisions thereto, which are in effect when the purchase order is awarded.

C. In the event of conflict between codes, standards or regulations, the conflict shall be referred to the Engineer for resolution.

D. The organizations having jurisdiction include, but are not limited to, the following:

1. AGA American Gas Association

2. ANSI American National Standards Institute

3. ASME American Society of Mechanical Engineers

4. ASTM American Society for Testing and Materials

5. AWS American Welding Society

6. AWWA American Water Works Association

7. NFPA National Fire Protection Association.

8. OSHA Regulations of the Occupations Safety and Health Administration.

9. UL Underwriter's Laboratories Inc.

10. The state, county or municipal laws and regulations governing the location where the equipment is to be installed.

E. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic and fire codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

1.4 SUBMITTALS

A. Manufacturers Installation Instructions: Submit installation instructions for material and equipment.

B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

D. Shop Drawings - Submit in accordance with Division 1 -General Requirements of these specifications.

1. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for the submitted equipment. The drawings shall further include operational clearances, mounting requirements, and structural supports required for the submitted equipment.

a. Wiring Diagrams: For power, signal, and control wiring.

2. Product Data: For each type of product indicated.

3. All Product Data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories will be a cause for rejection.

4. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

5. Project Record Documents: Record actual locations of components and instrumentation.

E. Operation and Maintenance Manual:

1. Provide operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:

a. Manufacturer's printed operating instructions.

b. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

c. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

2. Assemble and provide copies of manual in 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

1.5 WARRANTY

A. The Manufacturer shall warrant that all materials and equipment furnished under this contract will be new and of good quality, free from defects in design, workmanship, and materials.

B. Each item of equipment, or part thereof, proving to be defective within the specified period of the warranty shall be replaced, free of defect, without cost to the Owner.

C. The warranty period shall be the Manufacturer's standard warranty period, but not less than a minimum of twelve (12) months after startup, or 18 months after delivery of the equipment at the site (whichever comes first).

D. Defects shall include, but not be limited to noisy, rough, or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

E. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers, subject to compliance with requirements of this specification, are as follows:

1. Bimetallic-actuated thermometers

a. Ashcroft Inc.

b. Trerice, H. O. Co., EI Series

c. Weiss Instruments, Inc.

2. Direct-Mounted, Metal-Case, Dial-Type Pressure Gauges:

a. AMETEK, Inc.; U.S. Gauge.

b. Ashcroft Inc.

c. Trerice, H. O. Co.

d. Weiss Instruments, Inc.

3. Test Plugs:

a. Flow Design, Inc.

b. Peterson Equipment Co., Inc.

c. Trerice, H. O. Co.

d. Weiss Instruments, Inc.

4.

2.2 BIMETALLIC-ACTUATED THERMOMETERS

A. Standard: ASME B40.200.

B. Case: Sealed types; stainless steel with 3-inch nominal diameter.

C. External adjustment.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Plain glass or plastic.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1 percent of scale range.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.

2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.

3. Material for Use with Copper Tubing: CNR or CUNI.

4. Material for Use with Steel Piping: CRES.

5. Type: Stepped shank unless straight or tapered shank is indicated.

6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.

7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.

8. Bore: Diameter required to match thermometer bulb or stem.

9. Insertion Length: Length required to match thermometer bulb or stem.

10. Lagging Extension: Include on thermowells for insulated piping and tubing.

11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin

2.4 PRESSURE GAUGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gauges:

1. Standard: ASME B40.100.

2. Case: Liquid-filled type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.

3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.

4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

5. Movement: Mechanical, with link to pressure element and connection to pointer.

6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.

7. Pointer: Dark-colored metal.

8. Window: Glass or plastic.

9. Ring: Metal.

10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAUGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Siphons: Loop-shaped section of brass pipe with NPS 1/4 or NPS 1/2 pipe threads.

C. Valves: Brass ball, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

A. Description: Test-station fitting made for insertion into piping tee fitting.

B. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

C. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

D. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

E. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber

2.7 TEST PLUG KIT

A. Furnish one test-plug kit containing two thermometer(s), one pressure gauge and adapter, and carrying case. Thermometer sensing elements, pressure gauge, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

B. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

C. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

D. Pressure Gauge: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.

E. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 - EXECUTION

3.1 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install thermowells with socket to center of pipe and in vertical position in piping tees.

C. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

D. Install thermowells with extension on insulated piping.

E. Fill thermowells with heat-transfer medium.

F. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

G. Pack thermometers in a thermal conductive compound. Preferred products are: Honeywell Part No. 107408; Jonson Controls F-1000-182; York 013-00898-000.

H. Install direct-mounted pressure gauges in piping tees with pressure gauge located on pipe at the most readable position.

I. Install valve and snubber in piping for each pressure gage for fluids (except steam).

J. Install valve and syphon fitting in piping for each pressure gauge for steam.

K. Install test plugs in piping tees.

L. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.

M. Install flowmeter elements in accessible positions in piping systems, and per manufacturer's requirements.

N. Install wafer-orifice flowmeter elements between pipe flanges.

O. Install differential-pressure-type flowmeter elements, with at least minimum straight lengths of pipe, upstream and downstream from element according to manufacturer's written instructions.

P. Install permanent indicators on walls or brackets in accessible and readable positions.

Q. Install connection fittings in accessible locations for attachment to portable indicators.

R. Install thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.

2. Inlet and outlet of each hydronic boiler.

3. Two inlets and two outlets of each hydronic heat exchanger.

4. Inlet and outlet of each thermal-storage tank.

S. Install pressure gauges in the following locations:

1. Discharge of each pressure-reducing valve.

2. Inlet and outlet of each heat exchanger-water connection.

3. Suction and discharge of each pump.

3.3 CONNECTIONS

A. Install meters and gauges adjacent to machines and equipment to allow service and maintenance of meters, gauges, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

D. Connect thermal-energy meter transmitters to meters.

3.4 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gauges to proper angle for best visibility.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Heating and Glycol, Hot-Water Piping: 30 to 250 deg F or 30 to 300 deg F.

3.6 PRESSURE-GAUGE SCALE-RANGE SCHEDULE

A. Scale Range for Hydronic Water Piping: As best suited for final project conditions.

3.7 FLOWMETER SCHEDULE

A. Flowmeters for Hydronic Piping: Electromagnetic type.

END OF SECTION

SECTION 23 05 23

GENERAL DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

B. Equipment and all necessary accessories as designated in this section shall include the following.

1. Bronze ball valves.

2. Iron, butterfly valves.

3. High-performance butterfly valves.

4. Bronze lift check valves.

5. Bronze swing check valves.

6. Iron swing check valves.

7. Iron, grooved-end swing-check valves.

8. Bronze gate valves.

9. Iron gate valves.

10. Bronze globe valves.

11. Iron globe valves.

1.2 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

2. ASME B31.1 for power piping valves.

3. ASME B31.9 for building services piping valves.

1.3 STANDARD AND REGULATORY REQUIREMENTS

A. All materials, design, fabrication, assembly and test procedures shall be in accordance with the requirements of all applicable codes, standards or regulations having jurisdiction over the work.

B. Reference to any code, standard or regulation shall mean the latest published editions, including addenda, supplements and revisions thereto, which are in effect when the purchase order is awarded.

C. In the event of conflict between codes, standards or regulations, the conflict shall be referred to the Engineer for resolution.

D. The organizations having jurisdiction include, but are not limited to, the following:

1. ANSI American National Standards Institute
2. ASME American Society of Mechanical Engineers
3. ASTM American Society for Testing and Materials
4. AWS American Welding Society
5. AWWA American Water Works Association
6. MSS Manufacturers Standardization Society of the Valve and Fittings Industry
7. NFPA National Fire Protection Association.
8. OSHA Regulations of the Occupations Safety and Health Administration.
9. UL Underwriter's Laboratories Inc.
10. The state, county or municipal laws and regulations governing the location where the equipment is to be installed.

E. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic and fire codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

1.4 SUBMITTALS

A. Design Data: Indicate pipe size. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. Submit data on all materials, fittings, accessories and equipment.

B. Manufacturers Installation Instructions: Submit installation instructions for material and equipment.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

E. Shop Drawings - Submit in accordance with Division 1 -General Requirements of these specifications.

1. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for the submitted equipment. The drawings shall further include dimensions from structural elements or architectural grid lines, operational clearances, locations of any utility service connection points, mounting requirements, and structural supports required for the submitted equipment.

2. Provide product data for each type of the following:

a. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.

3. All Product Data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories will be a cause for rejection.

4. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

F. Operation and Maintenance Manual:

1. Provide a Complete parts list, operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:

a. Description of system and components.

b. Manufacturer's printed operating instructions.

c. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

d. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

2. Assemble and provide copies of manual in 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

1.5 WARRANTY

A. The Manufacturer shall warrant that all materials and equipment furnished under this contract will be new and of good quality, free from defects in design, workmanship, and materials.

B. Each item of equipment, or part thereof, proving to be defective within the specified period of the warranty shall be replaced, free of defect, without cost to the Owner.

C. The warranty period shall be the Manufacturer's standard warranty period, but not less than a minimum of twelve (12) months after startup, or 18 months after delivery of the equipment at the site (whichever comes first).

D. Warranty shall include materials and labor necessary to correct defects.

E. Defects shall include, but not be limited to noisy, rough, or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

F. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, grooves, and weld ends.

3. Set ball valves open to minimize exposure of functional surfaces.

4. Set butterfly valves closed or slightly open.

5. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers, subject to compliance with requirements of this specification, are as follows:

1. Bronze Ball Valves, Three-Piece with Full Port Stainless-Steel Trim

a. Conbraco Industries, Inc.; Apollo Valves.

b. Neles-Jamesbury, Inc.

c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Butterfly Valves

a. Bray Controls; a division of Bray International.

b. Crane Co.; Crane Valve Group; Stockham Division.

c. DeZurik Water Controls.

d. Hammond Valve.

e. Milwaukee Valve Company

3. High-Performance Butterfly Valves

a. Bray Controls; a division of Bray International.

b. Crane Co.; Crane Valve Group; Flowseal.

c. Crane Co.; Crane Valve Group; Stockham Division.

d. DeZurik Water Controls.

e. Milwaukee Valve Company

f. Jamesbury, Inc

4. Bronze Lift Check Valves

a. Nibco

b. Crane Co.; Crane Valve Group; Crane Valves.

c. Mueller.

5. Bronze Horizontal Swing Check Valves

a. Nibco

b. Crane Co.; Crane Valve Group; Crane Valves.

c. Mueller

6. Iron Swing Check Valves

a. Nibco

b. Crane Co.; Crane Valve Group; Crane Valves.

c. Mueller

7. Iron Grooved End Swing Check Valves

a. Nibco

b. Crane Co.; Crane Valve Group; Crane Valves.

c. Mueller

8. Bronze Gate Valves

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Stockham Division.

c. Hammond Valve.

d. Milwaukee Valve Company.

e. NIBCO INC.

f. Conbraco Industries, Inc.; Apollo Valves.

9. Iron Gate Valves

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Stockham Division.

c. Hammond Valve.

d. Milwaukee Valve Company.

e. NIBCO INC.

f. Conbraco Industries, Inc.; Apollo Valves.

10. Bronze Globe Valves

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Stockham Division.

c. Hammond Valve.

d. Milwaukee Valve Company.

e. NIBCO INC.

f. Conbraco Industries, Inc.; Apollo Valves.

11. Iron Globe Valves

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Stockham Division.

c. Hammond Valve.

d. Milwaukee Valve Company.

e. NIBCO INC.

f. Conbraco Industries, Inc.; Apollo Valves.

2.2 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.

2. Handwheel: For valves other than quarter-turn types.

3. Hand lever: For quarter-turn valves NPS 6 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

2. Butterfly Valves: With extended neck.

3. Gate Valves: With rising stem.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.

2. Grooved: With grooves according to AWWA C606.

3. Solder Joint: With sockets according to ASME B16.18.

4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45

2.3 BRONZE BALL VALVES

A. Bronze Ball Valves, Three-Piece with Full Port Stainless-Steel Trim:

1. Description:

a. Standard: MSS SP-110.

b. SWP Rating: 150 psig (1035 kPa).

c. CWP Rating: 600 psig (4140 kPa).

d. Body Design: Three piece.

e. Body Material: Bronze.

f. Ends: Threaded.

g. Seats: PTFE.

h. Stem: 316L Stainless steel.

i. Ball: 316L Stainless steel, vented.

j. Port: Full.

2.4 IRON, BUTTERFLY VALVES

A. Class 150B, Iron, Mechanical Joint or Flanged End Butterfly Valves:

1. Description:

a. Standard: ANSI Class 150B tested to 200 psi.

b. Body Material: Coated, cast iron.

c. Mechanical Joint or Flanged end.

d. Stem: Two-piece stainless steel.

e. Disc: Coated, ductile iron.

f. Seal: EPDM.

g. Shaft: 304 stainless steel.

2.5 HIGH-PERFORMANCE BUTTERFLY VALVES

A. Class 150, Single-Flange, High-Performance Butterfly Valves:

1. Description:

a. Standard: ANSI Class 150 lugged design.

b. CWP Rating: 275 psig at 100 deg F.

c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange, double offset design.

d. Body Material: Carbon steel, or stainless steel.

e. Seat: Reinforced PTFE or metal.

f. Stem: Stainless steel; offset from seat plane, one piece stem.

g. Disc: Carbon steel.

h. Service: Bidirectional.

i. Packing: PTFE V-ring.

2.6 BRONZE LIFT CHECK VALVES

A. Class 150, Lift Check Valves with Bronze Disc:

1. Description:

a. Standard: MSS SP-80, Type 1.

b. CWP Rating: 250 psig (1380 kPa) wog.

c. Body Design: Vertical flow.

d. Body Material: ASTM B 61 or ASTM B 584, bronze.

e. Ends: Threaded.

f. Disc: Bronze.

2.7 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Horizontal Swing Check Valves with Bronze Disc:

1. Description:

a. Standard: MSS SP-80, Type 3.

b. CWP Rating: 200 psig.

c. Body Design: Horizontal flow.

d. Body Material: ASTM B 62, bronze.

e. Ends: Threaded.

f. Disc: Bronze.

B. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Description:

a. Standard: MSS SP-80, Type 3.

b. CWP Rating: 300 psig.

c. Body Design: Horizontal flow.

d. Body Material: ASTM B 62, bronze.

e. Ends: Threaded.

f. Disc: Bronze.

2.8 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Description:

a. Standard: MSS SP-71, Type I.

b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.

c. NPS 14 to NPS 24, CWP Rating: 150 psig.

d. Body Design: Clear or full waterway.

e. Body Material: ASTM A 126, gray iron with bolted bonnet.

f. Ends: Flanged.

g. Trim: Bronze.

h. Gasket: Asbestos free.

B. Class 250, Iron Swing Check Valves with Metal Seats:

1. Description:

a. Standard: MSS SP-71, Type I.

b. NPS 2-1/2 to NPS 12, CWP Rating: 500 psig.

c. NPS 14 to NPS 24, CWP Rating: 300 psig.

d. Body Design: Clear or full waterway.

e. Body Material: ASTM A 126, gray iron with bolted bonnet.

f. Ends: Flanged.

g. Trim: Bronze.

h. Gasket: Asbestos free.

2.9 IRON, GROOVED-END SWING CHECK VALVES

A. 300 CWP, Iron, Grooved-End Swing Check Valves:

1. Description:

a. CWP Rating: 300 psig.

b. Body Material: ASTM A 536, ductile iron.

c. Seal: EPDM.

d. Disc: Spring operated, ductile iron or stainless steel.

2.10 BRONZE GATE VALVES

A. Class 125, RS Bronze Gate Valves:

1. Description:

a. Standard: MSS SP-80, Type 2.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.

d. Ends: Threaded or solder joint.

e. Stem: Bronze.

f. Disc: Solid wedge; bronze.

g. Packing: Asbestos free.

h. Handwheel: Malleable iron.

B. Class 150, RS Bronze Gate Valves:

1. Description:

a. Standard: MSS SP-80, Type 2.

b. CWP Rating: 300 psig (2070 kPa).

c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.

d. Ends: Threaded.

e. Stem: Bronze.

f. Disc: Solid wedge; bronze.

g. Packing: Asbestos free.

h. Handwheel: Malleable iron

2.11 IRON GATE VALVES

A. Class 125, OS&Y, Iron Gate Valves:

1. Description:

a. Standard: MSS SP-70, Type I.

b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.

c. NPS 14 to NPS 24, CWP Rating: 150 psig.

d. Body Material: ASTM A 126, gray iron with bolted bonnet.

e. Ends: Flanged.

f. Trim: Bronze.

g. Disc: Solid wedge.

h. Packing and Gasket: Asbestos free.

B. Class 250, OS&Y, Iron Gate Valves:

1. Description

a. Standard: MSS SP-70, Type I.

b. NPS 2-1/2 to NPS 12, CWP Rating: 500 psig.

c. NPS 14 to NPS 24, CWP Rating: 300 psig.

d. Body Material: ASTM A 126, gray iron with bolted bonnet.

e. Ends: Flanged.

f. Trim: Bronze.

g. Disc: Solid wedge.

h. Packing and Gasket: Asbestos free.

2.12 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Description

a. Standard: MSS SP-80, Type 1.

b. CWP Rating: 200 psig.

c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.

d. Ends: Threaded or solder joint.

e. Stem and Disc: Bronze.

f. Packing: Asbestos free.

g. Handwheel: Malleable iron.

2.13 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Description:

a. Standard: MSS SP-85, Type I.

b. CWP Rating: 200 psig.

c. Body Material: ASTM A 126, gray iron with bolted bonnet.

d. Ends: Flanged.

e. Trim: Bronze.

f. Packing and Gasket: Asbestos free.

B. Class 250, Iron Globe Valves:

1. Description:

a. Standard: MSS SP-85, Type I.

b. CWP Rating: 500 psig.

c. Body Material: ASTM A 126, gray iron with bolted bonnet.

d. Ends: Flanged.

e. Trim: Bronze.

f. Packing and Gasket: Asbestos free

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION

A. General: Comply with the ICC IMC, ICC IPC.

1. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

2. Locate valves for easy access and provide separate support where necessary.

3. Install valves in horizontal piping with stem at or above center of pipe.

4. Install valves in position to allow full stem movement.

5. Install chainwheels on operators for butterfly valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

6. Install check valves for proper direction of flow and as follows:

a. Swing Check Valves: In horizontal position with hinge pin level.

b. Lift Check Valves: With stem upright and plumb.

B. If valve applications are not indicated, use the following:

1. Shutoff Service:

a. NPS 2 and Smaller: Ball

b. NPS 2-1/2 and Larger: Butterfly

2. Dead-End Service: Single-flange (lug) type butterfly valves.

3. Throttling Service except Steam: Ball whenever allowable by size, and globe or butterfly if larger required.

4. Pump-Discharge Check Valves:

a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.

b. NPS 2-1/2 and Larger: Iron swing check valves with lever and weight or with spring or iron, center-guided, metal or resilient-seat check valves.

C. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

D. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solderjoint valve-end option is indicated in valve schedules below.

2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.

3. For Copper Tubing, NPS 5 and Larger: Flanged ends.

4. For Steel Piping, NPS 2 and Smaller: Threaded ends.

5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.

6. For Steel Piping, NPS 5 and Larger: Flanged ends.

7. For Grooved-End Copper Tubing and Steel Piping except Steam and Steam Condensate Piping: Valve ends may be grooved.

3.3 LOW TEMPERATURE COLD WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.

2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.

3. Bronze Swing Check Valves: Class 150, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron, Grooved-End Butterfly Valves, NPS 2-1/2 to NPS 12: 175 CWP.

2. High-Performance Butterfly Valves: Class 300, single flange.

3. Iron Swing Check Valves: Class 250, metal seats.

4. Iron, Grooved-End Check Valves, NPS 3 to NPS 12: 300 CWP.

3.4 LOW TEMPERATURE HOT WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.

2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.

3. Bronze Swing Check Valves: Class 150, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron, Grooved-End Butterfly Valves, NPS 2-1/2 to NPS 12: 175 CWP.

2. High-Performance Butterfly Valves: Class 300, single flange.

3. Iron Swing Check Valves: Class 250, metal seats.

4. Iron, Grooved-End Check Valves, NPS 3 to NPS 12: 300 CWP.

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install earthquake valves aboveground outside buildings according to listing.

E. Install anode for metallic valves in underground PE piping.

3.6 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

B. Equipment and all necessary accessories as designated in this section shall include the following.

1. Metal pipe hangers and supports.

2. Trapeze pipe hangers.

3. Metal framing systems.

4. Thermal-hanger shield inserts.

5. Fastener systems.

6. Pipe stands.

7. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.3 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Hangers and Supports for mechanical and plumbing piping shall be in accordance with MSS Standards.

1. MSS SP-58 – Pipe Hangers and Supports – Materials, Design and Manufacturer

2. MSS SP-69 – Pipe Hangers and Supports – Selection and Application

3. MSS SP-89 – Pipe Hangers and Supports – Fabrication and Installation Practices

D. Hangers and Supports for fire protection piping shall be in accordance with NFPA Standards.

E. Provide products which are UL listed and FM approved.

1. NFPA 13 – Standard for the Installation of Sprinkler Systems.

1.4 STANDARD AND REGULATORY REQUIREMENTS

A. All materials, design, fabrication, assembly and test procedures shall be in accordance with the requirements of all applicable codes, standards or regulations having jurisdiction over the work.

B. Reference to any code, standard or regulation shall mean the latest published editions, including addenda, supplements and revisions thereto, which are in effect when the purchase order is awarded.

C. In the event of conflict between codes, standards or regulations, the conflict shall be referred to the Engineer for resolution.

D. The organizations having jurisdiction include, but are not limited to, the following:

1. ANSI American National Standards Institute

2. ASME American Society of Mechanical Engineers

3. ASTM American Society for Testing and Materials

4. AWS American Welding Society

5. AWWA American Water Works Association

6. MSS Manufacturers Standardization Society of the Valve and Fittings Industry

7. NFPA National Fire Protection Association.

8. OSHA Regulations of the Occupations Safety and Health Administration.

9. UL Underwriter's Laboratories Inc.

10. The state, county or municipal laws and regulations governing the location where the equipment is to be installed.

E. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic and fire codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

1.5 SUBMITTALS

A. Design Data: Indicate pipe size. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. Submit data on all materials, accessories and equipment.

B. Manufacturers Installation Instructions: Submit installation instructions for material and equipment.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

E. Shop Drawings - Submit in accordance with Division 1 -General Requirements of these specifications.

1. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for the submitted equipment. The drawings shall further include dimensions from structural elements or architectural grid lines, mounting requirements, and structural supports required for the submitted equipment.

2. Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

a. Trapeze pipe hangers.

b. Metal framing systems.

c. Pipe stands.

d. Equipment supports.

3. All Product Data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories will be a cause for rejection.

4. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

F. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.

2. Design Calculations: Calculate requirements for designing trapeze hangers.

G. Operation and Maintenance Manual:

1. Provide a Complete parts list, operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:

a. Description of system and components.

b. Manufacturer's printed operating instructions.

c. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

d. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

2. Assemble and provide copies of manual in 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

1.6 WARRANTY

A. The Manufacturer shall warrant that all materials and equipment furnished under this contract will be new and of good quality, free from defects in design, workmanship, and materials.

B. Each item of equipment, or part thereof, proving to be defective within the specified period of the warranty shall be replaced, free of defect, without cost to the Owner.

C. The warranty period shall be the Manufacturer's standard warranty period, but not less than a minimum of twelve (12) months after startup, or 18 months after delivery of the equipment at the site (whichever comes first).

D. Warranty shall include materials and labor necessary to correct defects.

E. Defects shall include, but not be limited to noisy, rough, or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

F. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers, subject to compliance with requirements of this specification, are as follows:

1. Supports, General

a. Anvil

b. Cooper B-Line, Inc.

c. Atkore Power-Strut.

d. Superstrut

e. Atkore Unistrut Corporation.

2. Metal Framing Systems

a. Allied Tube & Conduit.

b. Cooper B-Line, Inc.

c. Atkore Power-Strut.

d. Atkore Unistrut Corporation.

3. Thermal Hanger Shields Inserts

a. Carpenter & Paterson, Inc.

b. Clement Support Services.

c. National Pipe Hanger Corporation.

d. PHS Industries, Inc.

e. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.

f. Piping Technology & Products, Inc.

g. Rilco Manufacturing Co., Inc.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components, coated.

2. Galvanized Metallic Coating: Hot dip galvanized.

3. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel with either electro-plated zinc or hot dipped galvanized finish.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper, factory-fabricated components.

2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

C. Stainless Steel Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, stainless steel, factory-fabricated components.

2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop or field-fabricated pipe-support assembly made from structural hot-dip galvanized, carbon-steel shapes with MSS SP-58 hot-dip galvanized or electro-coated zinc, carbon-steel hanger rods, nuts, saddles, and U-bolts. If used, they cannot impede serviceability of equipment.

B. See delegated design requirements in 1.4 above.

2.4 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.

2. Standard: MFMA-4.

3. Channels: Continuous slotted steel channel with in-turned lips.

4. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

6. Metallic Coating: Hot dip galvanized or electroplated zinc.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.7 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

2. Base: Stainless steel.

3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous thread rods.

4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

2. Bases: One or more; plastic.

3. Vertical Members: Two or more protective-coated-steel channels.

4. Horizontal Member: Protective-coated-steel channel.

5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon steel shapes, with hot dip galvanized coating.

2.9 MISCELLANEOUS MATERIALS AND REQUIREMENTS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and hot dip galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi, 28-day compressive strength.

a. Hangers are required to be specific to pipe and ductwork independently and not shared.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers. Multiple, stacked trapezes are not allowed.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Supports and hangers shall not interfere with equipment access.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, strainers, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

O. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

b. NPS 4: 12 inches long and 0.06 inch thick.

c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

7. Un-insulated Piping:

a. Where insulation is not required, use similar metal hangers such as copper hangers for copper piping, stainless steel for stainless steel piping, etc.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

5. Re-galvanize if galvanizing affected.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099100 "Painting"."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use coated carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

E. Use copper pipe hangers and copper attachments for copper piping and tubing. Likewise for stainless steel piping and tubing, use stainless steel hangers.

F. Use padded hangers for piping that is subject to scratching.

G. Use thermal-hanger shield inserts for insulated piping and tubing.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30.

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.

3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.

5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated, stationary pipes NPS 3/4 to NPS.

7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.

8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.

9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.

10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 8.

11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 3.

12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.

13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.

15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.

16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.

19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

6. C-Clamps (MSS Type 23): For structural shapes.

7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.

10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.

11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.

    b. Medium (MSS Type 32): 1500 lb.

    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.

2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.

3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.

4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.

5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.

8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

a. Horizontal (MSS Type 54): Mounted horizontally.

b. Vertical (MSS Type 55): Mounted vertically.

c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

P. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.7 HANGER SUPPORT INSTALLATION

A. Hanger Spacing: Provide hangers at minimum spacing in accordance with Chapter 41, ASHRAE Guide and as follows:

1. Steel Pipe, Copper Tubing: For straight runs of horizontal piping with no concentrated loads such as valves, flanges, expansion joints, or other components. Sections of piping with concentrated loads will have to be considered carefully and a determination made as to appropriate spacing and rod size for the given situation.

Pipe Size	Max. Span Steel	Max. Span Copper	Rod Size
1" and smaller	7 feet	5 feet	3/8"
1-1/4" to 2"	8 feet	8 feet	3/8"
2-1/2" to 3"	11 feet	9 feet	1/2"
4" to 5"	14 feet	10 feet	1/2"
6"	17 feet	12 feet	5/8"
8"	19 feet	14 feet	7/8"
10"	20 feet	N/A	7/8"
12"	20 feet	N/A	7/8"
14"	20 feet	N/A	1"
16"	20 feet	N/A	1"
18"	20 feet	N/A	1 1/4"
20"	20 feet	N/A	1 1/4"
24"	20 feet	N/A	1 1/2"

B. Install seismic restraints on piping as required.

END OF SECTION

SECTION 23 11 23

FACILITY NATURAL GAS PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

B. Fuel gas systems, including piping, equipment and all necessary accessories as designated in this section shall include the following.

1. Natural gas piping buried.

2. Natural gas piping above grade.

3. Unions and flanges.

4. Strainers.

5. Natural gas pressure regulators.

6. Natural gas pressure relief valves.

7. Underground pipe markers.

8. Bedding and cover materials.

1.2 QUALITY ASSURANCE

A. Manufacturer's Representative:

1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out and start up.

B. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

D. Pipe Fusion Qualifications: Qualify procedures according to ASTM

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.3 STANDARD AND REGULATORY REQUIREMENTS

A. All materials, design, fabrication, assembly and test procedures shall be in accordance with the requirements of all applicable codes, standards or regulations having jurisdiction over the work.

B. Reference to any code, standard or regulation shall mean the latest published editions, including addenda, supplements and revisions thereto, which are in effect when the purchase order is awarded.

C. In the event of conflict between codes, standards or regulations, the conflict shall be referred to the Engineer for resolution.

D. The organizations having jurisdiction include, but are not limited to, the following:

1. AGA American Gas Association
2. ANSI American National Standards Institute
3. ASME American Society of Mechanical Engineers
4. ASTM American Society for Testing and Materials
5. AWS American Welding Society
6. AWWA American Water Works Association
7. MSS Manufacturers Standardization Society of the Valve and Fittings Industry
8. NFPA National Fire Protection Association.
9. OSHA Regulations of the Occupations Safety and Health Administration.
10. UL Underwriter's Laboratories Inc.
11. The state, county or municipal laws and regulations governing the location where the equipment is to be installed.

E. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic and fire codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

1.4 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, provide compatible system components and joints.

B. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges, or couplings downstream of valves and at equipment connections. Do not use direct welded connections to valves, equipment.

C. Provide pipe hangers and supports in accordance with other sections.

D. Use plug, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

1.5 SUBMITTALS

A. Design Data: Indicate pipe size. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. Submit data on all materials, fittings, accessories and equipment.

B. Manufacturers Installation Instructions: Submit installation instructions for material and equipment.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

E. Shop Drawings - Submit in accordance with Division 1 -General Requirements of these specifications.

1. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for the submitted equipment. The drawings shall further include dimensions from structural elements or architectural grid lines, operational clearances, locations of any utility service connection points, mounting requirements, and structural supports required for the submitted equipment.

2. Provide product data for each type of the following:

a. Piping.

b. Fittings.

c. Joints.

d. Piping specialties.

e. Corrugated, stainless-steel tubing with associated components.

f. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.

g. Pressure regulators. Indicate pressure ratings and capacities.

h. Service meters including supports.

i. Mechanical sleeve seals.

j. Escutcheons.

k. Supports.

l. Remote meter reading accessories.

m. Seismic gas shut off valves.

3. All Product Data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories will be a cause for rejection.

4. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

F. Seismic-Design Submittal: Provide for natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.

2. Design Calculations: Calculate requirements for selecting seismic restraints.

G. Operation and Maintenance Manual:

1. Provide a Complete parts list, operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:

a. Description of system and components.

b. Manufacturer's printed operating instructions.

c. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

d. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

2. Assemble and provide copies of manual in 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

1.6 WARRANTY

A. The Manufacturer shall warrant that all materials and equipment furnished under this contract will be new and of good quality, free from defects in design, workmanship, and materials.

B. Each item of equipment, or part thereof, proving to be defective within the specified period of the warranty shall be replaced, free of defect, without cost to the Owner.

C. The warranty period shall be the Manufacturer's standard warranty period, but not less than a minimum of twelve (12) months after startup, or 18 months after delivery of the equipment at the site (whichever comes first).

D. Warranty shall include materials and labor necessary to correct defects.

E. Defects shall include, but not be limited to noisy, rough, or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

F. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating and protect from direct sunlight.

D. Protect stored PE pipes and valves from direct sunlight.

1.8 LABELING

A. Manufacturer shall securely attach in a prominent location on each major item of equipment a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (U.L.), or other National Recognized Testing Laboratory (NRTL), in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers, subject to compliance with requirements of this specification, are as follows:

1. Strainers

a. Mueller Steam Specialty.

b. O.C. Keckley Company.

c. Spirax Sarco, Inc.

2. Natural Gas Pressure Regulators

a. Emerson Fisher.

b. Sensus Equimeter.

c. American Meter.

d. Maxitrol.

3. Natural Gas Relief Valves

a. Emerson Fisher.

b. American Meter.

c. Or Approved Equal

4. Dielectric Unions

a. Capitol Manufacturing Company.

b. Central Plastics Company.

c. Hart Industries International, Inc.

d. McDonald, A. Y. Mfg. Co.

e. Watts Regulator Co.; Division of Watts Water Technologies, Inc.

f. Wilkins; Zurn Plumbing Products Group.

5. Dielectric Flange Kits

a. Advance Products & Systems, Inc.

b. Calpico Inc.

c. Central Plastics Company.

d. Pipeline Seal and Insulator, Inc.

e. Or approved equal.

6. Main Shut-off Valves

a. Nordstrom.

b. Fisher

c. Dresser Industries Inc.

d. Walworth Company

e. Grinnel

7. Ball Valves

a. Apollo.

b. Contromatics.

c. Conbraco

d. NIBCO

8. Bronze Plug Valves

a. Hammond.

b. Lee Brass Company.

c. McDonald.

d. NIBCO.

9. Cast Iron Non-Lubricated Plug Valves

a. McDonald.

b. Mueller Co.

c. Xomox Corporation.

10. Cast Iron Lubricated Plug Valves

a. Nordstrom.

b. Fisher

c. Dresser Industries Inc.

d. Walworth Company

11. Earthquake Valves

a. Pacific Seismic Products, Inc.

b. Quake Defense, Inc.

c. Strand Earthquake.

12. Gas Safety Shut-off Valves

    a. Maxon Corporation.

    b. Or Approved Equal.

2.2 NATURAL GAS PIPING, BURIED

A. Pipe: Black steel, ASTM A53/A53M, Schedule 40. Shop-applied pipe coating shall be one of the following types:

1. Coal Tar Enamel Coating: Exterior of pipe and fittings shall be cleaned, primed with Type B primer and coated with hot-applied coal tar enamel with bonded layer of felt wrap in accordance with AWWA C203. Asbestos felt shall not be used; felt material shall be fibrous glass mat in accordance with AWWA C203.

B. Holiday Inspections: Procedure for holiday inspection: Holiday Inspection shall be conducted on all coatings to determine the presence and number of discontinuities in those coatings using an applicable NACE standard such as SP0274 or SP0490 in the case thermosetting epoxy coating. Holiday Detectors shall be calibrated and supplied with a certificate of calibration from the factory. A calibration of the Holiday Detector shall be performed once every 6 months to verify output voltages are true and correct.

C. Steel Fittings:

1. Butt weld fittings, wrought steel, ASME B16.9.

2. Socket weld and threaded fittings forged steel, ASME B16.11.

3. Grooved End: Ductile iron (ASTM A536, Grade 65-45-12), malleable iron (ASTM A47/A47M, Grade 32510), or steel (ASTM A53/A53M, Type F or Type E or S, Grade B).

D. Steel Joints: Welded, ASME B31.8.

E. Thermoplastic (Polyethylene PE): PE pipe and heat fusion fittings shall conform to ASTM D2513, SDR 11 and manufactured for 125 psig working pressure. Pipe and fittings shall have heat fusion joints PE pipe and fitting materials for heat fusion shall be compatible to ensure uniform melting and a proper bond.

F. Fittings:

1. Socket Fusion Fittings: ASTM D2683.

2. Butt Fusion Fittings: ASTM D3261, molded and matching pipe dimensions.

G. Risers: Manufacturer's standard anodeless type riser, transition from plastic to steel pipe with fusion bonded epoxy coating. Inlet connection socket or butt weld or swaged gas tight construction with O ring seals, metal insert, and protective sleeve. Outlet or above ground connection end shall be threaded or flanged. Riser shall comply with ASTM A53/A53M, Type F and E, Grade A, Schedule 40.

H. Polyethylene ball valves, ASME B16.40 shall be manufactured and rated for underground gas service. Operating pressure to 125 psig. Valve shall be maintenance and corrosion free. Polyethylene valves shall be full port opening type. Valves shall be wrench operated. Wrench operated valves shall have a 2 inch square adaptor securely fastened to the valve stem. Polyethylene valves shall be installed by butt fusion method.

2.3 NATURAL GAS PIPING, ABOVE GRADE

A. Pipe: Black steel, ASTM A53/A53M, Schedule 40.

B. Nipples: Steel, ASTM A733, Schedule 40.

C. Fittings:

1. 2 inch under ASME B16.3 threaded malleable iron.

2. 2 inch and up to 4 inch ASME B16.11 socket welded.

3. 4 inch ASME B16.9 butt welded.

D. Joints: Provide welded or threaded joints.

E. Threaded Metallic Joints: Threaded joints in metallic pipe shall have tapered threads evenly cut. Metal screwed pipe joints shall be made leak-tight by applying pipe thread sealant to all threaded joints. Care must be taken to prevent the pipe dope compound from getting inside the internal pipeline. Teflon tape type sealant is prohibited.

2.4 PIPING

A. Inside steel piping:

1. For low pressure 0.5 psig or less use standard weight black steel pipe with 150 psig threaded malleable iron fittings for piping 4 in. and smaller.

2. For pressure above 5 psig, all piping shall be welded.

B. Underground piping:

1. Steel pipe with Dresser type and steel welding fittings. Pre-wrap with Mill-wrapped corrosion protection extruded polyolefin coating in accordance with Gas Company requirements, equal to Energy Coating Co. or PlexCo.

2. High density polyethylene pipe and fittings in accordance with ASTM D-2513, Grades 2306, 3306, and 3408 with fusion joints only, equal to Driscopipe 8100-DRII Series.

C. Underground drips shall be AGA and local gas company approved and shall be cast iron or tar coated welded steel pots with adjustable tar coated cast iron extension shaft and flush box with lock type extra heavy cast iron cover marked GAS DRIP.

D. In no case shall any gas pipe be less than ¾ inch.

2.5 REGULATOR VENT PIPING, ABOVE GRADE

A. Indoors: Same as natural gas piping, above grade.

B. Outdoors: PVC pipe, tubing, and fittings, UL 651.

2.6 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:

1. Ferrous Piping: Class 150, malleable iron, threaded.

2. Copper Piping: Class 150, bronze unions with soldered brazed joints.

B. Flanges for Pipe 2-1/2 inches and Larger:

1. Ferrous Piping: Class 150, forged steel, slip-on flanges.

2. Copper Piping: Class 150, slip-on bronze flanges.

3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.7 STRAINERS

A. 2 inch and Smaller: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

B. 2-1/2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

C. 5 inch and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.8 NATURAL GAS PRESSURE REGULATORS

A. Product Description: Spring loaded, general purpose, self-operating service regulator including internal relief type diaphragm assembly and vent valve. Diaphragm case can be rotated 360 degrees in relation to body.

1. Comply with ANSI Z21.80.

2. Temperatures: minus 20 degrees F to 150 degrees F.

3. Body: Cast iron with neoprene gasket.

4. Spring case, lower diaphragm casing, union ring, seat ring and disk holder: Aluminum.

5. Disk, diaphragm, and O-ring: Nitrile.

6. Minimum Inlet Pressure: 5 psi.

7. Furnish sizes 2 inches and smaller with threaded ends. Furnish sizes 2-1/2 inches and larger with flanged ends.

B. Service Pressure Regulators: Comply with ANSI Z21.80.

1. Body and Diaphragm Case: Cast iron or die-cast aluminum.

2. Springs: Zinc-plated steel; interchangeable.

3. Diaphragm Plate: Zinc-plated steel.

4. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.

5. Orifice: Aluminum; interchangeable.

6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.

7. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.

8. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.

9. Overpressure Protection Device: Factory mounted on pressure regulator.

10. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.

11. Maximum Inlet Pressure: 60 psig.

2.9 NATURAL GAS PRESSURE RELIEF VALVES

A. Product Description: Spring loaded type relief valve.

1. Body: Aluminum.

2. Diaphragm: Nitrile.

3. Orifice: Stainless steel.

4. Maximum operating temperature: 150 degrees F.

5. Inlet Connections: Threaded.

6. Outlet or Vent Connection: Same size as inlet connection.

2.10 UNDERGROUND LABELING

A. Detectable Warning Tape: Acid and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a

protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

2.11 DIELECTRIC FITTINGS

A. Provide dielectric couplings or unions between ferrous and non-ferrous pipe.

B. Dielectric Unions:

1. Minimum Operating-Pressure Rating: 150 psig.

2. Combination fitting of copper alloy and ferrous materials.

3. Insulating materials suitable for natural gas.

4. Combination fitting of copper alloy and ferrous materials with threaded, brazed joint, plain, or welded end connections that match piping system materials.

C. Dielectric-Flange Kits:

1. Minimum Operating-Pressure Rating: 150 psig.

2. Companion-flange assembly for field assembly.

3. Include flanges, full-face or ring-type neoprene or phenolic gasket, phenolic or PE bolt sleeves, phenolic washers, and steel backing washers.

4. Insulating materials suitable for natural gas.

5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.12 GAS VENT TERMINALS

A. ¾ in. and one (1) in. aluminum threaded vent terminal with 16 x 16 mesh 0.018 gauge stainless steel screen.

B. 1¼ in. to 4 in. standard pipe threaded elbow with 12 x 12 mesh stainless steel screen.

1. Equal to Upsco Inc.

C. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.

2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.

3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

   a. Material Group: 1.1.

   b. End Connections: Threaded or butt welding to match pipe.

   c. Lapped Face: Not permitted underground.

   d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.

   e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

   a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

2.13 VALVES

A. Manual Shut-off Valves Inside Building.

1. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

   a. CWP Rating: 125 psig.

   b. Threaded Ends: Comply with ASME B1.20.1.

   c. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.

   d. Tamperproof Feature: Locking feature for valves where required by the SDG&E.

   e. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.

   f. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

   g. Threaded cast iron body, 125 PSIG WOG.

2. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

   a. CWP Rating: 125 psig.

   b. Flanged Ends: Comply with ASME B16.5 for steel flanges.

c. Tamperproof Feature: Locking feature for valves where required by Con. Ed.

d. Service Mark: Initials "WOG" shall be permanently marked on valve body.

e. 2½ in. to 4-in.: Flanged cast iron body lubricated tapered plug type, 175 psig WOG.

f. 6 in. and larger: Flanged cast iron body lubricated tapered plug type, 200 psig WOG, worm gear operated.

3. Provide 2 wrenches for each size used.

a. Attach wrench to each valve.

B. Ball Valves

1. On local branches three inches and smaller, provide threaded three piece full port wafer-type ball valve with bronze body, ball stem, Teflon seats, and level handles, 300 psig WOG.

C. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. 2 inch and smaller: Threaded brass ball valves with full port TFE sears and blowout proof stem, 600 psig WOG.

2. Body: Bronze, complying with ASTM B 584.

3. Ball: Chrome-plated bronze.

4. Stem: Bronze; blowout proof.

5. Seats: Reinforced TFE; blowout proof.

6. Packing: Threaded-body packnut design with adjustable-stem packing.

7. Ends: Threaded, flared, or socket.

8. CWP Rating: 600 psig.

9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Bronze Plug Valves: MSS SP-78.

1. Body: Bronze, complying with ASTM B 584.

2. Plug: Bronze.

3. Ends: Threaded, socket, or flanged.

4. Operator: Square head or lug type with tamperproof feature where indicated.

5. Pressure Class: 125 psig.

6. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

7. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Cast-Iron, Non-lubricated Plug Valves: MSS SP-78.

1. Body: Cast iron, complying with ASTM A126, Class B.

2. Plug: Bronze or nickel-plated cast iron.

3. Seat: Coated with thermoplastic.

4. Stem Seal: Compatible with natural gas.

5. Ends: Threaded or flanged as indicated.

6. Operator: Square head or lug type with tamperproof feature where indicated.

7. Pressure Class: 125 psig.

8. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Cast Lubricated Plug Valves Inside Building:

1. 2-inch and smaller: Cast iron body, threaded, equal to Nordstrom Valves, Inc. Figure 114.

2. 2½ inch to 4-inch: Flanged cast iron body lubricated tapered plug type, 175 psig WOG, equal to Nordstrom Valves, Inc. Figure 115.

3. 6 inch and larger: Flanged cast iron body lubricated tapered plug type, 200 psig WOG, worm gear operated, equal to Nordstrom Valves, Inc. Figure 165.

4. Valves 2 ½ inch and larger shall be flanged.

5. Provide 2 wrenches for each size used.

6. Attach wrench to each valve.

7. Gas Cocks:

a. Gas cocks shall be for use only as manual gas shut-off valves at each piece of gas burning equipment; shall be of the plug type, bronze construction with check, nut and washer bottom and tee handle.

b. Gas cocks shall be Figure 10596 as manufactured by A.Y. McDonald Mfg. Co., or Series 52 as manufactured by Conbraco Industries, Inc.

c. Gas cocks shall only be used on piping 1 inch and smaller.

G. Valves Underground (Curb Type)

1. Provide welding end steel body tapered lubricated plug type with iron plug high head extension.

a. 2 inch to 4 inch: 200 psig WOG, equal to Nordstrom No. 1943.

b. 6 inch and larger: 275 psig WOG, equal to Nordstrom No. 4185.

2. Provide with adjustable tar coated cast iron extension shaft and flush box with lock type extra heavy cast iron cover marked GAS. Provide two operating wrenches.

H. Valve Boxes:

1. Cast-iron, two-section box. Each cast iron box shall be given a heavy coat of bituminous paint.

2. Top section with cover with "GAS" lettering.

3. A metal tag or label shall be installed on top or inside of each valve box lid. The tag shall designate the appropriate location number, valve size, and other pertinent information.

4. Bottom section with base to fit over valve and barrel a minimum of 5 inches in diameter.

5. Adjustable cast-iron extensions of length required for depth of bury.

6. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.14 EARTHQUAKE VALVES

A. Earthquake Valves: Comply with ASCE 25.

1. Listing: Listed and labeled by the an NRTL acceptable to authorities having jurisdiction.

2. Maximum Operating Pressure: 60 psi.

3. Cast-aluminum body with stainless-steel internal parts.

4. Nitrile-rubber, reset-stem o-ring seal.

5. Valve position, open or closed, indicator.

6. Composition valve seat with clapper held by spring or magnet locking mechanism.

7. Level indicator.

8. End Connections: Threaded for valves NPS 2 inches and smaller; flanged for valves NPS 2-1/2 inches and larger.

2.15 GAS SAFETY SHUTOFF VALVES

A. Gas safety shut-off valves shall be FM & UL listed, electric motor operated, normally closed, manual reset type. Valves shall be rising stem design with a straight through flow path with metal-to-metal seat and disc arrangement. The valve seat shall be stainless steel and the disc ductile iron. Valves shall be provided with a NEMA 4 enclosure modified for Class I, Division II hazardous locations, be provided with an electrical terminal block and shall operate on 120 V AC., 60 Cycles, single phase. Valves shall meet ANSI Class VI leakage standard and shall be provided with a visual indicator to note the position of the valve whether "OPEN" or "SHUT".

B. Gas safety shut-off valves 2 inches and smaller shall be threaded, 2 1/2 inches and larger shall be flanged. Flanged valves shall be provided with companion flange set by valve manufacturer.

C. Gas safety shut-off valves shall be installed in the following locations:

1. On the firm gas line downstream of its meter and before any branch take-offs.

D. Gas safety shut-off valves shall be wired to the gas leak detection system and shall function to shut off all gas supply to the building upon:

1. Action of the gas leak detection system (alarm condition), and,

2. Loss of normal electrical power.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect delivered equipment for damage from shipping and exposure to weather. Compare delivered equipment with packing lists and specifications to assure receipt of all items.

3.2 INSTALLATION

A. General: Comply with the ICC IFGC, ICC IPC and the following:

1. Install branch piping for fuel gas and connect to all fixtures, valves, cocks, outlets, casework, cabinets and equipment, including those furnished by the Government or specified in other sections.

2. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe, shall be reamed to full size after cutting.

3. All pipe runs shall be laid out to avoid interference with other work.

4. Install valves with stem in horizontal position whenever possible. All valves shall be easily accessible.

5. Install union and shut-off valve on pressure piping at connections to equipment.

6. Pipe Hangers, Supports and Accessories:

   a. All piping shall be supported per the ICC IFGC.

   b. Shop Painting and Plating: Hangers, supports, rods, inserts and accessories used for Pipe supports shall be shop coated with red lead or zinc Chromate primer paint. Electroplated copper hanger rods, hangers and accessories may be used with copper tubing.

   c. Floor, Wall and Ceiling Plates, Supports, Hangers:

      1) Solid or split unplated cast iron, chrome plated in finished areas.

      2) All plates shall be provided with set screws.

      3) Pipe Hangers: Height adjustable clevis type.

      4) Adjustable Floor Rests and Base Flanges: Steel.

      5) Concrete Inserts: "Universal" or continuous slotted type.

      6) Hanger Rods: Mild, low carbon steel, fully threaded or Threaded at each end with two removable nuts at each end for positioning rod and hanger and locking each in place.

      7) Riser Clamps: Malleable iron or steel.

      8) Rollers: Cast iron.

      9) Self-drilling type expansion shields shall be "Phillips" type, with case hardened steel expander plugs.

      10) Miscellaneous Materials: As specified, required, directed or as noted on the drawings for proper installation of hangers, supports and accessories.

7. Install cast chrome plated escutcheon with set screw at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.

8. Penetrations:

   a. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING. Completely fill and seal clearances between piping and openings with the fire stopping materials.

b. Waterproofing: At floor penetrations, completely seal clearances around the pipe and make watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.

B. Fuel gas piping shall conform to the following:

1. Entire fuel gas piping installation shall be in accordance with requirements of NFPA 54.

2. Provide fuel gas piping with plugged drip pockets at low points.

3. Seismic Data: Refer to Division 13 and Contract Drawings. Install automatic shutoff valve (earthquake valve) on discharge side of meter. Valve shall positively shut off supply of gas in case of pressure failure, remain shut off until manually reopened, and be provided with outside adjustment for reset.

C. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government

D. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

E. Remove scale and dirt, on inside and outside, before assembly.

F. Prepare piping connections to equipment with flanges or unions.

G. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

H. Field verify that connection to existing piping systems sizes, locations, and invert are as required.

I. Establish elevations of buried piping with not less than allowed per code.

J. Establish minimum separation of from other piping services in accordance with code.

3.3 NATURAL GAS SYSTEM INSTALLATION

A. Install piping free from traps and with drain pocket consisting of nipple and cap at low points for inside building and drip pot for underground piping.

B. Install shut-off valves at connection to each piece of equipment. Provide union or right and left nipple and coupling at equipment side of individual shut-off valve.

C. Install strainers on high pressure side of pressure reducing valves, on inlet side of indicating and control instruments and equipment subject to sediment damage and where shown on drawings. Strainer element shall be removable without disconnection of piping.

D. Install gas meter in a well ventilated and accessible location. Gas meter room (3 hr. rated enclosure) with explosion-proof fixtures.

E. Threaded Joints:

1. Make-up joints with U.L. listed gas resistant Teflon tape or Teflon paste, suited for gas piping.

F. Provide a two elbow-swing on all branches taken from a riser.

G. Provide valve tags for piping systems indicating the operating system pressure.

H. Color code piping at different pressures within the gas meter room. Paint fifteen (15) to five (5) psi system brown and reduced pressure piping yellow.

I. Welders must be qualified in accordance with either API 1104 or ASME IX Boiler and Pressure Vessel Code and as required by local code.

J. Provide sign on the exterior of the gas meter door shall be provided with bold lettering at least 1 in. high and properly spaced with lettering and background in contrasting colors reading “Gas Meter Room - No Storage Permitted.”

K. Support horizontal gas piping as follows:

1. ½ in. - 6 ft. on center.

2. ¾ in. or 1 in. - 8 ft. on center.

3. 1¼ in. or larger - 10 ft. on center.

4. Vertical piping at every floor.

L. Provide remote meter reading communication wiring to connect to building automation system. Wire gauge per manufacturer recommendation for distance required.

3.4 PIPING INSTALLATION, OUTDOOR

A. Comply with NFPA 54 Fuel Gas Code for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least 22 inches below finished grade as required.

1. If natural-gas piping is installed less than 72 inches below finished grade, install it in ductile iron pipe containment conduit.

2. Coordinate with site paving contractor for finished grade location.

3. Protect exterior underground pipe from damage due to heavy equipment traffic during construction.

C. Install underground, PE, natural-gas piping according to ASTM D2774.

3.5 PIPING INSTALLATION, INDOOR

A. Comply with NFPA 54 Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

1. Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.

c. Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.

d. Piping in Unfinished Service Spaces: One-piece, stamped-steel type with set screw.

e. Piping in Equipment Rooms: One-piece, cast-brass type.

f. Piping in Equipment Rooms: One-piece, stamped-steel type with set screw.

g. Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

H. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials as required.

I. Verify final equipment locations for roughing-in.

J. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

K. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

L. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

M. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

N. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.

2. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

a. Exception: Tubing passing horizontally through partitions or walls does not require striker barriers.

3. Prohibited Locations:

a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or ventilating ducts, or dumbwaiter or elevator shafts.

b. Do not install natural-gas piping embedded in concrete walls or partitions.

O. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

P. Connect branch piping from top or side of horizontal piping.

Q. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

R. Do not use natural-gas piping as grounding electrode.

S. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

T. Install pressure gauge upstream and downstream from each line regulator as required.

3.6 UTILITY SERVICE METER INSTALLATION

A. Install service-meter assemblies aboveground, on concrete bases.

B. Install metal shutoff valves upstream from service regulators.

C. Install strainer on inlet of service-pressure regulator and meter set.

D. Install service regulators mounted outside with vent outlet horizontal or facing down. Install screen in vent outlet if not integral with service regulator.

E. Install metal shutoff valves upstream from service meters.

F. Install service meters downstream from pressure regulators.

G. Install metal bollards to protect meter assemblies as required.

H. Install meters on full size gas headers.

3.7 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install earthquake valves aboveground outside buildings according to listing.

E. Install anode for metallic valves in underground PE piping.

3.8 HANGER & SUPPORT INSTALLATION

A. Install seismic restraints on piping as required.

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.

2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.

3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.

5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

C. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.

2. NPS 1/2: Maximum span, 72 inches; minimum rod size, 3/8 inch.

3. NPS 3/4 and Larger: Maximum span, 96 inches; minimum rod size, 3/8 inch

3.9 IDENTIFICATION

A. Identify new natural gas piping systems in accordance with requirements for CSA-B149.1.

B. Above ground natural gas piping to be primed and painted yellow along its entire length. All below ground propane piping to be covered with plastic yellow identification marker tape suitable for direct burial.

C. Supply and install "Natural Gas" pipe identification markers along length of natural gas piping installation in accordance with CSA-B149.1 and Section 23 05 53 01 - Mechanical Identification. Maximum spacing along straight length of pipe to be 20 feet.

D. Maintain minimum depth of burial of underground natural gas piping of 24 inches, unless otherwise noted.

3.10 TESTING

A. General: Test system either in its entirety or in sections after system is installed or cleaned.

B. Test shall be made in accordance with the International Fuel Gas Code. The system shall be tested at a minimum of 1.5 times maximum working pressure, but not less than 3 psig.

C. Comply with requirements of the local Authority Having Jurisdiction and the California Fuel Gas Code.

D. Minimum test pressure shall be 10 psi and test shall show no drop in pressure. Test duration shall not be less than 30 minutes in duration.

E. Record test pressure over the duration of the test with an automatic recording/printing gauge.

F. System Purging: After completing pressure tests, and before testing a gas-contaminated line, purge line with nitrogen at junction with main line to remove all air and gas. Clear completed line by attaching a test pilot fixture at capped stub-in line at building location and let gas flow until test pilot ignites. Procedures shall conform to NFPA 54 and ASME B31.8.

3.11 CLEANING

A. Clean all piping systems to remove all dirt, coatings and debris. Remove all valves, controls etc., and reinstall after piping system has been cleaned.

END OF SECTION

SECTION 26 05 05

GENERAL PROVISIONS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals shown, specified, and required to complete the electrical Work.

2. Contractor shall be responsible for all electrical demolition.

3. Common electrical installation requirements

B. Coordination:

1. Review installation procedures and schedules under other Specification Sections and coordinate with other trades the installation of electrical items that will be installed with or within formwork, walls, partitions, ceilings, panels, and site work.

2. Coordinate arrangement, mounting, and support of electrical equipment:

a. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

b. To provide for ease of disconnecting the equipment with minimum interference to other installations.

c. To allow right of way for piping and conduit installed at required slope.

d. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

3. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

4. Coordination and Intent of Electrical Drawings:

a. Dimensions on Drawings related to equipment are based on equipment of certain manufacturers. Verify the dimensions of equipment furnished to space available at the Site and allocated to the equipment.

b. Drawings show the principal elements of the electrical Work, and are not intended as detailed working drawings for the electrical Work. Drawings supplement and complement the Specifications and other Contract Documents relative to principal features of electrical systems.

c. Equipment and devices provided under this Contract shall be properly connected and interconnected with other equipment and devices for successful operation of

complete systems, whether or not all connections and interconnections are specifically mentioned or shown in the Contract Documents.

d. Drawings are provided for Contractor's guidance in fulfilling the intent of the Contract Documents. Contractor shall comply with Laws and Regulations, including safety and electrical codes, and provide materials, equipment, appurtenances, and specialty items necessary for complete and operable systems.

5. Obtain from Owner record drawings required to execute the Work.

6. Field Coordination:

a. Provide materials, equipment, and services to interface with existing circuits. Field-verify system and equipment requirements prior to modifying existing systems.

b. Coordinate the interface of equipment with field condition and Engineer.

c. Field-compare existing starter and panel control circuit terminations from record documents with existing circuits.

d. Field-trace existing circuits as required to interface the equipment provided.

e. Field-identify terminations for starters and panel controls for follow function for re-connection.

C. Area Classifications:

1. Materials, equipment, and incidentals shall be suitable for the area classification(s) shown, specified, and required.

2. Wet Locations: Comply with NEC and NEMA requirements for wet locations. Enclosures in wet locations shall be stainless steel and comply with NEMA 4X unless specified otherwise.

3. Corrosive Locations: Comply with NEC and NEMA requirements for corrosive locations. Enclosures in corrosive locations shall be stainless steel and conform to NEMA 4X requirements unless specified otherwise.

4. Hazardous Locations: Comply with NEC requirements for the Class and Division designated.

5. Dusty Locations: Indoor areas not designated as hazardous, corrosive, or wet are dusty locations. Comply with NEC and NEMA 12 requirements unless specified otherwise.

1.2 QUALITY ASSURANCE

A. Qualifications:

1. Electrical Subcontractor:

a. Electrical Subcontractor shall possess a valid electricians' and contractors' license in the jurisdiction where the Site is located.

b. If requested by Engineer, submit the following information for not less than three successful, completed projects: project name and location; year completed; name and contact information for: prime Contractor for whom electrical Subcontractor worked, project Owner, and project Engineer or architect, including addresses and telephone numbers.

2. Wiring Coordination:

a. Contractor shall be responsible for preparing complete point-to-point interconnection wiring diagrams. Diagrams shall identify all external interconnecting wiring associated with new or modified existing equipment.

b. Develop diagrams for performing the Work and to document terminations. Prepare diagrams in accordance with this Section and the example wiring diagram accepted by Engineer. Diagrams are in addition to loop diagrams required in Section 40 61 13, Process Control Systems General Provisions.

B. Component Supply and Compatibility:

1. Materials and equipment similar to each other shall be from the same manufacturer for uniformity.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Method of Delivery

1. If delivery is by truck, Bidder shall specify the anticipated type of vehicle: box truck, van, flatbed, stake bed, semitrailer, etc.

2. Bidder shall include information regarding special conditions such as over-sized dimensions or heavy axial loading.

B. Delivery Off-Loading

1. Bidder shall describe the off-loading process at the point of delivery including equipment requirements such as, but not limited to, powered-lift gate, fork-lift, crane (lift hooks, slings, spreaders, etc.).

2. Bidder shall include the time allowed for off-loading.

C. Installation

1. Bidder shall provide a full description of installation and assembly services provided by Bidder, including manpower, and an inclusive list of trades to be provided by Purchaser to complete the installation and assembly process.

1.4 SUBMITTALS

A. Action Submittal. Submit the following:

1. Product Data

a. Electrical Systems - Product Data

1) Manufacturer's name and product designation or catalog number.

2) Electrical ratings.

3) Manufacturer’s technical data and specifications.

4) Manufacturer’s indication of compliance with applicable reference standards.

5) Painting and coating systems proposed.

2. Shop Drawings

a. Internal Wiring Diagram and Drawings

1) Must indicate all connections to components and numbered terminals for external connections.

b. Dimensioned Plan, Section, Elevations, and Panel Layouts

1) Show means for mounting, conduit connection, and grounding.

c. Components List

1) Include manufacturer’s name and catalog number (or part number) for each.

d. Point-to point Interconnection Wiring Diagrams.

B. Informational Submittals. Submit the following:

1. Certificates

a. Manufacturer’s Certificate of Compliance with Applicable Reference Standards.

2. Test and Evaluation Reports

a. Electrical Systems - Test Procedures

1) Proposed testing procedures and testing limitations for source quality control testing and field quality control testing.

3. Manufacturers’ Instructions

a. Electrical Systems - Manufacturer’s Instructions

1) Installation data and instructions.

2) Instructions for handling, starting-up, and troubleshooting.

4. Source Quality Control Submittals

a. Electrical Systems - Source Quality Control Test Results

1) Results for required shop testing.

5. Field Quality Control Submittals

a. Electrical Systems Field Quality Control Test Results

1) Results for required field testing

6. Qualifications Statements

a. Electrical Subcontractor Qualification Statement

C. Closeout Submittals. Submit the following:

1. Record Documentation

a. Electrical System Record Drawings

1) One-line wiring diagram of the electrical distribution system.

2) Actual, in-place conduit and cable layouts with schedule of conduit sizes and number, and size of conductors.

3) Layouts of the power and lighting arrangements and the grounding system.

4) Control schematic diagrams, with terminal numbers and control devices identified, for all equipment.

5) Panel Schedules with circuit numbers and loads.

6) Record documents shall indicate final equipment and field installation information.

7) Instrumentation and Control Wiring Diagrams shall include the following:

a) electrical schematics of, but not be limited to; electrical enclosures, instrumentation, and interconnects to field devices.

8) Point-to-Point Interconnection Wiring Diagram Drawings: Include the following:

a) External control wiring for each piece of equipment, panel, instrument, and other devices and wiring to control stations and motor controllers.

b) Numbered terminal block identification for each wire termination.

c) Identification of the assigned wire numbers for all interconnections.

d) Identification of wiring by the conduit tag in which the wire is installed.

e) Terminal, junction, and pull boxes through which wiring is routed.

f) Identification of equipment and the submittal transmittal number for equipment from which wiring requirements and termination information was obtained.

9) Submittals shall be Editable AutoCAD file (.dwg format) of installed Wiring Diagram. AutoCAD file shall be in the current version of AutoCAD used by the Owner.

PART 2 PRODUCTS

2.1 Performance Criteria:

A. Electrical equipment shall be capable of operating successfully at full-rated load, without failure, with ambient outside air temperature of (--1--) degrees F to (--2--) degrees F and an elevation of (--3--) feet above mean sea level.

B. Unless specified otherwise, electrical equipment shall have ratings based on 75 degrees C terminations.

2.2 Testing Laboratory Labels: Electrical material and equipment shall bear the label of Underwriters' Laboratories, Inc. or other nationally recognized, independent testing laboratory, where standards have been established and label service applies.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine conditions under which Work will be performed and notify Engineer in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:

1. Install materials and equipment in accordance with the Contract Documents, Laws and Regulations, approved (and accepted, as applicable) Shop Drawings and other Contractor submittals, and manufacturer’s recommendations.

2. Define and identify all wiring, circuit terminations, and equipment to be modified to ensure proper interface of components. The Contract Price includes all costs associated with field services specified for a complete and functional system.

3. Perform work in a neat and workmanlike manner.

B. Common Requirements for Electrical Installation

1. Comply with NECA 1.

2. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

3. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

4. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

5. Right of Way: Give to piping systems installed at a required slope.

C. Staging, Sequencing, and Coordination with Existing Facilities:

1. Schedule, sequence, and install materials and equipment in accordance with Section 01 11 00, Summary of Work.

2. Perform the Work in a manner that will not interfere with the existing equipment and facilities or cause interruption of the functions of the Site, unless specified otherwise or otherwise allowed by Engineer.

3. When operation of existing facilities and Site is to be disrupted due to Contractor's operations, coordinate with Engineer.

4. Where the Work ties in with existing installations, take precautions and provide safeguards in connecting the Work to existing operating circuits to prevent interruption to existing circuits. Connection of Work to existing circuits shall be performed in the presence of Engineer.

5. Interruptions of existing circuits shall be coordinated with the Engineer who will determine the length of time a circuit may be de-energized to maintain processes in dependable and safe operation.

3.3 FIELD QUALITY CONTROL

A. Field Quality Control – General:

1. Perform field quality control for electrical Work in accordance with the Contract Documents.

B. Site Tests:

1. Prior to requesting certificate of Substantial Completion, demonstrate to Engineer that electrical systems and electrically-operated equipment installed or modified under the Contract operates in accordance with the Contract Documents and operates as required.

2. Perform the following operational tests on electrical systems:

a. Operate power circuits to verify proper operation and connection to electrical systems materials and equipment.

b. Operate control circuits, including pushbuttons, indicating lights, and similar devices, to verify proper connection and function. Operate all devices, such as pressure

switches, flow switches, and similar devices, to verify that shutdowns and control sequences operate as required.

3. Prepare and submit report on the equipment demonstration and operating field quality control tests. Report shall include complete information on the tests performed and results.

C. Manufacturer's Services:

1. Furnish at the Site qualified, factory-trained representative(s) of equipment manufacturers for the services indicated in the Contract Documents.

END OF SECTION

SECTION 26 05 13

MEDIUM VOLTAGE CABLES

PART 1 GENERAL

1.1 SCOPE

A. The work under this section includes furnishing and installing medium voltage cable including pulling, racking, splicing, and terminating. Included are the following topics:

1.2 Definition

A. Manufacturer: The company which owns controlling interest in the factory actually producing the cable being furnished for this project.

1.3 MEASUREMENT AND PAYMENT

A. This item is to be included in lump sum cost for Division 26 Electrical Equipment & Installation.

1.4 Submittals

A. Submit product data indicating cable and accessory construction, materials, ratings, and all other parameters identified in Part 2 - Products below.

B. Submit manufacturer's installation instructions.

C. Submit manufacturer's certificate stating approval for field acceptance testing per National Electrical Testing Association standards (at least 35 kV DC for 5 kV rated cable and 64 kV DC for 15 kV rated cable).

D. Submit manufacturer's certificate stating that medium voltage cable meets or exceeds all requirements specified below.

1.5 Project Record Documents

A. Accurately record exact sizes, lengths, types, locations, and quantities of cables. Also show where all splices are located for each cable.

1.6 Quality Assurance

A. The manufacturer shall be a company specializing in the manufacture of medium voltage cable and/or accessories with minimum five years documented experience in producing cable and/or accessories similar to those specified below.

B. The cable materials and manufacture shall meet or exceed all applicable requirements of the latest editions of ICEA Standard S-93-639, UL 1072 and NEMA standards.

C. The cable shall be manufactured using a triple extrusion process in which the conductor shield, insulation, and insulation shield are installed at essentially the same time without an intervening storage period on reels or other storage devices.

D. The Contractor shall be a company with experience in the installation of medium voltage cable, medium voltage equipment and components. The company shall have documented history with a minimum of two similar medium voltage projects.

E. The Contractor shall have a minimum of two qualified electricians trained and experienced (Minimum of two similar medium voltage projects) in the installation of medium voltage cable, medium voltage equipment and components.

F. At the discretion of the Engineer, documentation of experience, and relevant projects shall be furnished by the contractor.

G. Workmen involved in splicing and termination of cables shall have been specifically trained in the procedures required for the splices and terminations used in this project.

H. At the discretion of the Engineer, documentation of experience and/or training in medium voltage cable splicing and termination shall be furnished by the Contractor.

1.7 Delivery, Storage and Handling

A. Cable shall be stored according to manufacturer's recommendations as a minimum. In addition, cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 32 degrees F., the cable shall be moved to a heated (50 degrees F minimum) location. If necessary, cable will be stored off site at the Contractor's expense.

PART 2 - PRODUCTS

2.1 General

A. All cable shall be new, delivered to the site, and be less than two years since manufacture. It shall be from manufacturer's stock; not suppliers' warehouse stock. Manufacturer's certification of factory test values shall be submitted for all cable furnished. All specified dimensions are nominal.

B. Provide a 600 volt insulated copper ground conductor in all conduits with medium voltage cable. This ground conductor shall be the same size as the phase conductors unless indicated on the drawings. See Section 26 05 26 for more grounding requirements.

2.2 MEDIUM VOLTAGE CABLE – SHIELDED

A. Usage: This cable shall be used for all above and underground applications (except for jumper cable applications, see JUMPER CABLE below) and shall be contained in conduit or other raceways.

B. Cable: Single conductor, insulated cable rated 15 KV, 133% insulation level, ungrounded, NEC-UL Type MV-105. Sizes as indicated on the Drawings.

C. Conductor shield: extruded semiconductor with resistivity requirements of section 3.3 of ICEA S-93-639 for discharge-free designs and nonconducting high permittivity compound for

discharge-resistant designs. Material shall be clean stripping from the conductor and firmly bonded to the overlying insulation.

D. Insulation: Extruded EPR (ethylene propylene rubber), rated at 15 KV, 133% insulation level, nominal thickness of .220 inches.

E. Insulation Shield: The insulation shield shall consist of an extruded semiconducting layer directly over the insulation and a copper tape over the semiconducting covering. The tape shall be at least 5 mils (0.127 mm) thick and be spiral wrapped with a minimum 12.5 per cent overlap. The insulation shield shall meet all requirements of section 5 of ICEA S-93-639.

F. Jacket: Polyvinyl Chloride (PVC), black color with a jacket thickness meeting all requirements of ICEA S-93-639

G. Cable Rating: Continuous duty at 105 degrees C., wet or dry locations, suitable for underground duct installations, UL type MV-105.

2.3 JUMPER CABLE

A. Cable Rating: Continuous duty at 105 degrees C., wet or dry locations, suitable for underground duct installations, UL type MV-105.

B. Cable: Single conductor, flexible, non-shielded, insulated cable rated 15 KV, ungrounded. Size as indicated on the Drawings.

C. Conductor: Stranded, soft annealed copper.

D. Conductor shield: extruded semiconductor, clean stripping from the conductor and firmly bonded to the overlying insulation.

E. Insulation: Extruded EPR (ethylene propylene rubber), rated at 15 KV, minimum thickness of .175 inches

F. Cable Rating: Continuous duty at 105 degrees C., dry locations.

2.4 CABLE TERMINATIONS

A. Modular Molded Shrink Type Termination: IEEE 48; Class 1; 15 KV. Kit form, suitable for use with cable specified, including copper shield tape, and slip-on type flexible skirted polymer or silicon rubber insulator. All terminations shall be skirted type. Termination shall be hot or cold shrink type with internal stress relief tube to distribute electric field (10% to 90% equipotential lines) over entire length of skirted insulator.

B. Submittal for approval shall show electric field distribution (via equipotential lines) of termination device.

C. Lugs shall be copper, long barrel, two hole or four hole and rated for the voltage applied. The lugs shall match the pads on the equipment to which the cable will be mounted.

D. If there will be more than one cable on an equipment pad approved spiders (or spacers) must be used. Cable attachment to equipment must match the equipment manufacturers UL labeling requirements (if the equipment is UL Listed) as a minimum. Unless the equipment is

designed or listed for it, cable lugs may not be placed back to back on the equipment pad. In all cases, the termination and equipment must be taped with approved anti-tracking tape.

2.5 CABLE SPLICES

A. Modular Molded Shrink Type Splice: IEEE 404-1986; Class 1; 15 KV. Kit form, suitable for use with cable specified, including slip-on type flexible polymer or silicon rubber insulator. Splice shall be hot or cold shrink type with internal stress relief tube to distribute electric field (10% to 90% equipotential lines) over entire length of insulating material.

B. Molded body shall contain a built-in internal semiconducting layer which covers and contacts the splice barrel and the cable insulation layer to prevent electrical stress buildup inside the body. This semiconducting layer shall be bonded to and covered with a cured EPDM rubber or polymer insulating layer which, in turn, shall be bonded to and covered with a semiconducting layer and metallic shield and jacket.

C. Splicing sleeves shall be long barrel type and rated for the voltage applied.

D. The completed splice shall be approved for underground direct burial and water immersion service.

E. Submittal for approval shall show electric field distribution (via equipotential lines) of termination device.

PART 3 – EXECUTION

3.1 CABLE PULLING

A. Pump all water out of the manholes prior to beginning work.

B. Prior to pulling cable, a mandrel/swab 1/4 inch smaller than the duct diameter shall be pulled through duct run to insure adequate opening of duct run. Thoroughly swab conduits to remove foreign material before pulling cables.

C. Cables shall not be pulled from an outdoor (exterior) location when the outdoor (exterior) air temperature is below 32 degrees F.

D. Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but be not limited to, sheaves, winches, cable reels and/or cable reel jacks, duct entrance funnels, pulling tension gauge, and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices which may move or wear in a manner to pose a hazard to the cable shall not be used.

E. Cable ends shall be sealed and firmly held in the pulling device during the pulling operation.

F. Cable pulling shall be done in accordance with cable manufacturer's recommendations, except as modified herein, and ANSI/IEEE C2 standards. Manufacturer's recommendations shall be a part of the cable submittal. Recommended pulling tensions shall not be exceeded. Pulling bending radius shall not be less than that determined by the manufacturer or the NEC. Restrictions of pulling bending radius dimensions shall be strictly observed. Training

bending radius shall not be less than 12 times cable diameter. Any cable bent or kinked to radius less than recommended dimension shall not be installed.

G. Actual pulling tensions shall be continuously monitored and permanently recorded in a log and submitted to the Engineer at the end of the project.

H. During pulling operation an adequate number of persons shall be present to allow cable observation at all points of duct entry and exit as well as to feed cable and operate pulling machinery.

I. Pulling lubricant shall be used to ease pulling tensions. Lubricant shall be water or silicone based of a type which is noninjurious to the cable material used. Wax based lubricants are not allowed. Lubricant shall not harden or become adhesive with age.

J. Avoid abrasion and other damage to cables during installation.

K. Where cables are left in manhole or switchgear overnight or more than 8 hours prior to termination, the cable ends shall be sealed with paraffin or shrink wrap caps and supported in a manner which will prevent entrance of moisture into the cable. Cable shall be terminated and energized as soon as possible.

3.2 CABLE ROUTING IN MANHOLES AND SWITCHGEAR

A. Certain manholes shall have the cable looped around the walls. If not indicated on drawings, the manhole nearest building plus every third manhole if feeder contains multiple manholes shall contain cable loop. In such cases, the cable shall circle the manhole at least 360 degrees. Where manholes are not to be looped, cable shall be routed on the walls with the longest distance between points of entry and exit. Arrange cables to avoid interference with duct entrances into manhole.

B. All new and existing cable in manholes shall be secured to racks on the manhole walls. Cables shall be secured to racks with split porcelain or polymer insulators and clamps or mounted on a heavy duty nonmetallic multi-mount cable support arm as manufactured by Underground Devices, Inc. Insulators shall be of adequate size to contain all three phases and the ground of a given circuit. Fastening cables directly to support channel will not be accepted.

C. Cables within switchgear shall be routed in a manner which will allow adequate room for bending and terminating cables. Cables must be secured in a manner which will not result in cable weight being placed on the termination electrical joint. Cable support shall be made in a manner that does not force cable against grounded metal or which compresses cable diameter. Cable training bending radius shall be at least 12 times cable diameter. Any cable bent to a radius less than recommended dimension will not be accepted.

D. Jumper cable shall be routed in a manner that maintains adequate through-air separation between adjacent conductors and between conductors and any metallic or grounded surface.

3.3 SPLICES AND TERMINATIONS INSTALLATION

A. Splices are to be held to a minimum. Splice locations shall be determined by cable lengths available, pulling conditions and termination points. Splice locations are to be listed by the

Contractor prior to cable purchase and a listing of such locations submitted to the Engineer for approval before final cable lengths are determined.

B. Only experienced electricians shall be employed in this phase of the work. Refer to QUALITY ASSURANCE above.

C. Follow cable manufacturer's and splice or termination manufacturer's installation instructions and ANSI/IEEE C2 standards.

D. Clean, white lint-free gloves shall be used to handle end of cable during tape wrapping procedures.

E. Termination or splicing of the copper conductors (both power and ground conductors) shall be made only with tool applied compression (swaged) fittings.

F. Ground system connections:

1. Cable to bus: compression cable fitting bolted to bus with lock washers under nut.

2. Cable to ground rod: approved bolted fitting with backing plate between cable and rod.

G. Ground cable shield at each termination and splice.

H. Splice or termination failure upon high potential acceptance test will require complete reconstruction of the joint to manufacturer's specifications. Make sure that there is enough free cable at each termination or splice for two more terminations or splices to be performed.

I. Install Scotch #70 tape for anti-tracking on all exposed terminations.

J. All splices and terminations are to be tagged using embossed plastic tags with plastic attachment devices indicating date splice or termination was made, name of electrician involved, name of Contractor installing cable, feeder number and circuit to and from data.

K. All cable splices in manholes shall be supported on both sides of the splice within 2'0" of the splice. Splices shall not rely on cable for support.

L. Lugs shall be bolted to termination pads in equipment using corrosion resistant bolts, nuts, and washers. Use Belleville washers for bolting aluminum to aluminum, and lock washers for bolting copper to copper or as recommended by equipment manufacturer. Torque to manufacturer's recommendations.

3.4 FIREPROOFING OF MEDIUM VOLTAGE CABLES

A. Exposed cables in manholes, vaults, and cable trays shall be fireproofed. Additionally, cables shall be fireproofed in pull boxes, troughs, switchgear pull sections and pulling pits containing two or more sets of cable. Entire installation shall conform to manufacturer's recommendations.

B. Arc proofing material shall be Scotch #77 electrical arc and fireproofing tape or approved equal.

C. Install the fireproofing on the cables as follows:

D. Install tightly applied fireproofing tape, approximately 1/16 inch thick by 1-1/2 inches wide minimum, around each cable spirally in one half-lapped wrapping.

E. Install the tape with the coated side towards the cable and extend it not less than one inch into each duct.

F. Install random wrappings of Scotch #69 glass cloth tape around the installed fire proofing tape per manufacturer's instructions to prevent it from unraveling.

3.5 CABLE ACCEPTANCE TESTS

A. Acceptance tests will be performed by an independent Testing Consultant under separate contract with DFD. The Contractor shall coordinate the scheduling of the tests and provide labor and services necessary to allow the Testing Consultant to test each completed cable circuit. This includes opening and closing equipment, providing temporary light and power as needed, etc.

B. Acceptance tests will be performed on all cable after installation and prior to energization. All splices and terminations are to be completed and tested as part of the acceptance test.

C. In the event that test results are not satisfactory, the Contractor shall make repairs and replace components as necessary to correct faults. Following corrections, tests will be repeated to the extent required to prove the deficiencies are corrected.

3.6 CABLE IDENTIFICATION AND LABELING

A. Provide the following information on cable identification label:

1. Main feeder circuit number

2. To and From Data

B. Install cable labels on each conductor at each cable termination, each cable splice, in each manhole and in each pull box. Additionally, at these locations, provide one inch (1") colored vinyl plastic electrical tape wrap identification, (Scotch 35 or approved equal) around each conductor and cable as follows:

1. 15 KV individual conductor system

a. A - phase - one (1) red wrap

b. B - phase - two (2) red wraps with 1/2" space between wraps

c. C - phase - three (3) red wraps with 1/2" space between wraps

C. See paragraph above under SPLICES AND TERMINATIONS INSTALLATION for splice label requirements. This is in addition to identification labels.

D. During entire cable installation, phasing of conductors shall be maintained and identified. Where final connections to equipment are made, phasing shall be verified and proper phase rotation determined prior to connection.

3.7 CONSTRUCTION VERIFICATION

A. Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 26 08 00 in accordance with the procedures defined for construction verification in Section 01 91 01 or 01 91 02.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals shown, specified, and required to furnish and install low-voltage conductors and cabling.

2. Types of cabling required include:

a. Insulated cable for installation in raceways.

b. Cable for installation in cable trays.

B. Related Sections:

1. Section 26 05 53, Identification for Electrical Systems.

2. Section 31 00 05 Trenching and Earthwork

1.2 MEASUREMENT AND PAYMENT

A. This item is to be included in lump sum cost for Division 26 Electrical Equipment & Installation.

1.3 REFERENCES

A. Standards referenced in this Section are:

1. ANSI/NETA ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems.

2. ASTM B3, Specification for Soft or Annealed Copper Wire.

3. ASTM B8, Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft.

4. ASTM D3485, Specification for Smooth-Wall Coilable Polyethylene (PE) Conduit (Duct) for Preassembled Wire and Cable.

5. ASTM F2160, Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD).

6. NEMA TC 7, Smooth Wall Coilable Electrical Polyethylene Conduit.

7. UL 44, Thermoset-Insulated Wires and Cables.

8. UL 1277, Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver wire and cable according to NEMA WC 26.

1.5 SUBMITTALS

A. Action Submittals. Submit the following:

1. Product Data:

a. Low-Voltage Electrical Power Conductors and Cables – Product Data

1) Manufacturer's literature, specifications, and engineering data for low voltage insulated cable proposed for use.

b. Cable Connectors & Terminations – Product Data

1) Manufacturer's literature, specifications and engineering data for terminations connectors proposed for use including but not limited to the following:

a) 1000V Rated Cable Terminations

b) 90 degrees C Rated Cable Terminations

c) Narrow Flange Cable Terminations

B. Informational Submittals. Submit the following:

1. Certificates

a. Low-Voltage Electrical Power Conductors and Cables –Certifications

1) Certification by the manufacturer that the conductors and cables conform to the requirements of the drawings and specifications.

2) Certification by the Contractor that the conductors and cables have been properly installed, adjusted, and tested.

2. Field Quality Control Submittals

a. Low-Voltage Electrical Power Conductors and Cables – Field Quality Control

1) Written results of field insulation resistance tests.

1.6 QUALITY ASSURANCE

A. Items provided under this Section shall be listed or labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).

1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.

2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.

B. Regulatory Requirements: Comply with the following:

1. NEC Article 300, Wiring Methods.

2. NEC Article 310, Conductors for General Wiring.

3. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.

PART 2 PRODUCTS

2.1 MATERIALS

A. BUILDING WIRES AND CABLES

1. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as required to meet application and NEC requirements.

2. Wire and cable for 1000 volts and below: Soft drawn, copper wire with 600 volt insulation (1000 volt insulation for DC cables).

a. Conductors:

1) Annealed, copper in accordance with ASTM B33.

2) Stranding: Class B in accordance with ASTM B8.

b. Insulations and Coverings:

1) Rubber: Conform to NEMA WC 3.

2) Thermoplastic: Conform to NEMA WC 5.

3) Cross-Linked Polyethylene: Conform to NEMA WC 7.

4) Ethylene Propylene Rubber: Conform to NEMA WC 8.

3. Feeders and service conductors: Single conductor Type XHHW-2.

4. Branch Circuits:

a. Single Conductor Type THHN/THWN: Above ground and underfloor conduits.

b. Single Conductor Type XHHW-2: Outdoor conduits and duct bank conduits.

c. Single Conductor Type XHHW-2 Rated for use at 1000V: electric vehicle charger DC circuits in conduit and cable tray.

d. No. 12 AWG minimum size (unless otherwise noted) for branch circuit wiring, including motor circuits.

e. Size 120 v branch circuits for length of run on following basis.

1) 0 to 50 ft Run from Panelboard to first outlet: No. 12 AWG minimum.

2) 51 to 100 ft Run: Increase one wire size, i.e., No. 12 AWG becomes No. 10 AWG.

3) 101 to 150 ft Run: Increase two wire sizes, i.e., No. 12 AWG becomes No. 8 AWG.

4) 151 ft and above: Wiring sized for 3% maximum voltage drop.

f. For other branch circuits, voltage drop for branch circuits and feeder circuit combined shall not exceed requirements of the NEC 215.

5. Control Circuits:

a. Single conductor Type THHN/THWN: Above ground and underfloor conduits.

b. No. 14 AWG stranded copper minimum size (unless otherwise noted).

c. Multi-wire cable assembly: Duct bank conduits.

d. UL listed for installation in cable trays in accordance with NEC Art. 318, Class I, Division 2 hazardous areas.

6. Non-shielded Instrumentation, Graphic Indication, and Other Control Wiring Operating at Less Than 120 v: No. 14 AWG stranded copper except as otherwise indicated with same insulation as control circuits.

a. Single conductor Type THHW/THWN, above ground and underfloor conduits.

b. Multi-wire cable assembly: Duct bank conduits.

7. Shielded instrumentation wiring, above ground and underfloor conduits:

a. PVC insulation, tinned copper (19 by 27) stranded, No. 16 AWG, twisted pair or triplet cabled with aluminum mylar shielding, stranded, tinned, No. 18 AWG copper drain wire, and overall black FR-PVC, 90^{o}C, 600 volt jacket.

b. Multi-wire cable assembly: duct bank conduits.

8. Multi-Wire Control and Instrumentation Cable Assemblies:

a. Multi-conductor, color-coded cable with number and size of conductors indicated.

b. Where spare conductors are not indicated provide 10% spare conductors. One pair minimum.

c. Control and non-shielded instrumentation.

1) Bare soft stranded No. 14 or 12 AWG copper in accordance with ASTM B3.

2) Class B stranded in accordance with ASTM B8.

3) Type THWN insulation also meeting requirements of NEMA WC-5 with armor-nylon in accordance with UL 83-THHN/THWN.

4) Color coded or numbered in accordance with NEMA WC-5 Method I Table K-2.

5) Cabled with suitable fillers.

6) Overall black FR-PVC, 90°C, 600 volt sunlight resistant jacket.

7) UL listed for installation in cable trays in accordance with NEC Art. 318, Class I, Division 2 hazardous areas and in accordance with NEC 340 and for direct burial.

d. Shielded Instrumentation:

1) Bare soft stranded No. 16 AWG copper in accordance with ASTM B3.

2) Class B stranded tinned copper in accordance with ASTM B8.

3) PVC with nylon armor insulation.

4) Twisted pairs color coded in accordance with NEMA WC-5 Method I Table K-2, and numbered.

5) Individual and overall aluminum mylar shields and seven strand tinned copper drain wires.

6) Overall black FR-PVC 90°C 600 volt sunlight resistant jacket.

7) UL listed for installation in cable trays in accordance with NEC 318, Class I, Division 2 hazardous areas in accordance with NEC 340 and for direct burial.

9. Fiber-optic cables:

a. OM1 multimode fiber, riser rated, UV resistant, crush resistant patch cables, with compatible connectors

B. Cable Connectors, Solderless Type:

1. For wire sizes No. 4 AWG and above, use either compression type or bolted type with silver-plated contact faces.

2. For wire sizes up to and including No. 6 AWG, use compression type. Alarm and control wire shall be terminated using forked type connectors at terminal boards.

3. For wire sizes No. 1/0 AWG and larger, use connectors with at least two cable clamping elements or compression indents and provision for at least two carbon steel bolts with Belleville Washer Nut or approved equal bolts for joining to apparatus terminal.

4. Properly size connectors to fit fastening device and wire size. Connectors shall be rated for minimum 75 degree C, 600 volts (1000 volts for DC cables).

5. Terminations shall be coordinated with specific installation requirements of procured equipment. 90 degree C rated, and narrow flange cable lugs shall be provided if required by equipment manufacturer installation documents.

C. Cable Splices:

1. For wire sizes No. 8 AWG and larger, splices shall be made up with compression type copper splice fittings. Splices shall be taped and covered with materials recommended by cable manufacturer to provide insulation equal to that on conductors.

2. For wire sizes No. 10 AWG and smaller, splices may be made up with pre-insulated spring connectors.

3. For wet locations, splices shall be waterproof. Compression type splices shall be waterproofed by sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring thermosetting resin into mold that surrounds the joined conductor. Spring connector splices shall be waterproofed with sealant filler.

4. Splices shall be suitably sized for cable, rated 75 degrees C, and 600 volts (1000V for DC cables).

5. Splices shall be in accordance with NEC and UL.

D. Wire and Cable Markers:

1. Provide wire and cable markers in accordance with Section 26 05 53, Identification for Electrical Systems.

2.2 SOURCE QUALITY CONTROL

A. Factory Tests:

1. Factory-test wire and cable in accordance with UL and/or NEMA standards.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA "Standard of Installation".

B. Identification:

1. Identify conductors in accordance with Section 26 05 53, Identification for Electrical Systems.

2. Identify power conductors by circuit number and phase at each terminal or splice location.

3. Identify control and status wiring using numeral tagging system.

C. Color-code cables as follows:

1. Colors for power:

System	Conductor	Color
All Systems	Equipment Grounding	Green
240/120 Volts Single-Phase, Three-Wire	Grounded Neutral One Hot Leg Other Hot Leg	White Black Red
208Y/120 Volts Three-Phase, Four-Wire	Grounded Neutral Phase A Phase B Phase C	White Black Red Blue
240/120 Volts Three-Phase, Four-Wire Delta, Center Tap Ground on Single-Phase	Grounded Neutral Phase A High (wild) Leg Phase C	White Black Orange Blue
480Y/277 Volts Three-Phase, Four-Wire	Grounded Neutral Phase A Phase B Phase C	Gray Brown Orange Yellow
DC Power	Positive Negative	Red Black

2. Colors for control wire

a. AC hot conductor: Black.

b. AC neutral conductor: White.

c. Grounding conductor: Green.

d. AC control conductor, powered from within panel: Red.

e. AC control conductor, powered from remote source: Yellow.

f. DC (+) control conductor, discrete signal: Blue.

g. DC (-) control conductor, discrete signal: White with Blue Tracer.

h. DC control conductor, discrete signal: Blue.

i. Twisted pair cable (+) signal conductor, analog signal: White or Clear.

j. Twisted pair cable (-) signal conductor, analog signal: Black.

k. Twisted pair power, analog signal: Red

D. Remove existing wire from raceway before pulling in new wire and cable.

E. Bending Radius: Limit to minimum of six times cable overall diameter.

Slack: Provide maximum slack at all terminal points.

F. Run wire and cable in conduit or cable tray unless otherwise indicated on Drawings. Pull conductors into raceway simultaneously where more than 1 is being installed in same raceway.

1. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.

2. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

3. Do not draw conductor into conduits until building is enclosed, watertight, and work causing cable damage has been completed.

G. Install cable supports for vertical feeders in accordance with NEC. Provide split wedge type which firmly clamps each individual cable and tightens due to cable weight.

H. For panelboards, cabinets, wireways, switches, and equipment assemblies, neatly form, train, and tie cables in individual circuits.

I. Seal cable and wire entering building from underground or exterior between wire and conduit, where cable exits conduit, with non-hardening approved compound.

J. Install wire and cables in separate raceway systems as follows:

1. AC control.

2. DC control.

3. Shielded instrumentation.

4. Telephone cables.

5. Network Cables.

6. Fiber Optic Cables.

7. Emergency system.

8. Fire alarm system.

9. As required by NEC.

K. Where control or instrumentation cables are run in underground conduit and ducts provide multi-wire cable assemblies.

L. Where power cables and instrument/signal cables enter and pass through same manhole, handhole, or distribution box, or steel barrier, separate raceways shall continue through box manhole or handhole to avoid magnetic interaction between power cables and instrumentation conductors. In manholes and handholes, provide Type C raceway outlet body with 3/16 in. holes drilled in bottom for drainage.

M. Do not run instrumentation cables into control cabinets or MCC unless cables are terminated in cabinet or MCC.

N. Wiring at Outlets: Install with at least 12 in. (300 mm) of slack conductor at each outlet.

O. Do not use device as pass through for conductors. Pigtail conductors to device.

P. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL 486A.

Q. Drawings do not designate number of conductors in conduit nor does location of branch circuits and switch legs indicated on Drawings designate location or routing. Route branch circuits and switch legs as dictated by construction and these Specifications.

R. Neutral conductors SHALL NOT be shared.

3.2 TERMINATIONS AND SPLICES

A. Terminate control, instrumentation, and communication cables on terminal strips in separate terminal cabinets located near conduit entrances of buildings or as shown on Drawings.

B. Power Cable Splices (no splices in cables unless approved by Engineer):

1. Provide continuous lengths of cable without splices in motor circuits and feeders unless otherwise noted. Splices may be installed in motor circuits and feeders with prior approval by ENGINEER.

2. Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

3. Use splice and tap connectors that are compatible with conductor material.

4. Where pre-insulated spring connectors are used for equipment connections, tape connector to wire to prevent loosening under vibration.

5. Each tap, joint or splice in conductors No. 8 AWG and larger shall be taped with two half-lap layers of vinyl plastic electrical tape and finish wrap of color coding tape where required by code.

6. Cable splices shall be made only in manholes, handholes, wireways, distribution boxes, and junction boxes. Splices below grade, in manholes, handholes, and wet locations shall be waterproof.

C. Power Cable Terminations:

1. Termination of wires with full compression type lugs installed with appropriate hand or hydraulic tool. Use proper dies to achieve the desired compression.

2. For screw type terminal blocks, terminations for stranded conductors shall be made with T & B lock-on fork connector with insulated sleeves.

3. Motor lead conductor terminations shall be made with a T & B or approved equal, full compression lug, full ring type, bolted, and taped as required. For connecting motor lead to service wiring fasten full ring lugs together with cadmium plated steel cap screws, and cover with a minimum of 2 layers 1/2 lap, 3M Scotch No. 33 tape; option: T & B "Motor Stub Splice Insulator".

3.3 CONTROL CIRCUITS

A. Control circuit home runs from same area for the same system returning to same panel, (e.g., LCP, DPC, etc.,) may be combined provided signal and voltage types are not mixed.

B. Following types of home runs shall not be combined with other types:

1. 4-20 ma dc analog; Type 2 shielded cable.

2. 24 vdc discrete (e.g., field or LCP powered dry contacts).

3.4 BRANCH CIRCUITS

A. Motor branch circuits and branch circuits for 3 phase circuits shall not be combined.

B. Branch circuits for single phase equipment devices from same panel may be combined. Derating of conductors within conduit is not allowed.

3.5 FEEDERS:

A. Extend feeders at full capacity from origin to termination.

B. Each conduit raceway shall contain only those conductors constituting single feeder circuit.

C. Where multiple raceways are used for single feeder, each raceway shall contain conductor of each phase and neutral if used.

D. Where feeder conductors run in parallel, conductors shall be of same length, material, circular-mil area, insulation type, and terminated in same manner.

E. Where parallel feeder conductors run in separate raceways, raceways shall have same physical characteristics.

F. On network systems, neutral shall be run with phase wires. Unbalanced neutral current shall not exceed normal or derated conductor capacity.

3.6 MOTORS AND EQUIPMENT WIRING

A. Provide motor circuits in accordance with diagrams and schedules on Drawings and code requirements, from source of supply to associated motor starter and starter to motor terminal box, including necessary and required intermediate connections.

B. Do not include associated control conductors in same conduit with power conductors.

C. Provide branch circuits to conform with NEC requirements and nameplate ratings. CONTRACTOR responsible for verification of ratings of motors and installing proper branch circuits.

3.7 FIELD QUALITY CONTROL

A. Site Tests:

1. Test each electrical circuit after permanent cables are in place, to demonstrate that circuit and equipment are connected properly and will perform satisfactorily, free from improper grounds and short circuits.

2. Individually test 600-volt and 1000 volt cable mechanical connections after installation and before they are put in service, with calibrated torque wrench. Values shall be in accordance with manufacturer's recommendations.

3. Individually test 600-volt and 1000 volt cables for insulation resistance between phases and from each phase to ground. Test after cables are installed and before they are put in service, with Megger for one minute at voltage rating recommended by cable manufacturer or in accordance with ANSI/NETA ATS recommendations.

4. Insulation resistance for each conductor shall not be less than value recommended by cable manufacturer. Cables not meeting recommended value or that fail when tested under full load conditions shall be replaced with a new cable for full length.

5. Perform phase rotation test on all three-phase circuits.

3.8 CABLES (LOW VOLTAGE)

A. Inspect cables for physical damage and proper connection in accordance with single-line diagram.

B. Test cable mechanical connections to manufacturer's recommended values using calibrated torque wrench.

C. Check cable color coding with specifications and NEC standards.

D. Electrical Tests:

1. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 1000 volts dc for 1 min.

2. Perform continuity test to insure proper cable connection.

E. Test Values:

1. Evaluation results by comparison with cables of same length and type. Investigate any value less than 50 mega-ohms.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall provide labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install complete grounding for electrical systems, structures, and equipment.

2. Plus the following special applications:

a. Overhead cable trays grounding.

b. Underground distribution grounding.

c. Common ground bonding with lightning protection system

d. Grounding of steel structural columns

e. Grounding of unit substations, switchgear, and switchboards

f. Grounding of standby generators, solar PV inverter and battery storage inverters.

B. Related Sections:

1. 31 00 05 Trenching and Earthwork

1.2 MEASUREMENT AND PAYMENT

A. This item is to be included in lump sum cost for Division 26 Electrical Equipment & Installation.

1.3 REFERENCES

A. Standards referenced in this Section are:

1. ANSI/NETA ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems.

2. ASTM B8, Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft.

3. ASTM B 33, Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes.

4. UL 467, Grounding and Bonding Equipment.

5. National Fire Protection Association 70 (NFPA)

6. National Fire Protection Association 780 (NFPA)

B. Regulatory Requirements

1. National Fire Protection Association 70 (NFPA)

2. National Fire Protection Association 780 (NFPA)

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association (NETA) or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

a. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association (NETA) to supervise on-site testing specified in Part 3.

b. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

c. Comply with UL 467 for grounding and bonding materials and equipment.

1.5 SUBMITTALS

A. Action Submittals. Submit the following:

1. Product Data

a. Grounding and Bonding for Electrical Systems - Product Data

1) Manufacturer’s technical information for grounding materials proposed for use

2. Shop Drawings

a. Grounding and Bonding for Electrical Systems - Shop Drawings

1) Include listing of grounding connector types identifying where each will be used.

2) Include layouts of each structure’s ground grid.

3) Include test point construction details.

B. Informational Submittals. Submit the following:

1. Certificates

a. Grounding and Bonding for Electrical Systems - Certificates

1) Certificates for field testing agency, signed by Contractor, certifying that agency complies with requirements specified in Quality Assurance Section Above.

2. Field Quality Control Submittals

a. Grounding and Bonding for Electrical Systems – Testing Plans

1) Ground resistance test procedures

b. Grounding and Bonding for Electrical Systems - Field Quality Control

1) Results of ground resistance tests at each test point.

C. Closeout Submittals. Submit the following:

1. Record Documentation

a. Grounding and Bonding for Electrical Systems - Record Documentation

D. Maintenance Material Submittals. (NOT USED)

PART 2 PRODUCTS

2.1 MATERIALS

A. Bare Ground Cable:

1. Material: Soft-drawn, bare copper stranded cable complying with ASTM B8. No. 4/0 AWG minimum size unless otherwise shown or indicated on the Drawings.

B. Conductors

1. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

2. Bare Copper Conductors:

a. Solid Conductors: ASTM B 3.

b. Stranded Conductors: ASTM B 8.

c. Tinned Conductors: ASTM B 33.

d. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.

e. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

f. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

g. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

3. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches (6 by 50 mm) in cross section, unless otherwise indicated; with insulators

C. Ground Rods:

1. Material: Copper-clad rigid steel rods, 3/4-inch diameter, ten feet long.

D. Grounding Connectors:

1. Products and Manufacturers: Provide one of the following:

a. Pressure Connectors:

1) O.Z./Gedney, Division of Emerson.

2) Burndy Corporation.

3) Erico Products, Incorporated.

b. Welded Connections:

1) Cadweld by Erico Products, Incorporated.

2) Therm-O-Weld by Burndy Corporation.

2. Material:

a. Pressure connectors shall be copper or copper alloy castings, bolted pressure type, designed and fabricated specifically for items to be connected and assembled with Durium or silicone bronze bolts, nuts, and washers.

b. Welded connections shall be by exothermic process utilizing molds, cartridges, and hardware designed specifically for connection to be made or Burndy irreversible crimp types recommended by kit manufacturer for materials being joined and installation conditions

c. Pipe Connectors shall be clamp type, sized for pipe.

E. Ground Test Well

1. Provide heavy-duty test well suitable for heavy-duty traffic.

2. Diameter and Material: 12.75-inch outside diameter, Schedule 80 PVC.

3. Depth: Two feet.

4. Cover: Provide test well with cast iron cover marked, “Ground” with cast iron ring to support lid.

F. Ground system components shall comply with UL 467.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine conditions for the Work and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 APPLICATIONS

A. Equipment Grounding Conductors: Comply with NEC Article 250 for types, sizes, and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NEC are indicated.

1. Install equipment grounding conductor with circuit conductors for items below in addition to those required by Code:

a. Feeders and branch circuits.

b. Lighting circuits.

c. Receptacle circuits.

d. Single-phase motor or appliance branch circuits.

e. Three-phase motor or appliance branch circuits.

f. Flexible raceway runs.

g. Armored and metal-clad cable runs.

2. Busway Supply Circuits: Install separate equipment grounding conductor from grounding bus in switchgear, switchboard, or distribution panel to equipment grounding-bar terminal on busway.

3. Isolated Grounding-Receptacle Circuits: Install separate insulated equipment grounding conductor connected to receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding-conductor terminal of applicable derived system or service, except as otherwise indicated.

4. Isolated Equipment Enclosure Circuits: For designated equipment supplied by branch circuit or feeder, isolate equipment enclosure from supply raceway with nonmetallic raceway fitting listed for purpose. Install fitting where raceway enters enclosure, and install separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding-conductor terminal of applicable derived system or service, except as otherwise indicated.

5. Nonmetallic Raceways: Install equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

6. Air-Duct Equipment Circuits: Install equipment grounding conductor to duct-mounted electrical devices operating at 120 V and above, including air cleaners and heaters. Bond conductor to each unit and to air duct.

7. Water Heater, Heat-Tracing, and Antifrost Heater Circuits: Install separate equipment grounding conductor to each electric water heater, heat-tracing assembly, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

B. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding-electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on 1/4 by 2 by 12 in. (6 by 50 by 300 mm) grounding bus.

2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

C. Separately Derived Systems: Where NEC requires grounding, ground according to NEC 250.20 (D) and NEC 250.30.

D. Metal Poles Supporting Outdoor Lighting Fixtures: Ground pole to grounding electrode in addition to separate equipment grounding conductor run with supply branch circuit.

E. Common Ground Bonding with Lightning Protection System: Bond electric power system ground directly to lightning protection system grounding conductor at closest point to electric service grounding electrode. Use bonding conductor sized same as system grounding conductor and install in conduit.

F. Piping Systems and Other Equipment: Comply with NEC Article 250 for bonding requirements.

G. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 4/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.

2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

3. Install metal warning tape 12” above conductor.

H. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

I. Grounding Bus: Install in electrical and communication equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 1 inch (25 mm), minimum, from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.

2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

J. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2. Underground Connections: Welded connectors or irreversible crimp, except at test wells and as otherwise indicated.

3. Connections to Ground Rods at Test Wells: Bolted connectors.

4. Connections to Structural Steel: Welded connectors.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.

2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section 26 05 43, "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.

1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through lengths of conduit less than 12 inches.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.

3. Use exothermic-welded connectors or irreversible crimp connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

I. When performing exothermic weld to building steel, prepare surface to accept weld.

J. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each exterior wall steel column and rebar mat, extending around the perimeter of building.

1. Install tinned-copper conductor not less than No. 4/0 AWG for ground ring and for taps to building steel.

2. Buried ground ring shall be not less than 24 inches (600 mm) from building or equipment foundation.

3. Concrete-encased ground mat bonded to ground ring and equipment ground terminals.

K. Weld all buried connections except for test points.

L. GROUNDING OVERHEAD LINES

1. Comply with IEEE C2 grounding requirements.

2. Install two (2) parallel ground rods if resistance to ground by a single, ground-rod electrode exceeds 25 ohms.

3. Drive ground rods until tops are 12 inches (300 mm) below finished grade in undisturbed earth.

4. Ground-Rod Connections: Install bolted connectors for underground connections and connections to rods.

5. Lightning Arrester Grounding Conductors: Separate from other grounding conductors.

6. Secondary Neutral and Transformer Enclosure: Interconnect and connect to grounding conductor.

7. Protect grounding conductors running on surface of wood poles with molding extended from grade level up to and through communication service and transformer spaces.

M. GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

1. Comply with IEEE C2 grounding requirements.

2. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

3. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

4. Pad-Mounted Transformers and Switches: Install four ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 4 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

N. EQUIPMENT GROUNDING

1. Ground electrical equipment in compliance with Laws and Regulations and the Contract Documents.

2. Equipment grounding conductors shall be bare stranded copper cable of adequate size installed in metal conduit where required for mechanical protection. Ground conductors, pulled into conduits with non-grounded conductors, shall be insulated. Insulation shall be green.

3. Control panels grounding conductors shall be bare stranded copper cable of adequate size to ground grid from AC ground bus, and an insulated stranded copper cable of adequate size to ground grid from DC ground bus.

4. Connect ground conductors to conduit with copper clamps, straps, or with grounding bushings.

5. Connect to equipment by means of lug compressed on cable end. Bolt lug to equipment frame using holes or terminals provided on equipment specifically for grounding. Do not use hold-down bolts. Where grounding provisions are not included, drill suitable holes in locations recommended by equipment manufacturer or designated by Engineer.

6. Connect to motors by bolting directly to motor frames, not to soleplates or supporting structures.

7. Connect to service water piping by means of copper clamps. Use copper bonding jumpers on gasketed joints.

8. Scrape bolted surfaces clean and coat with conductive oxide-resistant compound.

9. Install insulated equipment grounding conductors with all feeders and branch circuits.

10. Air-Duct Equipment Circuits: NOT USED

11. Water Heater, Heat-Tracing, and Antifrost Heating Cables: NOT USED

12. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

13. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

14. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

a. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6-by-50-by-300-mm) grounding bus.

b. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

15. Metal and Wood Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

O. CORROSION INHIBITORS

1. When making grounding and bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used after scraping bolted surfaces clean and coat with conductive oxide resistant compound.

3.4 GROUND FAULT SYSTEMS

A. Visual and Mechanical Inspection:

1. Inspect for physical damage and compliance with Drawings and Specifications.

2. Inspect neutral main bonding connection to ensure following.

a. Zero sequence system grounded upstream of sensor.

b. Ground strap systems grounded through sensing device.

c. Ground connection made ahead of neutral disconnect link.

3. Inspect control power transformer to ensure adequate capacity for system.

4. Manual operate monitor panels (if present) for following:

a. Trip test.

b. No trip test.

c. Non-automatic reset.

5. Record proper operation and test sequence.

6. Inspect zero sequence systems for symmetrical alignment of core balance transformers about current carrying conductors.

7. Verify ground fault device circuit nameplate identification by actuation observation.

8. Pickup and time delay settings shall be set in accordance with settings developed through coordination study and as approved by ENGINEER.

B. Electrical Tests:

1. Test in accordance with manufacturer's instructions.

2. Measure system neutral insulation resistance to ensure no shunt ground paths exist, neutral-ground disconnect link removed, neutral insulation resistance measured, and link replaced.

3. Relay pickup current shall be determined by primary injection at sensor and circuit interrupting device operated.

4. Relay timing shall be tested by injecting 150% and 300% of pickup current into sensor. Total trip time shall be electrically monitored.

5. System operation shall be tested at 55% rated voltage.

6. Zone interlock system shall be tested by simultaneous sensor current injective and monitoring blocking function.

C. Test Parameters:

1. System neutral insulation shall be minimum of 100 ohms, preferably 1 megohm or larger.

2. Relay pickup current shall be within 10% of device dial or fixed setting, and in no case greater than 1,200 amp.

3. Relay timing shall be in accordance with manufacturer's published time-current characteristic curves, but in no case longer than 1 sec.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal[, at ground test wells][, and at individual ground rods]. Make tests at ground rods before any conductors are connected.

a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

b. Perform tests by fall-of-potential method according to IEEE 81.

B. Report measured ground resistances that exceed the following values: ****NOTE: Check IEEE Standards.

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.

2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.

3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.

4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm.

5. Substations and Pad-Mounted Equipment: 5 ohms.

6. Manhole Grounds: 10 ohms.

C. Testing Agency: Provide services of qualified independent testing agency to perform specified acceptance testing.

D. Testing: Upon completion of installation of ground-fault protection system and after electrical circuits have been energized, demonstrate capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.

E. Excessive Ground Resistance: Where resistance to ground exceeds specified values, notify ENGINEER promptly and include recommendations to reduce ground resistance and to accomplish recommended work.

F. Correct malfunctioning units at site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

G. Report: Prepare certified test reports, of ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

3.6 RESTORATION

1. Restore surface features, including vegetation, at areas disturbed by work of this Section.

2. Re-establish original grades, except as otherwise indicated.

3. Where sod has been removed, replace it as soon as possible after backfilling is completed.

4. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition.

5. Restored soil shall be compacted as required in 31 00 05 Trenching and Earthwork.

6. Include topsoil, fertilizer, lime, seeding, sodding, sprigging, and mulching as required in 32 92 00 Lawns and Grasses.

7. Maintain restored surfaces as required in Division 32 Paving Specifications.

8. Restore disturbed paving as required in Division 32 Paving Specifications.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 Description

A. Scope:

1. Supports from building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings.

2. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install hangers and supports for electrical systems.

3. Area Classifications: Materials shall by suitable for the area classification(s) shown or indicated on the Drawings, and specified in Section 26 05 05, General Provisions for Electrical Systems.

4. Provide complete support system to comply with seismic requirements. The support system shall be reviewed by a structural engineer.

B. Related Sections:

1. Section 26 05 05, General Provisions for Electrical Systems.

2. Section 26 05 33, Raceways and Boxes for Electrical Systems.

1.2 MEASUREMENT AND PAYMENT

A. This item is to be included in lump sum cost for Division 26 Electrical Equipment & Installation.

1.3 REFERENCES

A. Standards referenced in this section are:

1. ASTM A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

2. ASTM E84, Test Method for Surface Burning Characteristics of Building Materials

B. Regulatory Requirements:

1. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.

1.4 QUALITY ASSURANCE

A. Items provided under this section shall be listed and labeled by UL or other Nationally Recognized Testing laboratory (NRTL).

1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.

2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.

1.5 SUBMITTALS

A. Action Submittals. Submit the following:

1. Product Data

a. Hangers and Supports for Electrical Systems - Product Data

1) Manufacturer’s name, product designation, and catalog number of each material item proposed for use.

2) Manufacturer’s specifications including material, dimensional and weight data, and load capacity for each supporting system component proposed for use.

3) Manufacturer’s Instructions: manufacturer’s installation instructions, including recommended tightening torque values for all nuts and bolts.

4) Pictorial views and corresponding identifying text of each component proposed for installation.

2. Shop Drawings

a. Hangers and Supports for Electrical Systems - Shop Drawings

1) Detailed installation drawings showing dimensions and compatibility with proposed layout.

3. Delegated Design Submittal

a. Contractor is required to submit stamped final structural drawings showing hangers and supports to withstand seismic event.

B. Informational Submittals. Submit the following:

1. Certificates

a. Hangers and Supports for Electrical Systems - Certificates

1) Submit certifications required under this Section.

PART 2 PRODUCTS

2.1 MATERIALS

A. Strut, Fittings, and Accessories:

1. General

a. Unless otherwise shown or indicated, strut shall be 1-5/8 inches by 1-5/8 inches unless load permits use of 7/8 inches by 1-5/8 inches. Double struts shall be two pieces of the same strut, welded back-to-back at the factory.

b. Attachment holes, when required, shall be factory-punched on hole centers approximately equal to the cross-sectional width and shall be 9/16-inch diameter.

c. Fittings, braces, brackets, hardware, and accessories shall be Type 316 stainless steel.

d. Strut nuts shall be spring captured Type 316 stainless steel.

e. Square and round washers shall be Type 316 stainless steel.

2. Strut materials shall be suitable for area classifications indicated in Section 26 05 05, General Provisions for Electrical Systems, and shown or indicated on the Drawings.

a. Dusty Locations:

1) Strut shall be 12-gauge carbon steel, hot-dip galvanized after fabrication, complying with ASTM A123/A123M.

b. Wet Locations:

1) Strut shall be 12-gauge aluminum (Alloy 6063-T6).

c. Corrosive Locations:

1) Strut shall be 12-gauge Type 316 stainless steel.

B. Hanger Rods:

1. Material:

a. Dry Locations: All-thread, zinc-coated

b. Wet, Corrosive, or Hazardous Areas: Stainless steel.

2. Size: Not less than 3/8-inch diameter, unless otherwise shown on the Drawings or specified.

C. Beam Clamps for Attaching Threaded Rods or Bolts to Beam Flanges for Hanging Struts or Conduit Hangers:

1. Beam clamps shall be stainless steel equipped with stainless steel square-head set screw, and shall include threaded hole sized for attaching the all-thread rod or threaded bolt.

D. Recycled rubber conduit supports for electrical systems

1. Dimensions: 6-inches wide by 4 inches tall by 30.8 inches long

2. Steel frame: steel, strut galvanized per ASTM A653

3. Attaching hardware: zinc-plated threaded rod, nuts, and attaching hardware per ASTM B633.

E. Miscellaneous Hardware:

1. Bolts, screws, and washers shall be stainless steel.

2. Hex Nuts: Shall be stainless steel

3. Expansion Anchors: Stainless steel wedge or sleeve type.

4. Toggle Bolts: All stainless steel springhead type.

F. Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports. Comply with Section 05 50 00.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be installed and notify Engineer in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. The equipment shall be seismically qualified per the requirements of the California Building Code.

B. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.

C. Provide hangers and supports for electrical systems with necessary channels, fittings, brackets, and related hardware for mounting and supporting materials and equipment. Provide anchor systems, concrete inserts, and associated hardware for proper support of electrical systems.

D. Install equipment and devices on hangers and supports as shown on the Drawings, as specified, and as required.

E. Install hangers and supports level, true, free of rack, and parallel and perpendicular to building walls and floors, so that the hangers and supports are installed in a neat, professional, workmanlike manner.

F. Holes in suspended ceilings for rods for hangers and supports and other equipment shall be provided adjacent to bars, where possible, to facilitate removal of ceiling panels.

G. Coordinate installation of hangers and supports with equipment, cabinets, consoles, panels, enclosures, boxes, conduit, cable tray, wireway, busway, cable bus, piping, ductwork, lighting

fixtures, and other systems and equipment. Locate hangers and supports clear of interferences and access ways.

H. Mounting of Conduit:

1. Provide space of not less than 1/4-inch between conduit surfaces and abutting or near surfaces except struts, cable trays, steel beams, and columns.

2. Fasten conduit to struts, cable trays, steel beams, and columns using specified clamps and straps as shown, specified, and required.

3. Devices shall be compatible with size of conduit and type of support. Following installation, size identification shall be visible and legible.

4. Install conduit supports and fasteners in accordance with Section, 26 05 33.13, Rigid Conduits.

5. If supporting conduit to precast hollow core ceilings, install anchors in accordance with ceiling manufacturer.

I. Raceway and Cable Tray Supports:

1. Conform to manufacturer's recommendations for selection and installation of supports.

2. Strength of each support shall be adequate to carry present and future load multiplied by safety factor of at least four. Where this determination results in safety allowance of less than 200 lbs, provide additional strength until there is minimum of 200 lbs safety allowance in strength of each support.

3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.

4. Support parallel runs of horizontal raceways together on trapeze-type hangers.

5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1 in. and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4 in. dia or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.

6. In vertical runs, arrange support so load produced by weight of raceway and enclosed conductors is carried entirely by conduit supports with no weight load on raceway terminals.

J. Supports for Cabinets, Consoles, Panels, Enclosures, and Boxes:

1. Freestanding: Unless otherwise specified or shown on the Drawings, provide supports for floor-mounted equipment, cabinets, consoles, panels, enclosures, and boxes. Such supports shall be 3.5-inch high concrete equipment base with a 45 degree chamfered

edge. Base shall extend two inches beyond outside dimensions of equipment on all sides.

2. Wall-Mounted: Stainless steel

   a. Provide space not less than 1/4-inch between cabinets, consoles, panels, enclosures, and boxes and the surface on which each is mounted. Provide non-metallic or stainless steel spacers as required.

   b. Do not mount equipment, enclosures, panels, and boxes directly to beams or columns. Mount struts to beams or columns using beam clamps, and mount equipment, enclosures, panels, and boxes to the struts.

3. Floor Stand Rack: Stainless steel

   a. Where equipment, cabinets, consoles, panels, enclosures, and boxes cannot be wall-mounted, provide an independent floor stand rack.

   b. Floor stand rack shall consist of struts, plates, brackets, connection fittings, braces, accessories, and hardware assembled in a rigid framework suitable for mounting of intended materials and equipment.

   c. Equip floor stand racks with brackets and bases for rigidly-mounting the framework to the ceiling or floor, as applicable; or equip floor stand racks with beam clamps, angle plates, washers, and bolts for fastening to beam flanges, as applicable.

   d. When equipment, cabinets, consoles, panels, enclosures, and boxes weigh more than 100 pounds:

      1) Main vertical supports of floor stand rack assemblies shall be back-to-back struts.

      2) Bracing, clamping and anchoring of each floor stand rack shall be sufficient to ensure rigidity of the floor stand rack with the intended equipment, enclosures, conduit, cable tray, busway, cable bus, and wireway installed. Floor stand racks shall not be deflected more than 1/8-inch by a 100-pound force applied at any point on the floor stand rack in any direction.

K. Drilling into beams or columns is not allowed unless authorized by Engineer.

L. Tighten nuts and bolts to the manufacturer's recommended torque values.

M. Field Cutting:

1. Cut edges of strut and hanger rod shall have rounded corners, edges beveled, and burrs removed. If field cutting the strut is required, use clean, sharp, dedicated tools. Remove oil, shavings, burrs, and other residue of cuttings prior to installation.

2. Coatings: To prevent corrosion:

   a. Coat cut edges with zinc-rich paint. Provide protective end cap.

b. Bitumatic paint shall be used for aluminum in concrete.

N. Miscellaneous Supports: Support miscellaneous electrical components as required to produce same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.

O. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with following:

1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.

2. Holes cut in concrete shall not cut main reinforcing bars. Fill holes that are not used.

3. Load applied to any fastener shall not exceed 25% of proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals shown, specified, and required to furnish and install conduit and fittings to form complete, coordinated and grounded raceway systems.

2. When specific, detailed conduit routings for various systems within buildings and other areas are not be shown on the Drawings, Contractor shall establish routings based on single-line, riser, and interconnection diagrams and other information on the Drawings. Contractor shall provide for the proper installation of conduits in each system.

3. Conduit types and the installation methods shall comply with the following, unless otherwise shown or indicated in the Contract Documents:

a. Use rigid aluminum conduit for exposed indoor conduit runs in non-corrosive areas.

b. Use PVC-coated rigid steel for exposed exterior conduit runs in hazardous, wet, and corrosive locations.

c. Use PVC-coated rigid steel or rigid aluminum conduit for exposed interior conduit runs in hazardous, wet, and corrosive locations.

d. Use PVC-coated rigid steel conduit for individual conduits direct-buried in the ground.

e. Use Schedule 40 PVC conduit for concrete-encased duct bank runs.

f. Use PVC coated rigid steel conduit for transition from duct bank.

g. Use Schedule 40 PVC conduit for conduit runs embedded in structural concrete slabs. Use PVC coated rigid steel conduit for transition from duct bank.

B. Coordination:

1. Conduit runs shown are diagrammatic. Coordinate conduit installation with piping, ductwork, light fixtures, and other systems and equipment and locate to avoid interferences.

2. For conduits to be embedded in concrete slabs, confirm adequate slab thickness and coordinate location of conduits with placement of reinforcing steel, waterstops, expansion joints, and other features of the concrete slab.

C. Related Sections:

1. Section 26 05 05, General Provisions for Electrical Systems.
2. Section 26 05 29, Hangers and Supports for Electrical Systems.
3. Section 26 05 53, Identification for Electrical Systems.
4. Section 31 00 05 Trenching and Earthwork
5. Section 32 12 16, Asphalt Paving.

1.2 MEASUREMENT AND PAYMENT

A. This item is to be included in lump sum cost for Division 26 Electrical Equipment & Installation.

1.3 REFERENCES

A. Standards referenced in this Section are:

1. AASHTO, Standard Specifications for Highway Bridges.
2. ANSI C80.1, Standard for Rigid Electrical Steel Conduit (ERSC).
3. ANSI/NEMA FB1, Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable.
4. NEMA TC3, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
5. UL 514B, Conduit, Tubing, and Cable Fittings.
6. UL 886, Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

B. Regulatory Requirements: Comply with the following:

1. National Electrical Code: Components and installation shall comply with NFPA 70.
2. NEC Article 344, Rigid Metal Conduit.
3. NEC Article 350, Liquid-Tight Flexible Metal Conduit.
4. NEC Article 352, Rigid Nonmetallic Conduit.
5. NEC Article 358, Electrical Metallic Tubing.

C. Items provided under this section shall be listed or labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).

1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.
2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.

D. Comply with NECA "Standard of Installation."

1.4 SUBMITTALS

A. Action Submittals. Submit the following:

1. Product Data

a. Raceways and Boxes – Product Data

1) Manufacturer's catalog cuts and product data for conduit, fittings, and appurtenances.

2. Shop Drawings

a. Raceways and Boxes – Assembly Details

1) Assembly details of conduit racks and other conduit support systems.

b. Raceways and Boxes – Layout Drawings

1) Showing proposed routing of exposed conduits, conduits embedded in structural concrete, and conduits directly buried in the ground.

2) Show locations of pull and junction boxes and penetrations in walls and floors.

3) Shop Drawings of embedded conduits shall include cross-sections showing thickness of concrete slabs and locations of conduits relative to reinforcing steel, waterstops, and other features of the slab.

B. Informational Submittals. Submit the following:

1. Manufacturers' Instructions

a. Raceways and Boxes – Manufacturers' Instructions

1) When requested by Engineer, provide copies of manufacturer's recommendations for handling and installing products.

2. Field Quality Control Submittals

a. Raceways and Boxes – Field Quality Control

1) When requested by Engineer, provide copies of results of specified field quality control testing.

C. Closeout Submittals. Submit the following:

1. Record Documentation

a. Raceways and Boxes – Record Drawings

1) Show actual routing of exposed and concealed conduit runs in record documents in accordance with Section 01 78 39, Project Record Documents.

PART 2 PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit, Elbows, and Couplings:

1. Material: Rigid, heavy-wall, mild steel, hot-dip galvanized, smooth interior, tapered threads and carefully reamed ends; 3/4-inch NPS minimum size.

2. Galvanized Rigid Steel Conduit: ANSI C80.1.

B. PVC-coated Rigid Steel Conduit, Elbows, and Couplings:

1. Manufacturers: Provide products of one of the following:

a. Robroy Industries.

b. No “Or Equal”

2. Material: Rigid, heavy-wall, mild steel, hot-dip galvanized, smooth urethane interior coating, tapered threads, carefully reamed ends, 3/4-inch NPS minimum size with factory exterior coating of 40-mil thick PVC.

3. Color: Color of coating shall be the same on all conduit and fittings.

4. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

C. Aluminum Conduit, Elbows, and Couplings:

1. Material: Rigid, heavy-wall aluminum, smooth interior, tapered threads and carefully reamed ends; 3/4-inch NPS minimum size.

2. Rigid Aluminum Conduit: ANSI C80.5.

D. IMC – intermediate conduit shall not be used.

2.2 METALLIC FITTINGS

A. Metallic Conduit Fittings, and Outlet Bodies:

1. Material and Construction: Cast gray iron alloy, cast malleable iron or aluminum bodies and covers consistent with conduit material. Units shall be threaded type with five full threads. Materials shall comply with ANSI/NEMA FB1 and be listed by UL. Do not use “LB” fittings. Use type “LBD” fittings where use of fittings is unavoidable.

2. Use: Conduits shall be gasketed and watertight in hazardous, wet, and corrosive locations.

3. The use of threadless couplings and connectors is prohibited.

B. PVC-coated Conduit Fittings, and Outlet Bodies:

1. Material and Construction: Cast gray iron alloy, cast malleable iron bodies and covers with factory coating of 40-mil thick PVC and smooth urethane interior coating. Units shall be threaded type with five full threads. Material shall comply with ANSI/NEMA FB1 and be listed by UL. Do not use “LB” fittings. Use type “LBD” fittings where use of fittings is unavoidable.

2. Use: Provide PVC-coated or aluminum conduit fittings and outlet bodies in hazardous, wet, and corrosive locations. Fitting material shall be consistent with conduit material.

C. Conduit Hubs:

1. Material: Threaded conduit hub, vibration-proof, weatherproof, with captive O-ring seal, zinc metal with insulated throat and bonding screw.

2. Use: Provide for all conduit terminations to boxes, cabinets, and other enclosures in areas designated as wet locations.

D. PVC-coated Conduit Hubs:

1. Manufacturers: Provide products one of the following:

a. Robroy Industries.

b. No “Or Equal”

2. Material: Threaded conduit hub, vibration-proof, weatherproof, with captive O-ring seal, zinc metal with insulated throat and bonding screw, and factory coating of 40-mil thick PVC and smooth urethane interior coating.

3. Use: Provide for PVC-coated steel or aluminum conduit terminations to boxes, cabinets, and other enclosures in areas designated as corrosive location.

E. Conduit Bushings and Locknuts:

1. Insulated Bushings: Malleable iron body with plastic liner. Threaded type with steel clamping screw. Provide with bronze grounding lug, as required.

2. Locknuts: Steel for sizes 3/4-inch through two-inch diameter and malleable iron for sizes 2.5-inch through four-inch diameter.

3. Use: Provide for all conduit terminations to boxes, cabinets and other enclosures except threaded type in areas designated as dusty locations.

F. Thru-wall Seals

1. For new construction through exterior subsurface walls and exterior concrete walls.

2. For new construction passing through concrete floors and floor slabs.

3. For conduits passing through new exterior masonry block walls or through core-drilled holes in existing exterior subsurface walls, exterior concrete walls, floor slabs ,and roof slabs, and for conduits passing through existing interior concrete walls or floors and interior masonry block walls.

    a. Manufacturer: Provide one of the following:

        1) Type CSMI sealing bushing at the inside of the structure and Type CSMC sealing bushing at the outside of the structure by O-Z/Gedney.

        2) Or equal.

2.3 NONMETALLIC CONDUIT AND FITTINGS

A. Non-metallic Conduit and Fittings: Nonmetallic Conduit

1. Rigid Nonmetallic Polyvinyl Chloride (PVC) Conduit:

    a. NEMA TC 2, Schedule 40 or 80 PVC.Rated for 90 degrees C, complying with UL 514B and 651.

    b. Elbows and Fittings shall comply with NEMA TC3

    c. Match conduit to type of material

    d. Fittings: Form elbows, bodies, terminations, expansions, and fasteners of same material and manufacturer as base conduit. Provide cement by same manufacturer as base conduit.

2.4 FLEXIBLE CONDUIT

A. Flexible Conduit (Non-hazardous Areas and Class 1, Division 2, Hazardous Areas):

1. Material: Flexible galvanized steel core with smooth, abrasion-resistant, liquid-tight, polyvinyl chloride cover. Continuous copper ground built in for sizes 3/4-inch through 1.25-inch. Material shall be UL-listed.

B. Flexible Conduit (Class 1, Group D, Division 1, Hazardous Areas):

1. Material: Flexible brass inner core with bronze outer braid and protective neoprene plastic coating. Steel, brass, or bronze end fittings. Minimum of 12 inches long.

C. Flexible Metal Conduit: Zinc-coated steel.

D. Liquid-tight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.

2.5 FLEXIBLE CONDUIT FITTINGS:

A. Metallic Flexible conduit fittings

1. Material and Construction:

a. Malleable iron with cadmium finish. Fittings shall adapt the conduit to standard threaded connections, shall have an inside diameter not less than that of the corresponding standard conduit size and shall be UL listed.

b. Conduit fittings shall be insulated throat type. Conduit shall be liquid-tight with one piece sealing "O" rings with connectors when entering boxes or enclosures

2. Use: Provide on flexible conduit in non-hazardous and Class 1, Division 2 hazardous areas.

B. PVC-Coated Flexible Conduit Fittings:

1. Material and Construction:

a. Malleable iron with standard finish and 40-mil PVC exterior coating. Fittings shall adapt the conduit to standard threaded connections, and shall have an inside diameter not less than that of the corresponding standard conduit size.

b. Conduit fittings shall be insulated throat type. Conduit shall be liquidtight with one piece sealing "O" rings with connectors when entering boxes or enclosures

2.6 WIREWAYS

A. Material: Sheet metal sized and shaped as indicated.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireway as required for complete system.

C. Select features where not otherwise indicated, as required to complete wiring system and to comply with NEC.

D. Wireway Covers:

1. Hinged type for dry locations.

2. Bolted cover with gasket for wet locations.

E. Finish: Manufacturer's standard enamel finish unless other wise noted.

2.7 PULL JUNCTION, AND TERMINAL BOXES:

A. General – Applicable to All Boxes:

1. Description and Performance Criteria:

a. Boxes shall be appropriate for each location in accordance with NEMA requirements and as required for area classifications specified in Section 26 05 05, General Provisions for Electrical Systems.

b. For flush-mounted pullboxes in slabs or pavement potentially subject to vehicular traffic, boxes and covers shall be constructed for H-20 loading in accordance with AASHTO Standard Specifications for Highway Bridges.

2. Materials: Pull boxes embedded in concrete slabs shall be polymer concrete.

3. Terminal strips and terminal blocks in terminal boxes shall be mounted on terminal box sub-panels.

4. Identification: Boxes shall be identified in accordance with Section 26 05 53, Identification for Electrical Systems.

B. Materials and Construction – Dusty Locations:

1. Material: NEMA 12 or fiberglass.

2. Gasket: Oil-resistant gasket.

3. Access: Lift-off hinges and quick-release latches.

C. Materials and Construction - Wet, Corrosive, or Hazardous Locations:

1. Material:

a. Pull boxes in wet, corrosive, or outdoor areas shall be NEMA 4X stainless steel.

b. Boxes for areas classified as hazardous locations, where required by NEC, shall be NEMA 7 explosion-proof and comply with UL 886.

c. In corrosive locations, where the conduit system is PVC-coated, boxes shall be cast metal with factory-applied 40-mil PVC coating, Type 316 stainless steel, or non-metallic thermoplastic or fiberglass reinforced plastic material.

2. Gasket:

a. Provide neoprene gaskets for wet and corrosive locations.

b. Gaskets shall be an approved type designed for the purpose. Improvised gaskets are not acceptable.

3. Access: Stainless steel cover bolts.

4. Features:

a. External mounting lugs.

b. Drilled and tapped conduit holes.

c. Boxes where conduits enter building or structure below grade shall have 1/4-inch drain hole at bottom of the box.

d. Provide threaded connections for explosion proof boxes.

D. Terminal Blocks:

1. Material and Construction:

a. NEMA-rated nylon modular terminal blocks.

b. 600-volt rated.

c. Terminals shall be screwed type with permanently affixed numeric identifiers beside each connection.

d. Power terminals shall be copper and rated for the circuit ampacity.

2.8 ACCESSORIES

A. Fasteners: To the extent possible, fastener material shall be consistent with conduit material. For PVC-coated rigid steel conduit runs, fasteners shall have factory applied PVC coating or be stainless steel. Fasten raceway systems to supporting structures using the following:

1. To Wood: Stainless steel screws

2. To Hollow Masonry Units: Toggle bolts and/or hollow wall anchors shall be stainless steel.

3. To Brick Masonry: Expansion bolts by Price, or equal shall be stainless steel.

4. To Concrete: Anchors shall be expansion anchors shall be stainless steel.

5. To Steel: Beam clamps in accordance with Section 26 05 29, Hangers and Supports for Electrical Systems which shall be stainless steel.

B. Duct Sealing Compound

1. Soft, fibrous, slightly tacky, non-hardening sealing compound.

2. Remains workable at all temperatures.

3. Compound shall not slump at temperature of 300°F and shall readily adhere to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit passing through concrete floors, walls, or boxes. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.

D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers.

E. Pipe Sleeves: Provide pipe sleeves of one of following:

1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from following gauge metal for sleeve diameter noted:

   a. 3 in. and smaller: 20 ga.

   b. 4 in. to 6 in.: 16 ga.

   c. Over 6 in.: 14 ga.

2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.

3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

2.9 FIRE RESISTANT JOINT SEALERS

A. Two-part, foamed-in-place, silicone sealant formulated for use in through-penetration fire-stopping around cables, conduit, pipes, and duct penetrations through fire-rated walls and floors.

B. Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with ASTM E 814, by Underwriters' Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.

2.10 IDENTIFICATION

A. Conduit Labels:

1. Provide conduit labels in accordance with Section 26 05 53, Identification for Electrical Systems.

B. Warning Tape:

1. Provide warning tape in accordance with Section 26 05 53, Identification for Electrical Systems.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be performed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Supports:

1. Rigidly support conduits by clamps, hangers, or Unistrut-type channels. Conduit supports and accessories shall be in accordance with Section 26 05 29, Hangers and Supports for Electrical Systems.

2. Support single conduits by means of one-hole pipe clamps in combination with one-screw back plates, to raise conduits from the support surface. Support multiple runs of conduits on trapeze type hangers.

B. Fastenings: Fasten raceway systems rigidly and neatly to supporting structures using specified materials. Follow NEC for support spacing.

C. Exposed Conduit:

1. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow surface contours as much as practical.

   a. Mount exposed horizontal runs as high above floor as possible, and in no case lower than 7 ft above floors, walkways, or platforms in passage areas.

   b. Run parallel or banked raceways together, on common supports where practical.

   c. Make bends in parallel or banked runs from same center line to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.

2. Where possible, run in groups. Provide conduit racks of suitable width, length, and height, arranged to suit field conditions. Provide support every ten feet, minimum.

3. Install on structural members in protected locations.

4. Locate clear of interferences.

5. Provide six inches of clearance from hot fluid lines and 1/4-inch from walls.

6. Install vertical runs plumb. Unsecured drop length shall not exceed 12 feet.

7. Use temporary closures to prevent foreign matter from entering raceway.

D. Underground Conduits:

1. Install individual, underground conduits minimum of 36 inches below grade, unless otherwise shown or indicated.

2. Perform excavation, bedding, backfilling, and surface restoration, including pavement replacement where required, in accordance with Section 31 00 05 Trenching and Earthwork, and Section 32 16 00, Asphalt Paving.

3. Install traceable warning tape 12 inches below finished grade over buried conduits.

4. Installation shall be in accordance with requirements of section 26 05 43 Underground Ducts and Raceways for Electrical Systems

E. Empty Conduits:

1. Install nylon pull wire in each empty conduit and cap conduits not terminating in boxes with permanent fittings designed for the purpose.

2. Install two spare 1 in. conduits from top of each flush mounted panelboard to area above ceiling for future use. On flush mounted panelboards located on first and higher level floors, provide two spare 1 in. conduits from bottom of panelboard to ceiling area of floor below for future use.

F. Field Bends: No indentations. Diameter of conduit shall not vary more than 15 percent at bends.

G. Joints:

1. Apply conductive compound to joints before assembly.

2. Make up joints tight and ground thoroughly.

3. Use standard tapered pipe threads for conduit and fittings.

4. Cut conduit ends square and ream to prevent damaging wire and cable.

5. Use full threaded couplings. Split couplings are not allowed.

6. Use strap wrenches and vises to install conduit. Replace conduit with wrench marks.

7. Apply zinc-rich paint to exposed threads and other areas of galvanized conduit system where base metal is exposed.

H. Terminations:

1. Install insulated bushings on conduits entering boxes or cabinets, except when threaded hubs are used.

2. Provide locknuts on both inside and outside of enclosure, except when threaded hubs are used.

3. Use of bushings in lieu of locknuts is not allowed.

4. Install conduit hubs on conduits entering boxes or cabinets in wet and corrosive areas.

I. Moisture Protection:

1. Plug or cap conduit ends at time of installation to prevent entrance of moisture and foreign materials.

2. Underground and embedded conduit connections shall be watertight.

3. Thruwall Seals and Conduit Sealing Bushings: Install for conduits passing through concrete slabs, floors, walls, or concrete block walls.

4. Drainage: Conduit runs shall be fully drainable. Where possible install conduit runs to drain to one end and away from building. Avoid pockets or depressions in conduit runs.

5. Seal conduit openings within control and instrumentation panels and distribution equipment with duct sealing compound to provide watertight seal.

6. Use threaded hubs when entering top of enclosures.

7. Use sealing type locknuts when entering sides or bottom of enclosures.

J. Corrosion Protection:

1. Dissimilar Metals:

a. Prevent occurrence of electrolytic action between dissimilar metals.

b. Do not use copper products in connection with aluminum, and do not use aluminum in locations subject to drainage of copper compounds on bare aluminum.

c. Protect Aluminum conduit where in contact with concrete.

K. Core drill for individual conduits passing through existing concrete slabs and walls. Notify Engineer in writing in advance of core drilling. Prior to core drilling, drill sufficient number of small exploratory holes to establish that the area to be core drilled is free of existing embedded conduits. Seal spaces around conduit meeting moisture protection requirements of this section.

L. Non-metallic Conduit:

1. Install in accordance with manufacturer's recommendations.

2. Provide manufacturer's recommended adhesives or sealants for watertight connections.

3. Provide expansion fittings for expansion and contraction to compensate for temperature variations. Fittings shall be watertight and suitable for direct burial.

4. Use PVC coated rigid steel elbows in concrete encasements and duct banks.

5. Transition to PVC-coated rigid steel conduit before making turn up to enclosures.

M. PVC-coated Rigid Steel Conduit:

1. Install in accordance with manufacturer's recommendations.

2. Install with manufacturer's installation tools to avoid damage to PVC coating.

3. Repair damaged PVC coating with manufacturer's recommended touch-up compound.

4. Use only manufacturer approved threading equipment and tools

N. Telephone and Signal System Raceways 2 in. Trade Size and Smaller: In addition to above requirements, install in maximum lengths of 150 ft (45 m) and with maximum of two 90° bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements.

O. Conduit bends

1. Make bends and offsets so inside diameter is not reduced. Unless otherwise indicated, keep legs of bend in same plane and straight legs of offsets parallel.

2. Provide NEMA standard conduit bends, except for conduits containing medium voltage cable, fiber optic cable, or conductors requiring large radius bends.

3. Provide large radius conduit bends for conduits containing 5 kV and 15 kV cables as follows:

Conduit Trade	Bend Radius
2 in. - 2-1/2 in.	36 in.
3 in. - 4 in.	48 in.
5 in.	48 in.

4. Where physical limitations do not permit use of above, conduit bends with radius of at 8 times diameter of largest cable passing through conduit may be used.

P. Identify conduits, including spares, in accordance with Section 26 05 53, Identification for Electrical Systems.

Q. Vertical Conductor Supports: Install simultaneously with installation of conductors.

R. Sleeves: Install in concrete slabs and walls and other fire-rated floors and walls for raceways and cable installations. For sleeves through fire rated-wall or floor construction, apply UL listed firestopping sealant in gaps between sleeves and enclosed conduits and cables.

S. Conduit Seals: Install seals for conduit penetrations of slabs below grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

T. Conduit extending through roof shall be sealed and integrated into the roofing system and made water tight.

3.3 FLEXIBLE CONDUIT INSTALLATION

A. Use maximum of 6 ft (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures.

B. Install at motors, transformers, field instruments, and equipment subject to vibration or require movement for maintenance purposes. Provide necessary reducer where equipment furnished cannot accept 3/4 inch diameter flexible conduit. Limit flexible conduit length to three feet maximum.

C. Use liquidtight flexible conduit in wet or damp locations.

D. Use approved flexible connections in hazardous locations.

E. Install separate ground conductor inside flexible conduit connections.

3.4 PULL JUNCTION AND TERMINAL BOXES INSTALLATION

A. Mount boxes so that sufficient access and working space is provided and maintain clearance of not less than 1/4-inch from walls.

B. Securely fasten boxes to walls or other structural surfaces on which boxes are mounted. Provide independent supports that comply with Section 26 05 29, Hangers and Supports for Electrical Systems, where boxes will not be mounted on walls or other structural surface.

C. Install pull boxes where shown or indicated, and provide pull boxes or conduit bodies where one or more of the following conditions exist:

1. Conduit runs containing more than three 90-degree bends.

2. Conduit runs exceeding 200 feet in length.

D. Provide removable, flame-retardant, insulating cable supports in boxes with any dimension exceeding three feet.

E. Field-apply PVC touch-up to scratched PVC boxes damaged during installation. Touch-up work shall be in accordance with manufacturer's recommendations and instructions.

F. Size junction, pull, and terminal boxes in accordance with NEC Article 314 and other Laws and Regulations.

G. Provide terminal blocks in boxes where shown and where cable terminations or splices are required.

H. Do not locate boxes on handrails, unless directed by Engineer.

3.5 FITTINGS

A. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. Install raceway sealing fittings at following points and elsewhere as indicated:

1. Where conduits enter or leave hazardous locations.

2. Where conduits pass from warm locations to cold locations, such as boundaries of refrigerated spaces and air-conditioned spaces.

3. Where otherwise required by NEC.

B. Use raceway fittings compatible with raceway and suitable for use and location. For GRS use threaded galvanized rigid steel conduit fittings, except as otherwise indicated.

C. Install automatic breather drain fittings according to manufacturer's written instructions. Locate fittings to drain conduit system and prevent condensate from entering device enclosures. Install automatic breather drain fittings at following points and elsewhere as indicated.

1. Where vertical seals are installed.

2. Low points in conduit system.

3. Below field instruments at junction of flexible and rigid conduit.

4. Where otherwise required by NEC.

D. Install wall entrance seal as dictated by application where conduits pass through foundation walls below grade.

E. Install conduit expansion fittings complete with bonding jumper in following locations.

1. Conduit runs crossing structural expansion joint.

2. Conduit runs attached to 2 separate structures.

3. Conduit runs where movement perpendicular to axis of conduit may be encountered.

F. Where conduit passes from inside of building to outdoors, it shall be firmly packed at fitting nearest wall line with Johns-Manville Duxseal to depth of at least 1 in. after wires and cables are pulled in; or, if conduit enters directly into equipment, it shall be fitted with seal and drain fitting to prevent water entering equipment.

3.6 GROUNDING

A. Ground in accordance with Section 26 05 26.

B. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals according to torques requirements specified in UL 486A.

3.7 PROTECTION

A. Provide final protection and maintain conditions, in manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touch-up coating recommended by manufacturer.

3.8 CLEANING

A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

3.9 FIELD QUALITY CONTROL

A. Site Tests:

1. Test conduits by pulling through each conduit a cylindrical mandrel with length not less than two pipe inside diameters, having an outside diameter equal to 90 percent of conduit's inside diameter.

2. Maintain a record, by number, of all conduits successfully tested.

3. Repair or replace conduits that do not successfully pass testing, and re-test.

END OF SECTION

SECTION 26 05 36

CABLE TRAYS

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, tests and services to install complete cable tray systems as shown on the drawings.

2. Cable tray systems are defined to include but are not limited to straight sections of ladder type cable trays, bends, tees, elbows, drop-outs, supports, and accessories.

B. Coordination:

1. Coordinate location and elevation for cable tray installation with conduit, lighting fixture, steel frame, hangers and supports and equipment within the space specified in drawings where cable tray is indicated.

2. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before cable tray for electrical systems Work.

3. Notify other disciplines in advance of installing cable tray for electrical systems to provide others with sufficient time for installing items included in their scope that will be installed with or before cable tray for electrical systems work.

C. Related Sections:

1. Section 26 05 05, General Provisions For Electrical Systems

2. Section 26 05 19, Low-Voltage Electrical Power Conductors and Cables

3. Section 26 05 26, Grounding and Bonding for Electrical Systems.

4. Section 26 05 29, Hangers and Supports for Electrical Systems

5. Section 26 05 33, Raceways and Boxes for Electrical Systems

6. Section 26 05 53, Identification for Electrical Systems.

1.2 MEASUREMENT AND PAYMENT

A. This item is to be included in lump sum cost for Division 26 Electrical Equipment & Installation.

1.3 REFERENCES

A. Standards referenced in this Section are:

1. ANSI/NFPA 70 - National Electrical Code.

2. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.

3. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

4. ASTM A1011 - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High Strength Low Alloy with Improved Formability *(Formerly ASTM A570 &A607)*

5. ASTM A1008 – Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability *(Formerly ASTM A611)*

6. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel

7. NEMA VE 1-2017 – Metallic Cable Tray Systems

8. NEMA VE 2-2018 – Cable Tray Installation Guidelines

1.4 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Engineer no fewer than fourteen (14) days in advance of proposed interruption of electrical service.

2. Do not proceed with interruption of electrical service without Engineer's written permission.

1.5 DRAWINGS

A. The drawings, which constitute a part of these specifications, indicate the general route of the cable tray systems. Data presented on these drawings are as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification, of all dimensions, routing, etc., is directed.

B. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.

1.6 SUBMITTALS

A. Action Submittals. Submit the following:

1. Product Data: Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable tray, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.

2. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer, licensed in the state where Project is located, who is responsible for their preparation.

a. Design Calculations: Calculate requirements for selecting seismic restraints.

b. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

C. Coordination Drawings: Floor plans and sections, drawn to scale. Include scaled

cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements. Show the following:

a. Vertical and horizontal offsets and transitions.

b. Clearances for access above and to side of cable trays.

c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of cable trays and fittings of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. NEMA Compliance: Comply with NEMA Standards Publications Number VE1, “Cable Tray Systems”

C. NEC Compliance: Comply with NEC, as applicable to construction and installation of cable tray and cable channel systems (Article 318, NEC).

D. UL Compliance: Provide products that are UL-classified and labeled.

E. NFPA Compliance: Comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" pertaining to installation of cable tray systems.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Avoid breakage, denting and scoring finishes. Damaged products will not be installed. Store cable trays and accessories in original cartons and in clean dry space; protect from weather and construction traffic. Wet materials will be unpacked and dried before storage.

B. Method of Delivery

1. If deliver is by truck, Bidder shall specify the anticipated type of vehicle: box truck, van, flatbed, stake bed, semitrailer, etc.

2. Bidder shall include information regarding special conditions such as over-sized dimensions or heavy axial loading.

C. Delivery Off-Loading

1. Bidder shall describe the off-loading process at the point of delivery including equipment requirements such as, but not limited to, powered-lift gate, fork-lift, crane (lift hooks, slings, spreaders, etc.).

2. Bidder shall include the time allowed for off-loading.

D. Installation

1. Bidder shall provide a full description of installation and assembly services provided by Bidder, including manpower, and an inclusive list of trades to be provided by Purchaser to complete the installation and assembly process.

PART 2 PRODUCTS

2.1 CABLE TRAY SECTIONS AND COMPONENTS

A. General: Except as otherwise indicated, provide metal cable trays, of types, classes and sizes indicated; with splice plates, bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.

B. Project design is based on aluminum cable ladder. Any deviations from this require approval in writing.

C. Materials and Finish: Material and finish specifications for each tray type are as follows:

1. Aluminum: Straight section and fitting side rails and rungs shall be extruded from Aluminum Association Alloy 6063. All fabricated parts shall be made from Aluminum Association Alloy 5052.

2. Pre-galvanized Steel: Straight sections, fitting side rails, rungs, and covers shall be made from steel meeting the minimum mechanical properties and mill galvanized in accordance with ASTM A653 SS, Grade 33, coating designation G90.

3. Hot-dip Galvanized Steel: Straight section and fitting side rails and rungs shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS, Grade 33 for 14 gauge and heavier, ASTM A1008, Grade 33, Type 2 for 16 gauge and lighter, and shall be hot-dip galvanized after fabrication in accordance with ASTM A123. All covers and splice plates must also be hot-dip galvanized after fabrication; mill galvanized covers are not acceptable for hot-dipped galvanized cable tray. All hot-dip galvanized after fabrication steel cable trays must be returned to point of manufacture after coating for inspection and removal of all icicles and excess zinc. Failure to do so can cause damage to cables and/or injury to installers.

4. Stainless Steel: Straight section and fitting side rails and rungs shall be made of AISI Type 304 or Type 316 stainless steel. Transverse members (rungs) or corrugated bottoms shall be welded to the side rails with Type 316 stainless steel welding wire.

2.2 TYPE OF TRAY SYSTEM

A. Ladder type trays shall consist of two longitudinal members (side rails) with transverse members (rungs) welded to the side rails. Rungs shall be spaced 9 inches on center. Spacing in radiused fittings shall be 9 inches and measured at the center of the tray's width. Rungs shall have a minimum cable-bearing surface of 7/8 inch with radiused edges. No portion of the rungs shall protrude below the bottom plane of the side rails. **Each rung must be capable of supporting the maximum cable load, with a safety factor of 1.5 and a 200 pound concentrated load when tested in accordance with NEMA VE-1, section 5.4.

B. Tray Sizes shall have 6 inch minimum usable load depth, or as noted on the drawing.

C. Straight tray sections shall have side rails fabricated as I-Beams. All straight sections shall be supplied in standard 24 foot lengths, except where shorter lengths are permitted to facilitate tray assembly lengths as shown on drawings.

D. Tray widths shall be as shown on drawings

E. All fittings must have a minimum radius of 24 inches

F. Splice plates shall be the bolted type made as indicated below for each tray type. The resistance of fixed splice connections between adjacent sections of tray shall not exceed .00033 ohms. Splice plate construction shall be such that a splice may be located anywhere within the support span without diminishing rated loading capacity of the cable tray. Splice plates shall be furnished with straight sections and fittings.

1. Aluminum Tray - Splice plates shall be made of 6063-T6 aluminum, using four square neck carriage bolts and serrated flange locknuts. Hardware shall be zinc plated in accordance with ASTM B633, SC1. If aluminum cable tray is to be used outdoors then hardware shall be Type 316 stainless

2. Steel (including Pre-galvanized and Hot-dip galvanized) - Splice plates shall be manufactured of high strength steel, meeting the minimum mechanical properties of ASTM A1011 HSLAS, Grade 50, Class 1. Each splice plate shall be attached with four ribbed neck carriage bolts with serrated flange locknuts. Hardware shall be zinc plated in accordance with ASTM B633 SC1 for pre-galvanized cable trays, or Chromium Zinc in accordance with ASTM F-1136-88 for hot-dip galvanized cable trays.

G. Cable Tray Supports: Shall be placed so that the support spans do not exceed maximum span as determined by manufacturer load study for the calculated load (refer to section 2.3 below) or otherwise indicated on drawings. Supports shall be constructed from 12 gauge steel formed shape channel members 1-5/8 inch by 1-5/8 inch with necessary hardware such as Trapeze Support Kits (9G-55XX-22SH) as manufactured by Cooper B-Line, Inc. or engineer approved equal. Cable trays installed adjacent to walls shall be supported on wall mounted brackets such as B409 as manufactured by Cooper B-Line, Inc. or engineer approved equal.

H. Center hung supports shall be manufactured of 12 gauge, 1-5/8 inch by 1-5/8 inch B-Line B22 steel strut with a pipe welded at the middle of the support to provide eccentric loading stability. Support shall withstand 700 pounds in a 60 percent vs. 40 percent eccentric loading condition with a safety factor of 3.

I. Trapeze hangers and center-hung supports shall be supported by 1/2 inch (minimum) diameter rods.

J. Barrier Strips: Shall be placed as specified on drawings and be fastened into the tray with self-drilling screws.

K. Accessories - special accessories shall be furnished as required to protect, support, and install a cable tray system. Accessories shall consist of but are not limited to; section splice plates, expansion plates, blind-end plates, specially designed ladder dropouts, barriers, etc.

2.3 LOADING CAPACITIES

A. Cable tray shall be capable of carrying a uniformly distributed load sufficient to support the equipment indicated on the drawings as determined by cable tray vendor. A safety factor of 1.5 shall be included when supported as a simple span and tested per NEMA VE1 Section 5.2.

B. Cable Tray Vendor shall submit load calculations and installation drawings approved by a professional engineer licensed in the Project state.

PART 3 EXECUTION

3.1 INSPECTION

A. Install cable trays as indicated: Installation shall be in accordance with equipment manufacturer's instructions, and with recognized industry practices to ensure that cable tray equipment comply with requirements of NEC and applicable portions of NFPA 70B. Reference NEMA-VE2 for general cable tray installation guidelines.

B. Coordinate cable tray with other electrical work as necessary to properly integrate installation of cable tray work with other work.

C. Provide sufficient space encompassing cable trays to permit access for installing and maintaining cables.

D. Cable tray fitting supports shall be located such that they meet the strength requirements of straight sections. Install fitting supports per NEMA VE-2 guidelines, or in accordance with manufacturer's instructions.

3.2 TESTING

A. Test cable trays to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance. See NFPA 70B, Chapter 18, for testing and test methods.

B. Manufacturer shall provide test reports witnessed by an independent testing laboratory of the "worst case" loading conditions outlined in this specification and performed in accordance with the latest revision of NEMA VE-1; including test reports verifying rung load capacity in accordance with NEMA VE-1 Section 5.4.

"END OF SECTION"

SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. Provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install manholes, handholes, and underground ductbanks for electrical systems Work.

B. Coordination:

1. Coordinate manhole, handhole, and underground ductbank installation with piping, sheeting other excavation supports, and other Underground Facilities, and locate clear of interferences.

2. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before manhole, handhole, and underground ductbanks for electrical systems Work.

3. Coordinate locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Engineer.

C. Related Sections:

1. Section 03 20 00, Concrete Reinforcing.

2. Section 03 30 00, Cast in Place Concrete.

3. Section 26 05 26, Grounding and Bonding for Electrical Systems.

4. Section 26 05 53, Identification for Electrical Systems.

5. Section 26 05 33 Raceways and Boxes for Electrical Systems

6. Section 31 00 05, Trenching and Earthwork

7. Section 31 20 00, Excavation

1.2 MEASUREMENT AND PAYMENT

A. This item is to be bid per linear foot according to the bid sheet, and not included in overall lump sum cost for section 26 electrical equipment & installation.

1.3 REFERENCES

A. Standards referenced in this Section are:

1. AASHTO, Specifications for Highway Bridges.
2. ANSI/SCTE 77, Specification for Underground Enclosure Integrity.
3. ASTM A48/A48M, Specification for Gray Iron Castings.
4. ASTM C478, Specification for Precast Reinforced Concrete Manhole Sections
5. ASTM C 858, Specification for Underground Precast Concrete Utility Structures
6. ASTM C 1037, Standard Practice for Inspection of Underground Precast Concrete Utility Structures

1.4 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Engineer no fewer than fourteen (14) days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Engineer's written permission.

1.5 SUBMITTALS

A. Action Submittals. Submit the following:

1. Product Data
    a. Underground Ducts and Raceways - Manufacturer’s Technical Information
        1) Specifications, and literature for manholes, handholes, castings, and accessories proposed for use.
        2) Duct-Bank Materials - Include separators and miscellaneous components.
        3) Ducts and Conduits and Their Accessories - Include elbows, end bells, bends, fittings, and solvent cement.
        4) Warning Tape - Product information including markings and selected color.
2. Shop Drawings
    a. Layout of Manhole Electrical Systems
        1) Where manholes have extensive electrical systems and supports for electrical systems, submit for each plans, sections, and details indicating proposed layout of such materials and equipment in each manhole.

2) Shop Drawings for Factory-Fabricated Handholes and Boxes Other Than Precast Concrete

a) Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:

- Duct entry provisions, including locations and duct sizes.
- Cover design.
- Grounding details.
- Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

3) Precast or Factory-Fabricated Underground Utility Structures

a) Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:

- Duct entry provisions, including locations and duct sizes.
- Reinforcement details.
- Frame and cover design and manhole frame support rings.
- Ladder and/or Step details.
- Grounding details.
- Dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
- Joint details.

b. Duct-Bank Coordination Drawings

1) Show duct profiles and coordination with other utilities and underground structures.

2) Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.

3) Drawings shall be signed and sealed by a qualified professional engineer.

4) Typical cross sections for each ductbank.

B. Informational Submittals. Submit the following:

1. Certificates

a. Underground Ducts and Raceways – Product Certificates

1) Submit for concrete and steel used in precast concrete manholes and handholes, as required by ASTM C 858.

C. Closeout Submittals. Submit the following:

1. Record Documentation

a. Underground Ducts and Raceways – Record Drawings

1) Include actual routing of underground ductbank runs on record documents in accordance with Section 01 78 39, Project Record Documents.

D. Maintenance Material Submittals. Submit the following.

1. Extra Stock Materials

a. Underground Ducts and Raceways – Extra Stock Materials

1) Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to ten (10) percent of quantity of each item installed.

1.6 QUALITY ASSURANCE

A. Component Supply and Compatibility:

1. Obtain all manholes and handholes furnished under this Section from a single Supplier, unless otherwise acceptable to Engineer.

2. Manhole and handhole Supplier shall review and approve the Shop Drawing submittals for the manholes and handholes furnished.

3. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store precast concrete and/or other factory-fabricated underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

PART 2 PRODUCTS

2.1 MATERIALS

A. Material and Construction:

1. Material shall be precast or cast-in-place reinforced concrete per Contract Drawings.

2. Provide minimum interior dimensions as shown or indicated.

3. Unless otherwise indicated on drawings provide a deep sump in manhole floor with gravel filled knockout for drainage.

4. Duct entrances shall be sized and located to suit the ductbanks.

5. Precast Manholes:

   a. Except where otherwise specified, precast manhole components shall consist of reinforced concrete pipe sections specially designed and constructed for use as manholes and manufactured in accordance with ASTM C478, except as modified in this Section.

   b. Precast, reinforced concrete manhole bases, riser sections, flat slabs, and other components shall be manufactured by wet-cast methods, using forms that provide smooth surfaces free of irregularities, honeycombing, and other imperfections.

   c. Joints between manhole components shall be tongue-and-groove type employing a single, continuous rubber O-ring gasket. Circumferential and longitudinal steel reinforcing shall extend into bell and spigot ends of joint without breaking steel continuity. Joints between base sections, riser sections, and top slabs of manholes six feet in diameter and less shall be rubber and concrete joints. Joints for manhole components greater than six-foot diameter shall have steel bell and spigot rings.

   d. Precast manhole components shall:

      1) have sufficient strength to withstand loads imposed upon them; and

      2) be constructed for minimum earth cover loading of 130 pounds per cubic foot, AASHTO H-20 wheel loading, and an allowance of 30 percent in roadways and 15 percent in rights-of-way for impact.

      3) Manhole bases shall have two cages of reinforcing steel in the walls, each reinforcing cage shall be of area equal to that required in the riser sections.

      4) Wall thickness shall be not less than five inches.

      5) Concrete top slabs shall be not less than eight inches thick.

   e. Lifting holes, when provided, shall be tapered. Not more than two lifting holes shall be cast into each section. Provide tapered, solid rubber plugs to seal lifting holes. Lifting holes shall be made to be sealed by plugs driven from the outside face of section only.

   f. Point of intersection (P.I.) of ductbank centerlines shall be marked with 1/4-inch diameter steel pin firmly enclosed in floor of each manhole base and protruding approximately one-inch above finished floor of base.

g. Mark date of manufacture and name or trademark of manufacturer on inside of manhole barrel.

h. Barrel of manhole shall be constructed of various lengths of riser pipe manufactured in increments of one foot to provide correct height with the fewest joints. Provide not less than one foot clear between openings in barrel of manholes for ductbanks or other penetrations and the nearest joint. Provide special manhole base or riser sections as required.

i. Provide at top of manhole barrel a precast or cast-in-place slab, or precast eccentric cone, as shown or approved, to receive manhole frame and cover.

j. Comply with ASTM C 858 and with interlocking mating sections, complete with accessories, hardware, and features.

1) Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.

a) Windows shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls.

b) Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.

c) Window openings shall be framed with at least two additional No. 4 steel reinforcing bars in concrete around each opening.

2) Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

a) Type and size shall match fittings to duct or conduit to be terminated.

b) Fittings shall align with elevations of approaching ducts and be located near interior corners of manholes to facilitate racking of cable.

k. Concrete Knockout Panels: 1-1/2 to 2 inches (38 to 50 mm) thick, for future conduit entrance and sleeve for ground rod.

l. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

6. Cast-In-Place Manholes

a. Description: Underground utility structures, constructed in place, complete with accessories, hardware, and features. Include concrete knockout panels for conduit entrance and sleeve for ground rod.

b. Materials: Comply with ASTM C 858 and with Division 03 Section "Cast-in-Place Concrete."

c. Structural Design Loading: As specified in Part 3 "Underground Enclosure Application" Article.

B. Accessories:

1. Frames and Covers:

a. Manufacturers: Provide products of one of the following:

1) Neenah Foundry Company.

2) East Jordan Iron Works.

b. Material: Cast iron complying with ASTM A48/A48M, Class 30A.

c. Covers: Watertight, sealed type marked “ELECTRICAL” in raised two-inch letters. Identify covers as shown or indicated on the Drawings.

d. Grout the frame to the manhole or handhole.

2. Pulling Irons:

a. Material: Galvanized steel.

b. Cast in the wall opposite to centerline of each incoming ductbank and 12 inches below centerline of bottom line of ducts.

3. Cable Racks:

a. Material: Galvanized steel cast in the wall.

b. Cable racks shall adequately support cables with space allowed for future cables.

c. Each rack shall be a vertical assembly of two-foot cable racks extending from within six inches of manhole roof slab to within six inches of manhole floor.

4. Cable Hooks:

a. Material: Galvanized steel.

b. Length: 7.5-inch minimum.

5. Insulators:

a. Material: Porcelain.

C. Duct: Provide conduit and fittings in accordance with Section 26 05 33, Raceways and Boxes for Electrical Systems. Conduit types shall be as follows:

1. Schedule 40 PVC conduits for power circuits.

2. Galvanized rigid steel conduits for the following types of circuits: low voltage status, analog, and communication.

D. Backfill: Provide backfill, including select backfill, in accordance with Section 31 00 05 Trenching and Earthwork.

E. Reinforcing: Provide Ductbank reinforcing in accordance with Section 03 20 00, Concrete Reinforcing.

F. Concrete: Provide ductbank concrete slurry in accordance with Section 31 20 00, Cast-in-Place Concrete.

G. Grounding: Provide ground cable in accordance with Section 26 05 26, Grounding and Bonding for Electrical Systems.

H. Conduit Spacers: Conduit spacers shall be nonmetallic, interlocking type to maintain spacing between conduits. Provide spacers suitable for all conduit types used in multiple sizes.

I. Duct Sealing Compound:

1. Products and Manufacturers: Provide one of the following:

a. 0-Z/Gedney, Type DUX.

b. Or equal.

J. Warning Tape: Underground-line warning tape specified in Division 26 Section "Identification for Electrical Systems."

2.2 PRECAST CONCRETE HANDHOLES AND BOXES

A. Comply with ASTM C 858 for design and manufacturing processes.

B. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

2. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

3. Frame and Cover: Weatherproof steel frame, with hinged steel access door assembly with tamper-resistant, captive, cover-securing bolts.

a. Cover Hinges: Concealed, with hold-open ratchet assembly.

b. Cover Handle: Recessed.

4. Frame and Cover: Weatherproof aluminum frame with hinged aluminum access door assembly with tamper-resistant, captive, cover-securing bolts.

    a. Cover Hinges: Concealed, with hold-open ratchet assembly.

    b. Cover Handle: Recessed.

5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

6. Cover Legend: Molded lettering, "ELECTRIC." "TELEPHONE." “FIBER OPTIC”

7. Configuration: Units shall be designed for flush burial and have [open] [closed] [integral closed] bottom, unless otherwise indicated.

8. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

    a. Extension shall provide increased depth of minimum of 12 inches.

    b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.

9. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches vertically and horizontally to accommodate alignment variations.

    a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.

    b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.

    c. Window openings shall be framed with at least two additional No. 4 steel reinforcing bars in concrete around each opening.

10. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

    a. Type and size shall match fittings to duct or conduit to be terminated.

    b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.

11. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.3 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

1. Strength tests of complete boxes and covers shall be by either an independent testing agency or the manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION FOR MANHOLES AND HANDHOLES

A. Excavation and Backfill for Manholes and Handholes:

1. Provide manholes and handholes for electrical systems where shown or indicated and verify at the Site the required locations.

2. Perform excavation and filling required for installing manholes and handholes for electrical systems, in accordance with Section 31 00 05 Trenching and Earthwork.

3. Provide manholes and handholes on granular subbase course as shown or indicated. If not shown, provide layer of compacted select fill not less than six inches deep on which manhole or handhole for electrical systems will be installed.

4. Carefully set, level, and align at proper grade manhole bases and handholes.

B. Precast Manholes:

1. Set manhole sections vertical with steps and sections in true alignment. Butter the base of each bell or groove end at joints between components with one-to-two proportion cement-sand mortar to provide uniform bearing between components. Seal joints with cement mortar inside and out and trowel smooth to contour of wall surface. Raised or rough joint finishes are unacceptable.

2. Install sections, joints, and gaskets in accordance with manufacturer's recommendations.

3. Tightly seal each lifting hole with solid rubber plug driven into hole from outside of barrel; fill remaining void with one-to-two proportion cement-sand mortar.

C. Manhole and handhole structures shall be watertight. Provide grout collar to seal all penetrations into manholes and handholes for electrical systems.

D. Cable Supports in Manholes:

1. Manhole shall be fabricated with cast-in-place galvanized steel cable support racks. Provide cable hooks to support each cable on each rack along the cable run within manholes.

2. Individually support each cable at each hook on porcelain insulators. Provide sufficient slack for each cable.

3. Securely tie each cable in place at each insulator block to prevent excessive movement of insulators, cables, or fireproof tape. Tie cables with non-metallic 3/4-inch strapping tape manufactured by 3M or approved equal, or tie down with nylon straps.

E. Grounding:

1. Provide 3/4-inch by 10-foot copper-clad ground rod for each manhole.

2. Bond all exposed metal manhole accessories and concrete reinforcing rods with No. 4 AWG minimum bare copper wire and connect to ground rod and to the ductbank ground cable.

F. Metal Pull Box:

1. Provide NEMA 4X, stainless steel, wall-mounted pull box inside each manhole and handhole for electrical systems where analog signal cables are mixed with power cables.

2. Route conduits for analog cables directly into and out of metal pull box so that analog cables are not exposed.

G. Riser Rings:

1. Provide riser rings for manholes when required to adjust cover to proper grade. Construct riser ring on manhole roof slab or cone section on which manhole frame and cover will be placed.

2. Height of riser rings shall be as required to bring frame to proper grade and shall not exceed 6 inches in height.

3. Riser rings shall be precast concrete and shall have a minimum thickness of 2 inches and a maximum thickness of 6 inches.

H. Grading at Manholes and Handholes:

1. Unpaved Areas:

a. Install manholes and handholes in unpaved areas as shown or directed by Engineer to rim elevation higher than finished grade.

b. Grade the ground surface to drain away from manholes and handholes.

c. Provide fill around manholes and handholes to level of upper rim of manhole or handhole frame, and evenly grade the surface to a one (vertical)-to-five (horizontal) slope to surrounding grade, unless otherwise shown or directed by Engineer.

2. Paved or Travelled Areas:

a. Install manholes and handholes in paved or travelled areas to meet final grade of paved or concrete surface.

b. Manholes and handholes shall not project above finished roadway pavement.

3. Contractor shall be solely responsible for proper height of manholes and handholes necessary to reach final grade. Engineer's review of Shop Drawings and other submittals for manholes and handholes is general in nature. Provide random-length precast manhole riser sections to adjust manholes to accommodate field conditions for final grading and final elevations.

3.3 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch above finished grade.

D. Install handholes and boxes with bottom below the frost line, 36 inches below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

G. For enclosures installed in asphalt paving and concrete paving and subject to occasional, non-deliberate, heavy-vehicle loading, provide concrete ring encircling, and in contact with, enclosure and with top surface of box cover frame. Bottom of ring shall rest on manhole.

3.4 INSTALLATION OF UNDERGROUND DUCTBANKS

A. Underground Duct Application

1. Ducts for Electrical Cables Over 600 V: RNC, NEMA Type EPC-40 - PVC, in concrete-encased duct bank, unless otherwise indicated.

2. Ducts for Electrical Feeders and branch circuits 600 V and Less: RNC, NEMA Type EPC-40 - PVC, in concrete-encased duct bank, unless otherwise indicated.

3. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40 - PVC, in concrete-encased duct bank, unless otherwise indicated.

4. Underground Conduits for Instrumentation and Control Wiring shall be PVC Coated galvanized rigid conduit installed in direct-buried underground conduits, unless otherwise indicated.

5. Conduits shall use plastic ty-wrap to tie to spacers. Tie wires shall not be used.

B. Excavation and Backfilling:

1. Provide excavation and backfilling for duct bank installation in accordance with 31 20 00 Excavation. Do not backfill with material containing large rock, paving materials, cinders, large or sharply angular substances, corrosive material, or other materials that can damage or contribute to corrosion of ducts or cables, or prevent adequate compaction of backfill.

C. Ductbank Layout:

1. Depth: Install top of duct bank at least 36 inches below finished grade in areas not subject to deliberate traffic, and at least 42 inches below finished grade in deliberate traffic paths for vehicles, unless otherwise indicated on drawings.

D. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions. Ductbank Assembly:

1. Assemble ductbanks using non-magnetic saddles, spacers, and separators. Position separators to provide minimum three-inch concrete separation between outer surfaces of each conduit. Provide side forms for each ductbank.

2. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

E. Stub-Ups:

1. Use manufactured PVC Coated Rigid duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Extend concrete encasement throughout the length of the elbow.

2. Stub-Ups: Use manufactured PVC Coated Rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.

b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

F. Curves and Bends:

1. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at transformer enclosures.

2. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, for all fiber optic cable runs.

3. Use manufactured long sweep bends with a minimum radius of 36 inches, both horizontally and vertically, at other locations, unless otherwise indicated.

4. Use PVC coated Rigid Conduit elbows for 90 degree turns in Rigid Non-metallic Conduit within concrete encasement.

G. Concrete Placing:

1. Provide minimum four-inch concrete covering on each side, top, and bottom of concrete envelopes around conduits. Concrete covering shall be as shown or indicated on the Drawings.

2. Firmly fix conduits in place during concrete placing. Carefully place and vibrate concrete to fill spaces between conduits.

H. Conduit Transitions:

1. Conduit installations shall be watertight throughout entire length of ductbank.

2. Terminate conduits with insulated grounding bushings.

3. Continue conduits inside buildings in accordance with Section 26 05 33.13, Rigid Conduits, and as shown or indicated in the Contract Documents.

4. If ducts are not concrete-encased, provide expansion and deflection fittings in accordance with Section 26 05 33.26, Expansion/Deflection Fittings.

5. Plug and seal empty spare conduits entering structures. Conduits in use entering structures shall be sealed watertight with duct sealing compound.

6. Pulling Cord: Install 100-lbf- (445-N-) test nylon cord in ducts, including spares.

I. Ductbank Reinforcing:

1. Provide reinforcing for all ductbanks:

2. Install ductbank reinforcement as shown or indicated on the Drawings.

3. Provide maximum clearance of 1.5 inches from bars to edge of concrete encasement.

J. Connections to Structures:

1. Firmly anchor ductbanks to structure walls, building walls, or slabs. Epoxy-grout ductbank rebar into structure concrete to eliminate sheer forces between ductbank and structure wall concrete.

2. Duct banks shall be doweled to concrete manholes, concrete hand holes, and concrete foundations with a minimum of four corners of the duct bank.

3. Ductbank penetrations through structure walls shall be watertight.

K. Grounding:

1. Provide bare stranded copper ductbank ground cable in each ductbank envelope. Make ground electrically continuous throughout entire ductbank system.

2. Connect ground cable to building and station ground grid or to equipment ground buses. Also, connect ground cable to steel conduit extensions of underground ductbank system.

3. Provide ground clamp and bonding of each steel conduit extension to maintain continuity of ground system.

4. Terminate ground cable at last manhole or handhole for outlying structures.

L. Detectable Underground Warning Tape:

1. Provide detectable underground warning tapes complying with Section 26 05 53, Identification for Electrical Systems, over the full length of each underground ductbank.

2. Install warning tapes approximately 12 inches below grade.

3. Provide multiple tapes across the width of each ductbank. Locate center of a warning tape above each edge of ductbank, and at intervals across top width of ductbank so that clear space between tapes does not exceed six inches.

4. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

M. Reused Existing Conduits or Ducts:

1. Pull rag swab through duct to remove water and to clean conduits prior to installing new cable.

2. Repeat swabbing until all foreign material is removed.

3. Pull mandrel through duct, if necessary, to remove obstructions.

N. Direct-Buried Conduits:

1. Only single run conduit shall be direct buried unless otherwise indicated.

2. Conduit shall be PVC coated rigid.

3. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottoms as specified in Section 31 00 05 Trenching and Earthwork

4. After installing conduit, backfill and compact. Start at tie-in point and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as

temperature changes during this process. Firmly tamp backfill around conduit to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill, make final connections at end of run and complete backfilling with normal compaction as specified in Section 31 00 05 Trenching and Earthwork.

5. Depth: Install top of conduit at least 36 inches below finished grade, unless otherwise indicated.

6. Install manufactured PVC Coated Rigid elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

A. Watertightness:

1. Manholes and handholes for electrical systems shall be free of visible leakage. Inspect each manhole and handhole accompanied by Engineer, and repair leaks.

B. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.

2. Pull test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.

3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Correct deficiencies and retest as specified above to demonstrate compliance.

3.6 CLEANING

A. Pull rag swab through duct to remove water and to clean conduits prior to installing new cable.

B. Repeat swabbing until all foreign material is removed.

C. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals shown, specified, and required to furnish and install identification for electrical apparatus and electrical Work.

2. Section Includes:

a. Identification for raceways.

b. Identification of power and control cables.

c. Identification for conductors.

d. Underground-line warning tape.

e. Warning labels and signs.

f. Instruction signs.

g. Equipment identification labels.

h. Miscellaneous identification products.

B. Related Sections:

1. Section 26 05 13 Medium Voltage Cables

2. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables.

3. Section 26 13 13 - Metal Enclosed MV Switchgear

1.2 MEASUREMENT AND PAYMENT

A. This item is to be included in lump sum cost for Division 26 Electrical Equipment & Installation.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following:

1. 2019 California Electrical Code, California Code of Regulations Title 24, Part 3, including but not limited to the sections below:

a. CEC Article 110, Requirements for Electrical Installation.

b. CEC Article 210, Branch Circuits.

c. CEC Article 215, Feeders.

d. CEC Article 250, Grounding & Bonding

e. CEC Article 328, Medium Voltage Cable

f. CEC Article 336, Power & Control Tray Cable

g. CEC Article 392, Cable Trays

h. CEC Article 408, Switchboards, Switchgear & Panelboards

i. CEC Article 450, Transformers & Transformer Vaults

j. CEC Article 504, Intrinsically Safe Systems.

k. CEC Article 700, Emergency Systems.

l. CEC Article 701, Legally Required Standby Systems.

m. CEC Article 702, Optional Standby Systems.

2. 40 CFR 1910.145 (OSHA) – Specification for Accident Prevention Signs and Tags.

3. ANSI A13.1and IEEE C2.

4. NFPA 79.

5. 29 CFR 1910.144 and 29 CFR 1910.145.

6. ANSI Z535.4 for safety signs and labels.

7. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.4 FIELD CONDITIONS

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

1.5 SUBMITTALS

A. Action Submittals. Submit the following:

1. Product Data

a. Identification For Electrical Systems –Product Data

1) Manufacturer's literature, cut sheets, specifications, dimensions and technical data for all products proposed under this Section.

2. Shop Drawings

a. Identification For Electrical Systems – Shop Drawings

1) Complete description and listing of proposed electrical identification and electrical identification devices for associated equipment or systems.

2) Conduit and wire identification numbering system and equipment signage.

b. Identification For Electrical Systems – Schedule

1) An index of nomenclature of electrical equipment and system components used in identification signs and labels.

3. Studies and Calculations

a. Electrical System Study – Report

1)

4. Samples

a. Identification For Electrical Systems – Samples

1) For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

A. Engraved Identification Devices (Nameplates and Legend Plates):

1. Lettering size and line weight shall be the same for all legend plates on the same panel or enclosure.

2. Nameplates:

a. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

b. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

c. Nameplates one-inch or less in height shall have one mounting hole at each end. Nameplates greater than one-inch in height shall have mounting holes in the four corners.

d. Nameplates one-inch or less in height shall have one mounting hole at each end. Nameplates greater than one-inch in height shall have mounting holes in the four corners.

3. Legend Plates:

a. Legend plates for pushbuttons, pilot lights, selector switches, and other panel-mounted devices shall be large size with dimensions of approximately 2-7/16 inches wide by 2-13/32 inches tall (Allen Bradley large automotive size), plastic, custom engraved with black letters on white background.

1) Provide standard-size legend plates where devices are mounted on motor control centers and spacing of devices precludes using automotive-size legend plates.

B. Safety Signs and Voltage Markers:

1. Provide all signage as required by California Electrical Code, including but not limited to the signs & markers listed in this specification.

2. Provide high voltage signs for equipment operating over 600 volts.

3. High-Voltage Safety Signs for Outdoor Applications:

a. Unless otherwise shown or indicated, high voltage safety signs shall be not less than 10 inches high by 14 inches wide, of fiberglass reinforced plastic, and shall comply with 40 CFR 1910.145. Signs shall resist fading from exposure to temperature extremes, ultraviolet light, abrasive, and corrosive environments, and shall read, “DANGER – HIGH VOLTAGE – KEEP OUT”

b. Mounting hardware shall be Type 316 stainless steel. Nylon cable ties shall be permitted for applications that do not allow stainless steel hardware.

4. High-Voltage Safety Signs for Indoor Applications:

a. High voltage safety signs for installation on indoor equipment shall be either pressure-sensitive acrylic or vinyl, and shall be not less than 10 inches high by 14 inches wide, shall comply with 40 CFR 1910.145, and shall read, “DANGER – HIGH VOLTAGE – KEEP OUT”.

5. Cable Tray Safety Signs:

    a. Cable tray safety signs shall be pressure-sensitive vinyl conforming to 40 CFR 1910.145, 5 inches by 3.5 inches in size, and shall read, “DANGER – HIGH VOLTAGE”

6. Low-Voltage Safety Signs:

    a. Low voltage safety signs shall be pressure-sensitive vinyl complying with 40 CFR 1910.145, five inches by 3.5 inches in size, and shall read, “DANGER – 480 VOLTS”.

7. Low-Voltage Markers:

    a. Low voltage markers shall be either pressure-sensitive vinyl or vinyl cloth with black lettering on orange background and shall read, “120 VOLTS”, “208 VOLTS”, “120/208 VOLTS”, or “240 VOLTS” as required.

C. Arc-flash Safety Signs:

1. Warning signs shall be adhesive-backed polyester.

2. Warning signs shall read, “Warning – Arc Flash and Shock Hazard. Appropriate PPE Required.” Arc flash warning signs shall indicate the flash protection boundary, incident energy in calories per square centimeter, hazard level, description of required protective clothing, shock hazard, limited approach boundary, restricted approach boundary, prohibited approach boundary, and equipment name. Values included on labels shall be from section 26 05 73.

D. Detectable Underground Warning Tape:

1. Construction: Aluminum core encased with polyethylene

2. Width: Six inches.

3. Color Finish: Red

4. Detectable Underground Warning Tape: “CAUTION: BURIED ELECTRICAL LINE BELOW”

5. Detectable Underground Warning Tape: “CAUTION: BURIED FIBER OPTIC LINE BELOW”

6. Detectable Underground Warning Tape: “CAUTION: BURIED CATV LINE BELOW”

7. Detectable Underground Warning Tape: “CAUTION: BURIED TELEPHONE LINE BELOW”

E. Thermal Printing System:

1. Utilize thermal transfer printing system to provide non-smearing labels and markers.

2.2 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letter on an Orange field

2. Legend: Indicate voltage

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on a red field.

2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high letters on 20-inch (500-mm) centers.

D. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.3 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Colors for Raceways Carrying Circuits at 600 V and Less:

1. Black letters on an orange field

2. Legend: Indicate voltage

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on a red field.

2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high letters on 20-inch (500-mm) centers.

D. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

E. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.4 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Colors: Text shall be black letters on a white field

2.5 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.6 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.

2. Punched or drilled for mechanical fasteners.

3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.7 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).

2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).

3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).

4. Color: Black.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).

2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).

3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).

4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch (5 mm).

2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).

3. UL 94 Flame Rating: 94V-0.

4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).

5. Color: Black.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

2.9 FABRICATION

A. Engraved Identification Devices (Nameplates and Legend Plates):

1. Nameplate and legend plate text is preliminary and subject to change pending final review and approval of nomenclature by Engineer after start-up and testing.

PART 3 EXECUTION

3.1 GENERAL

A. Contractor shall be responsible for conducting relevant electrical calculations and studies to establish values for warnings, labels and signage based on build conditions and product specifications. See SECTION 26 05 73

3.2 INSTALLATION

A. Provide electrical identification in accordance with manufacturer recommendations and as required for proper identification of equipment and materials.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

E. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

   1. Outdoors: UV-stabilized nylon.

   2. In Spaces Handling Environmental Air: Plenum rated.

   3. Twist off excess length. Ensure ends are smooth and round.

J. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape per drawing detail. If no detail exists install directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench [or concrete envelope] exceeds 16 inches (400 mm) overall.

K. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application

L. Engraved Identification Devices (Nameplates and Legend Plates):

   1. Equipment to Be Labeled:

      a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved or engraved, laminated acrylic or melamine label.

      b. Enclosures and electrical cabinets.

c. Access doors and panels for concealed electrical items.

d. Switchgear.

e. Switchboards.

f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.

g. Substations.

h. Emergency system boxes and enclosures.

i. Motor-control centers.

j. Enclosed switches.

k. Enclosed circuit breakers.

l. Enclosed controllers.

m. Variable-speed controllers.

n. Push-button stations.

o. Power transfer equipment.

p. Contactors.

q. Remote-controlled switches, dimmer modules, and control devices.

r. Battery-inverter units.

s. Battery racks.

t. Power-generating units.

u. Monitoring and control equipment.

v. UPS equipment.

2. Unless otherwise indicated in the Contract Documents, attach permanent nameplates with permanent adhesive and with 3/16-inch diameter, round head, stainless steel machine screws into drilled and tapped holes.

3. Provide nameplate with 1.5-inch high letters to identify each console, cabinet, control station, panel, or enclosure as shown or indicated.

4. Provide nameplates for field-mounted motor starters, disconnect switches, manual starter switches, pushbutton stations, and similar equipment operating components, which shall describe motor or equipment function and circuit number.

5. Provide nameplates with 1/2-inch high letters to identify each junction and terminal box shown or indicated.

6. On control panel enclosures, provide nameplates for each main and feeder circuit including control fuses, and for each indicating light and instrument.

    a. Provide nameplate with 1.5-inch high letters giving switchgear designation, voltage rating, ampere rating, short circuit rating, manufacturer's name, general order number, and item number.

    b. Identify individual door for each compartment with nameplate giving item designation and circuit number.

7. Electrical Distribution Panel Identification

    a. Panel designator shall consist of the following designator and format, unless alternate designations are provided on the drawings: Four digit Building number followed by a colon followed by a one digit floor number, followed by Voltage Designation (H/L) and one digit panel number.

    b. Voltage Designation shall be "H" for 277/480 V and "L" for 120/208 V.

    c. Format: BBBB:FVP

        1) Example: 1000:1H1

            a) Building Number:1000

            b) Floor Number:1

            c) Voltage: 480 V

            d) Panel Number:1

8. Switchgear:

    a. Provide nameplate with 1.5-inch letters with switchgear designation.

    b. Provide nameplates for each main and feeder circuit.

    c. Identify individual door for each unit compartment with nameplate identifying controlled equipment.

9. Motor Control Centers:

    a. Provide nameplate with 1.5-inch letters with motor control center designation.

    b. Identify individual door for each unit compartment with nameplate identifying controlled equipment.

10. Except conduit, all electrical appurtenances including lighting panels, convenience outlets, fixtures, and lighting switches, shall be provided with nameplates indicating appropriate circuit breaker number(s).

11. Push Buttons:

    a. Provide legend plates for identification of functions.

    b. Provide nameplates for identification of controlled equipment.

    c. Name plates shall use the control panel reference designator and shall comply with NFPA 79.

12. Pilot Lights:

    a. Provide legend plates for identification of functions.

    b. Provide nameplates for identification of controlled equipment.

    c. Name plates shall use the control panel reference designator and shall comply with NFPA 79.

13. Selector Switches:

    a. Provide legend plates for identification of functions.

    b. Provide nameplates for identification of controlled equipment.

    c. Name plates shall use the control panel reference designator and shall comply with NFPA 79.

14. Panel Mounted Instruments:

    a. Provide nameplates for identification of function.

    b. Name plates shall use the control panel reference designator and shall comply with NFPA 79.

15. Interiors of Cabinets, Consoles, Panels, Terminal Boxes, and Other Enclosures:

    a. Provide nameplates for identification.

    b. Name plates shall use the control panel reference designator and shall comply with NFPA 79.

    c. Provide each item inside cabinet, console, panel, terminal box, or enclosure with laminated plastic nameplate as shown on approved Shop Drawings and Contractor's other submittals. Install nameplates with adhesive.

    d. Interior items require nameplates and shall use the reference designators as indicated on the bill of materials and electrical schematics. Items include, but not limited to:

1) Terminal blocks and strips.

2) Bus bars.

3) Relays.

4) Rear of face-mounted items.

5) Rear of door-mounted items.

6) Interior mounted items that require identification when mounted externally.

7) PLC

8) UPS

9) Radio

10) Surge Protective Devices

e. Circuit Breaker Directory:

1) Provide engraved laminated plastic directory listing function and load controlled for each circuit breaker within panel used for power distribution.

16. Re-label existing equipment whose designation have changed.

M. Safety Signs and Voltage Markers:

1. Provide safety signs and voltage markers on and around electrical equipment as shown or indicated.

a. Install rigid safety signs using stainless steel fasteners.

b. Clean surfaces before applying pressure-sensitive signs and markers.

2. Install high voltage safety signs on all equipment doors providing access to uninsulated conductors, including terminal devices, greater than 600 volts.

3. Provide cable tray safety signs on both sides of cable trays at maximum intervals of 20 feet. Install signs on side rails of tray as acceptable to Engineer.

a. Label cable trays that contain conductors greater than 600 volts with cable tray safety signs.

b. Cable trays that contain conductors greater than 208 volts and less than 600 volts shall be labeled with low voltage safety signs.

c. Cable trays that contain conductors of 120/208 volts shall be labeled with low voltage markers.

d. Label cable trays that contain intrinsically safe wiring or cables in accordance with CEC Article 504.

4. Install low voltage safety signs on equipment doors that provide access to uninsulated 480-volt conductors, including terminal devices.

5. Install low voltage markers on each terminal box, safety disconnect switch, and panelboard installed, modified, or relocated as part of the Work and containing 120/208 volt conductors.

N. Voltage System Identification Directories

1. Provide voltage system identification directories as required by CEC Article 210 and CEC Article 215.

2. Provide in each electrical room voltage system identification directory mounted on wall or door at each entrance to room.

3. For panelboards, switchboards, motor control centers, and other branch circuit or feeder distribution equipment that are not located in electrical rooms, provide voltage system identification directory mounted on equipment.

a. Directories shall be affixed using epoxy glue. Screws or bolts shall not penetrate equipment enclosures.

b. Directories shall be readily visible and not obscure labels and other markings on equipment.

O. Arc-flash Safety Signs:

1. Provide arc-flash safety signs as required by NFPA 70..

2. Provide signs for switchboards, panelboards, motor control centers, and industrial control panels. Provide signs for control panels that contain 480 volt equipment. Provide arc flash warning signs on other equipment where the incident energy is greater than 1.2 calories per square centimeter.

P. Conduit Labels:

1. Provide conduits with conduit labels unless otherwise shown or indicated.

2. Do not label flexible conduit.

3. Do not label exposed single conduit runs of less than 25 feet between local disconnect switches and their associated equipment.

4. Conduit labels shall indicate the following information:

a. Voltage

5. Conduits that contain intrinsically safe wiring shall have an additional conduit marker provided that has blue letters on white background and reads, “INTRINSICALLY SAFE WIRING”.

    a. Install intrinsically safe pipe markers in accordance with CEC Article 504 along entire installation. Spacing between labels shall not exceed 25 feet.

6. Provide conduit labels at the following locations:

    a. Where each conduit enters and exits walls, ceilings, floors, or slabs.

    b. Where conduit enters or exits boxes, cabinets, consoles, panels, or enclosures, except pull boxes and conduit bodies used for pull boxes.

    c. At maximum intervals of 50 feet along length of conduit.

7. Orient conduit labels to be readable. Text shall be left to right on horizontal conduits and down to up on vertical conduits.

Q. Wire and Cable Identification:

1. Color-coding of insulated conductors shall comply with Section 26 05 19 Low Voltage Electrical Power Conductors and Cables, and also comply with Section 26 05 13 Medium Voltage Cable

2. Text shall be left to right on horizontal conduits and down to up on vertical conduits.

3. Use wrap-around labels where wire or cable is to be labeled but is not terminated. Wire and cable shall be uniquely individually labeled. (i.e. Spare 1, Spare 2,….)

4. Do not provide labels for the following:

    a. Bare (uninsulated) conductors, unless otherwise shown or indicated as labeled.

5. Provide wire and cable labels for the following:

    a. New, rerouted, or revised wire or cable.

    b. Insulated conductors.

    c. Wire and cable terminations:

        1) Wire labels shall be applied outside of the wireway between the wireway and the terminal.

        2) Apply cable labels between 1/2-inch and one inch of cable breakout into individual conductors.

            a) Label individual conductors in a cable after breakout as specified for wires.

    d. Wire or cable exiting cabinets, consoles, panels, terminal boxes, and enclosures.

1) Label wires or cables within two inches of entrance to conduit.

e. Wire or cable in junction boxes and pull boxes

1) Label wires or cables within two inches of entrance to conduit.

f. Wire and cable installed in cable tray.

1) Wire and cable shall have labels at maximum intervals of 20 feet.

g. Wire and cable installed without termination in electrical manholes.

1) Wire and cable shall have wrap-around labels applied within one foot of exiting manhole.

6. Modified Cabinets, Consoles, Panels, and Enclosures:

a. New or rerouted wire or cable in existing cabinets, consoles, panels, and enclosures shall be labeled using the same format and designation as shown above where possible. Where existing equipment naming differs from format listed above coordinate with Owner.

R. Terminal Strip Labeling:

1. Label panel side of terminal to match panel wire number.

2. Label field side of terminal to match field wire number.

S. Generator System Warning Signs:

1. Provide warning signs for generator systems as required by NEC.

2. Install generator location warning sign on or immediately adjacent to service equipment, or to “normal” source disconnecting means when generator is located out of sight of service equipment or disconnecting means.

3. Install generator grounding warning sign on enclosure or immediately adjacent to point where generator neutral is connected to grounding electrode system if connection is made remote from generator.

END OF SECTION

SECTION 26 05 73

ELECTRICAL SYSTEM STUDY

PART 1 GENERAL

1.1 DESCRIPTION

A. Provide computer-based, fault-current and overcurrent protective device coordination studies and arc flash protection study of all electrical equipment indicated on the Contract Documents.

1.2 WORK INCLUDED

A. Overcurrent Protective Device Coordination: All overcurrent protective devices (OCPD) proposed for this project shall be selected to be selectively coordinated with the overcurrent protective devices installed on their supply side such that an overcurrent event (overload, short-circuit, or ground-fault) occurring at the lowest level in the system (branch circuit) cannot cause the feeder protective device supplying the branch circuit panelboard to open. This coordination shall be carried through each level of distribution for all branches of both normal and emergency power. Best available settings shall be provided for the normal power system. Emergency power coordination shall coordinate to a level of 0.1 seconds.

B. Delegated Design for Short Circuit Analysis: Prepare a computer-based, short circuit study to determine three phase and ground fault at each bus to verify interrupting rating capacity for each equipment.

C. Delegated Design for Arc Flash Hazard Analysis: Prepare a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

D. Protective devices shall be provided and based on results of this coordination study.

1.3 DEFINITIONS

A. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

B. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

C. SCCR: Short-circuit current rating.

D. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

E. PPE: Personal protective equipment.

1.4 SUBMITTALS

A. The following submittals shall be made for system protective devices specified in all electrical specification sections. The release of electrical equipment submittals (panelboards, engine

generators, switchboards, bus ducts, fused switches, circuit breakers, switchgear, etc.) is dependent on the receipt of a complete and accurate overcurrent protective device coordination study. The Engineer requires a full submittal review period as delineated within these specifications to adequately review the OCPD study against the submitted electrical components prior to release of submittals for equipment procurement. The submittal schedule required by the project requirements shall provide for this review time in the action submittal process. Delay claims arising due to Contractor's failure to coordinate simultaneous action submittals will not be considered by the Owner. The following submittals shall be in digital and hard copy form:

1. Coordination-study input data, including completed computer program input data sheets. Provide editable electronic media, including all SKM files and breaker TCC's.

2. Study and Equipment Evaluation Reports.

3. Coordination-Study Report, signed, dated, and sealed by a qualified professional engineer in the state of the project.

4. Short circuit study input data, including completed computer program input data sheets. Utility available fault contribution.

5. Short circuit report, signed, dated, and sealed by a qualified professional engineer in the state of the project.

6. Arc-flash study input data, including completed computer program input data sheets.

7. Arc-Flash Hazard Analysis Report; signed, dated, and sealed by a qualified professional engineer in the state of the project.

B. Product Data: For computer software program to be used for the studies.

C. Qualification Data: For Coordination Study Specialist, Short Circuit and Arc-Flash Hazard Analysis Specialist.

D. Product Certificates: For coordination-study, Short Circuit and fault-current-study computer software programs, certifying compliance with IEEE 399. For arc-flash analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

E. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.

F. Operation and Maintenance Procedures: Provide maintenance procedures for use by the Owner's personnel that comply with requirements in NFPA 70E.

G. Sample of all warning labels.

1.5 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this section. Manual calculations are not acceptable.

B. Delegated Design System Study Specialist Qualifications: Comprehensive engineering analysis by a qualified Professional Engineer or personnel trained and employed by the equipment manufacturer in required calculation methodology.

1. Analysis shall be performed by a Professional Engineer or personnel trained, employed, and supervised by a registered Professional Engineer.

2. Registered professional engineer shall be a full-time employee of the electrical equipment manufacturer or a professional engineering firm.

3. Report shall be signed and sealed by a Professional Engineer with current registration in the state of the project.

4. All reports shall be prepared by the same entity and delivered as a single report with tabbed sections for each study.

C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

D. Comply with IEEE 399 for general study procedures.

E. Comply with IEEE 1584 for Guide for Performing Arc Flash Hazard Calculations.

PART 2 PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Computer Software Developers: Subject to compliance with requirements, provide products by the following:

1. SKM Systems Analysis, Inc.

2. Power Analytics Corporation.

3. Easy Power LLC.

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399 for fault-current and overcurrent protective device coordination studies.

B. Comply with IEEE 1584 and NFPA 70E for arc-flash hazard analysis.

C. Analytical features of fault-current-study computer software program shall include “mandatory,” “very desirable,” and “desirable” features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate coordination by computer-generated, time-current coordination plots.

2.3 SHORT-CIRCUIT STUDY REPORT CONTENT

A. Executive Summary

B. Study descriptions, purpose, basis and scope of the study.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.

2. Cable ratings and lengths.

3. Transformer kilovolt ampere (kVA) and voltage ratings.

4. Motor and generator designations and kVA ratings.

5. Switchgear, switchboard, motor-control center and panelboard designations.

6. For both normal and emergency power systems.

7. Generators and Automatic Transfer Switches.

8. Fused switches and circuit breakers.

9. Photovoltaic system equipment.

D. Study Input Data: As described in “Power System Data” Article

E. Short-Circuit Study Output:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage

b. Calculated symmetrical fault-current magnitude and angle.

c. Fault-point X/R ratio.

d. No AC Decrement (NACD) ratio.

e. Equivalent impedence.

f. Incident Energy and Flash Protection Boundary Calculations

g. Arcing fault magnitude.

h. Protective device clearing time.

i. Duration of arc.

j. Arc-flash boundary.

k. Working distance.

l. Incident energy.

m. Hazard risk category.

n. Recommendations for arc-flash energy reduction.

F. Fault study input data, case descriptions, and fault-current calculations, including a definition of terms and guide for interpretation of the computer printout.

G. Equipment specific Arc Flash Warning Labels.

H. Recommendations for system improvements, where needed.

2.4 ARC-FLASH WARNING LABELS

A. Provide a 3.5-by-5-inch thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, “WARNING, ARC-FLASH HAZARD,” and shall include the following information taken directly from the final arc-flash hazard analysis.

1. Flash Hazard Boundary

2. Short Circuit Current Available

3. Shock Hazard when Cover is Removed

4. Limited Approach Boundary

5. Restricted Approach Boundary

6. Prohibited Approach Boundary

7. PPE Requirements, including the following:

a. Hazard Risk Category

b. Required Minimum Arc Rating of PPE in cal/cm^2

c. Clothing Description

8. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

D. Labels shall provide all flash boundaries, flash hazard levels, voltage levels, shock hazards and recommended PPE.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance.

1. Proceed with coordination study and arc-flash study only after relevant equipment final submittals have been assembled, but prior to their submission to the Engineer.

a. Coordination study shall accompany submission of relevant equipment submittals.

3.2 POWER SYSTEM DATA

A. Delegated Design System Analyst performing the short circuit, protective device coordination study, and arc-flash hazard analysis shall furnish the Contractor with a list of required data immediately after award of the contract. Contractor shall expedite collection of the data to ensure completion of the study and analysis, as required.

B. For new equipment, use characteristics of the final submitted shop drawing for all equipment. For existing equipment, this Contractor shall field verify all required equipment ratings and characteristics needed for completing the studies.

C. Source combination shall include present and future motors and generators indicated in the Contract Documents.

D. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices specified in these specifications and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.

2. Impedance of the incoming utility service entrance.

3. Electrical Distribution System Diagram: In electronic-copy formats, showing the following:

a. Circuit breakers and fuses ratings and types.

b. Relays and associated power and current transformer ratings and ratios.

c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, X/R ratios, taps measured in percent, and phase shift.

d. Generator short-circuit current contribution data, including short-circuit reactance, rated kilovolt amperes, size, rated voltage, and X/R ratio.

e. Cables: Indicate conduit material, sizes of conductors, conductor material insulation, and length.

f. Busway ampacity, impedance, lengths, and conductor material.

g. Motor horsepower and code letter designation according to NEMA MG 1.

h. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

i. Medium-voltage cable sizes, lengths, conductor material, and conductor construction and metallic shield performance parameters.

4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

a. Special load considerations, including starting inrush currents and frequent starting and stopping.

b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capacity.

c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.

d. Generator thermal-damage curve.

e. Ratings, types, and settings of the utility company's overcurrent protective devices.

f. Special overcurrent protective device settings or types stipulated by the utility company.

g. Time-current-characteristic curves of devices.

h. Manufacturer, frame size, interrupting rating in amperes RMS symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.

i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.

j. Panelboards, switchboards, switchgear, motor-control center ampacity, and interrupting rating in amperes RMS symmetrical.

3.3 FAULT-CURRENT STUDY

A. A short-circuit current ratings indicated in the Contract Documents are based on Fault-Current study prepared by the Engineer during design and are based on available information and anticipated feeder lengths. Calculate the maximum available short-circuit current in amperes RMS symmetrical at circuit-breaker positions of the electrical power distribution system based on proposed feeder routing and actual equipment being proposed for the project. The calculation shall be for a current immediately after initiation and for a three-phase bolted short-circuit at each of the following:

1. Electric Utility's supply termination point.

2. Switchgear and switchboard buses.

3. Transformers.

4. Distribution panelboards.

5. Branch circuit panelboards.

6. Standby Generators and Automatic Transfer Switches.

7. Enclosed Fused Switches.

8. Enclosed Circuit Breakers.

B. Study the electrical distribution system from normal and emergency power sources throughout electrical distribution system for the Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

C. Calculate momentary and interrupting duties on the basis of maximum available fault current.

D. Calculate short-circuit currents according to IEEE 551.

E. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 241 and IEEE 242.

1. Transformers, as appropriate for transformers included in the project:

a. ANSI C57.12.10.

b. ANSI C57.12.22.

c. ANSI C57.12.40.

d. IEEE C57.12.00.

e. IEEE C57.96.

2. Medium-Voltage Circuit Breakers: IEEE C37.010.

3. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.

4. Low-Voltage Fuses: IEEE C37.46.

F. Study Report:

1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on the electrical distribution system diagram.

G. Equipment Evaluation Report:

1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated ½-cycle symmetrical fault current.

2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to ½-cycle symmetrical fault current.

3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated ½-cycle symmetrical fault current.

4. Notify the Engineer, in writing, of any existing circuit protective devices improperly rated for the calculated available fault current.

3.4 COORDINATION STUDY

A. Provide a coordination study using an approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.

1. Calculate the maximum and minimum ½-cycle short circuit currents.

2. Calculate the maximum and minimum ground-fault currents.

B. Comply with IEEE 241 and IEEE 242 recommendations for fault currents and time intervals.

C. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.

b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.

c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

D. Utility Over Current Protection: Obtain available short circuit current, inrush current, and upstream protective device time current curves from the local electric utility as needed. Device setting for service entrance over current protection device shall be coordinated with utility device.

E. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short circuit current.

F. Coordination-Study Report: Prepare a written report indicating the following results of the coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:

a. Device tag.

b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.

c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.

d. Fuse-current rating and type.

e. Ground-fault relay-pickup and time-delay settings.

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including the power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

a. Device tag.

b. Voltage and current ratio for curves.

c. Three-phase and single-phase damage points for each transformer.

d. No damage, melting, and clearing curves for fuses.

e. Cable damage curves.

f. Transformer inrush points.

g. Maximum fault-current cutoff point.

h. Motor starting characteristics, damage points and overload relay.

i. Thermal damage curve for motors larger than 100 HP.

j. Generator short circuit decrement curve and damage point, and thermal damage curve.

G. Completed data sheets for setting of all adjustable overcurrent protective devices.

H. Complete Schedule of breaker settings to summarize information contained on data sheets.

3.5 ARC FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system where work could be performed on energized parts, including, but not limited to, the following:

1. Disconnect switches.

2. Electrical substations.

3. Electrical switchgear and switchboards.

4. Enclosed circuit breakers.

5. Meter Sockets and assemblies.

6. Panelboards.

7. Automatic or Manual Transfer Switches.

8. Transformers.

9. Emergency Generator.

C. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short circuit and coordination study model. Ground overcurrent protection relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.

D. Calculate the arc-flash protection boundary and the corresponding incident energy calculations for multiple system scenarios to be compared and the greatest incident energy to be uniquely reported for each equipment location. Calculations shall be performed to represent the maximum and minimum contributions of fault current magnitude for all normal and emergency operating conditions.

1. The minimum calculation will assume that the utility contribution is at a minimum and will assume a minimum motor contribution (all motors OFF).

2. The maximum calculation will assume a maximum contribution from the utility and will assume the maximum amount of motors to be operating. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable.

E. Incident energy calculations shall consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators to be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond 3-5 cycles.

2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible.

F. For each equipment location with a separately enclosed main device, calculations for incident energy and flash protection boundary shall include both the line and load side of the main breaker.

1. When performing incident energy calculations on the line side of a main breaker, the line side and load side contributions must be included in the fault calculation.

G. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device to compute the incident energy for the corresponding location.

H. Arc Flash calculation shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash even, a maximum clearing time based on the specific location shall be utilized.

I. Complete Arc Flash report shall be used for the preparation of Arc Flash Warning labels for electrical equipment. Labels shall not be made until the Engineer has no further comments to the final report.

J. Provide an 8-hour instructor led Electrical Safety Training Course which includes NFPA 70E materials, including the selection of personal protective equipment. The training shall be certified and provided by an OSHA authorized Instructor. Training shall occur at the Owner's facility. Training materials shall be provided by this Contractor.

3.6 CORRECT DEFICIENCIES, RE-CALCULATE AND REPORT

A. After the Engineer's initial review, correct unsatisfactory conditions and recalculate to demonstrate compliance, resubmit overcurrent protective devices, as required, to bring the system into compliance.

B. Revise and resubmit report multiple times, as necessary, to demonstrate compliance with all project requirements.

3.7 APPLICATION OF WARNING LABELS

A. Install arc-flash warning labels under the direct supervision and control of the Arc-Flash Hazard Study Specialist. Reference section 26 05 53 for label specifications and locations.

B. Coordinate locations with the Owner prior to any work.

3.8 FIELD ADJUSTMENTS

A. The contractor and equipment vendors shall adjust relay and protective device settings according to the recommended settings provided by the coordination study. This shall be performed prior to equipment being energized.

END OF SECTION

SECTION 26 11 16.11

SECONDARY UNIT SUBSTATIONS – SECONDARY LESS THAN 1000 V

PART 1 GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install the secondary unit substation(s) complete from the incoming line terminals to the outgoing line terminals as specified herein and as shown on the contract drawings.

B. The secondary unit substation shall consist of primary equipment, transformer and secondary equipment as specified below. The manufacturer of the unit substation shall furnish and coordinate all major components of the substations, including incoming primary equipment section, transformer and low-voltage section, as well as circuit breakers, fusible switches, and metering components. Provide a single warranty covering all substation assemblies, transformers and components.

C. Connections between the primary device and transformer shall be bus and between the transformer and secondary shall be flexible bus braid.

D. Outdoor primary and secondary equipment where specified shall be of weatherproof construction, rodent proof and shall contain 120-volt space heaters, receptacles and lighting as required.

1.2 MEASUREMENT AND PAYMENT

A. This item is to be included in lump sum cost for Unit Substations.

1.3 RELATED SECTIONS

A. Section 26 12 16 – Substation Transformers – Dry-Type

B. Section 26 37 13 - Microgrid Energy Management System

C. Section 26 13 26 – Metal-Clad Switchgear– Medium Voltage

D. Section 26 13 13 – Metal-Enclosed Breaker Switchgear – Medium Voltage

E. Section 26 24 13. – LV Distribution Switchboards – Low Voltage

F. Section 26 24 16. – Panelboards

1.4 REFERENCES

A. The secondary unit substation shall be designed, assembled, tested and installed in accordance with latest applicable standards of NEMA, IEEE and ANSI, applicable to its three major sections:

1. MV Metal-Clad Switchgear – NEMA SG4, SG5; ANSI C37
2. MV Metal-Enclosed Switchgear – NEMA SG4, SG5; ANSI C37
3. MV Load Interrupter Switchgear – NEMA SG4, SG5; ANSI C37
4. MV Motor Controllers – ANSI/NEMA ICS-3-Part 2, UL347
5. Secondary Substation Transformers – NEMA 210, IEEE 100, ANSI C57
6. LV Metal-Enclosed Switchgear – ANSI C37, UL 1558
7. LV Distribution Switchboards – NEMA PB-2, UL 891

1.5 SUBMITTALS – FOR REVIEW/APPROVAL

A. The following information shall be submitted to the Engineer:

1. Master drawing index
2. Front view elevation
3. Floor plan
4. Single line
5. Schematic diagram
6. Nameplate schedule
7. Component list
8. Conduit entry/exit locations
9. Assembly ratings including:
    a. Short-circuit rating
    b. Voltage
    c. Continuous current
    d. Basic Impulse level for equipment over 600 volts

e. kVA

10. Major component ratings including:

a. Voltage

b. Continuous current

c. Interrupting ratings

11. Cable terminal sizes

12. Connection details between close-coupled assemblies

13. Composite front view and floor plan of close-coupled assemblies

14. Impedance for transformers

15. Product data sheets

B. Where applicable, the following additional information shall be submitted to the Engineer:

1. Busway connection

2. Key interlock scheme drawing and sequence of operation

1.6 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:

1. Final as-built drawings and information for items listed Paragraph 1.04, and shall incorporate all changes made during the manufacturing process

2. Wiring diagrams

3. Certified production test reports

4. Installation information

5. Seismic certification as specified

1.7 QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. Provide Seismic tested equipment as follows:

1. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the latest California Building Code (CBC) with OSHPD Amendments.

2. The Project Structural Engineer will provide site specific ground motion criteria for use by the manufacturer to establish SDS values required. See structural drawing S.1.

3. The Importance Factor rating of the equipment shall be 1.5.

4. Contractor shall provide seismic ratings and certifications of equipment as part of the submittal process for review by the Project Structural Engineer to verify equipment ratings are "equal to" or "greater than" those specified for the project site.

5. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.

a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon the above criteria to verify the seismic design of the equipment.

b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.

c. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

1.8 REGULATORY REQUIREMENTS

A. Certified copies of production test reports shall be supplied demonstrating compliance with these standards when requested by the engineer.

1.9 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.10 OPERATION AND MAINTENANCE MANUALS

A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins, and renewal parts lists where applicable for the complete assembly and each major component.

PART 2 A PRODUCTS – PRIMARY EQUIPMENT

Metal-Enclosed Switchgear – Section 26 13 13

B PRODUCTS – TRANSFORMERS

Dry-Type Transformers Section 26 12 16

C PRODUCTS – SECONDARY EQUIPMENT

Switchboards Low Voltage Section 26 24 13

Surge Protection Devices Section 26 43 13

Panelboards Section 26 24 16

Include surge protection device (SPD) on the secondary side of all unit substations.

PART 3 EXECUTION

3.1 FACTORY TESTING

A. Standard factory tests shall be performed on the primary equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

B. The following factory tests shall be made on all transformers. All tests shall be in accordance with the latest revision of ANSI and NEMA standards.

1. Resistance measurements of all windings on the rated voltage connection of each unit and at the tap extremes of one unit only of a given rating on this project

2. Ratio tests on the rated voltage connection and on all tap connections

3. Polarity and phase-relation tests on the rated voltage connections

4. No-load loss at rated voltage on the rated voltage connection

5. Exciting current at rated voltage on the rated voltage connection

6. Impedance and load loss at rated current on the rated voltage connection of each unit and on the tap extremes of one unit only of a given rating on this project

7. Applied potential test

8. Induced potential tests

9. Temperature test(s) shall be made on all units. Tests shall not be required when there is available a record of a temperature test on an essentially duplicate unit. When a transformer is supplied with auxiliary cooling equipment to provide more than one kVA rating, temperature tests as listed above shall be made on the lowest kVA OA or AA rating and the highest kVA FA rating

10. ANSI impulse test on all primary windings

C. The following standard factory tests shall be performed on the secondary equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

1. The switchgear shall be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete switchgear shall be tested to ensure the accuracy of the wiring and the functioning of all equipment. The main bus system shall be given a dielectric test of 2200 volts for one minute between live parts and ground and between opposite polarities

2. The wiring and control circuits shall be given a dielectric test of 1500 volts for one minute or 1800 volts for one second between live parts and ground, in accordance with ANSI C37.20.1

D. The manufacturer shall provide three (3) certified copies of factory test reports.

E. Factory tests as outlined above shall be witnessed by the owner's representative unless declined by the owner or owner’s representative in writing.

1. The manufacturer shall notify the owner two (2) weeks prior to the date the tests are to be performed

2. The manufacturer shall include the cost of transportation and lodging for up to three (3) owner's representatives. The cost of meals and incidental expenses shall be the owner's responsibility

3.2 FIELD QUALITY CONTROL

A. Provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in installation and startup of the equipment specified under this section. The manufacturer's representative shall provide technical direction and assistance to the contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained herein.

B. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

3.3 MANUFACTURER'S CERTIFICATION

A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

3.4 TRAINING

A. The Contractor shall provide a training session for up to five (5) owner's representatives for a minimum of 1 normal workday at a job site location determined by the owner.

B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall include instructions on the assembly including primary equipment, transformer, and secondary equipment. All circuit breakers, protective devices and other major components shall be included.

3.5 INSTALLATION

A. The contractor shall install all equipment per the manufacturer’s recommendation and the contract drawings.

B. All necessary hardware to secure the assembly in place shall be provided by the contractor.

"END OF SECTION"

SECTION 26 12 16

SUBSTATION TRANSFORMERS – DRY-TYPE

PART 1 GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install the primary and/or secondary substation transformers as specified herein and as shown on the contract drawings.

1.2 MEASUREMENT AND PAYMENT

A. This item is to be included in lump sum cost for Unit Substations.

1.3 RELATED SECTIONS

A. 26 11 16 Secondary Unit Substation

1.4 REFERENCES

A. The substation transformers shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA and ANSI. ANSI C57

1.5 SUBMITTALS – FOR REVIEW/APPROVAL

A. The following information shall be submitted to the Engineer:

1. Master drawing index
2. Front view elevation and weight
3. Plan view
4. Schematic diagrams
5. Nameplate diagram
6. Component list
7. Conduit entry/exit locations
8. Ratings including:
    a. kVA
    b. Primary and secondary voltage
    c. Taps
    d. Primary and secondary continuous current

e. Basic Impulse Level

f. Impedance

g. Insulation class and temperature rise

9. Cable terminal sizes

10. Product data sheets

B. Where applicable, the following additional information shall be submitted to the Engineer:

1. Busway connection

2. Connection details between close-coupled assemblies

3. Composite floor plan of close-coupled assemblies

4. Key interlock scheme drawing and sequence of operations

1.6 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:

1. Final as-built drawings and information for items listed in Section 1.04, and shall incorporate all changes made during the manufacturing process.

2. Wiring diagrams

3. Certified production test reports

4. Installation information

5. Seismic certification as specified

1.7 QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. Provide Seismic tested equipment as follows:

1. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the latest California Building Code (CBC) with OSHPD Amendments.

2. The Project Structural Engineer will provide site specific ground motion criteria for use by the manufacturer to establish SDS values required. See structural drawing S.1.

3. The Importance Factor rating of the equipment shall be 1.5.

4. Contractor shall provide seismic ratings and certifications of equipment as part of the submittal process for review by the Project Structural Engineer to verify equipment ratings are "equal to" or "greater than" those specified for the project site.

5. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.

   a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon the above criteria to verify the seismic design of the equipment.

   b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.

   c. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

1.8 REGULATORY REQUIREMENTS

A. UL label required.

1.9 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer’s instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.10 OPERATION AND MAINTENANCE MANUALS

A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins and renewal parts lists where applicable, for the complete assembly and each major component.

1.11 FIELD MEASUREMENTS

A. Measure primary and secondary voltages and make appropriate Tap adjustments.

PART 2 PRODUCTS – DRY-TYPE TRANSFORMERS

2.1 MANUFACTURERS

Example Product Manufacturers: Products and manufacturers specified are to establish a standard of quality for design, function, materials, and appearance. Products shall be modified as necessary by the manufacturer for compliance with requirements. The listed manufacturers are

provided for example only and are not intended to represent all qualified manufactures. Contractor may select an alternate manufacturer provided the product(s) comply with all design requirements.

A. Eaton (Basis for Design)

B. ABB

C. Schneider Electric

D. GE

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will also be considered.

2.2 RATINGS

A. The ratings of the transformer shall be as shown on the drawings and described below.

kVA Rating	As shown on drawings		
Impedance	5.75%	ANSI Standard Tolerance	
HV	12kV	kV [Delta/Wye as shown on drawings]	
HV BIL	95kV	kV	
LV	480V	Volts Wye	
LV BIL	45	kV	

B. Minimum of two 2-1/2 percent FCAN and two 2-1/2 percent FCBN primary taps.

2.3 CONSTRUCTION

A. Forced air (FA) units for 300 kVA and above shall contain all necessary components and wiring, including fans, for automatically increasing the kVA rating by 33%. The (FA) package shall include an electronic temperature monitor and fan control unit. The package shall include a TC-50 Transformer Temperature Controller that monitors up to three (3) ventilated Dry Type transformer windings and (1) ambient temperature. The controller's electronic components shall be conformally coated to prevent premature failure due to extreme environmental conditions. The controller shall operate relays by comparing the highest winding temperature to stored set point temperatures and display four (4) thermocouple inputs as well as the stored maximum temperature and its associated winding. The unit shall provide Fans, Alarm, and Trip output relays. Form C contacts shall be provided to trip the transformer off-line if any of the winding temperatures exceeds the trip setting. A test function shall be provided to: test the digital display and all of the LEDs; simulate over-temperature conditions; and check the internal temperature of the monitor. A 4-20 mA analog signal shall be provided for remote indication or for use with SCADA systems or Microgrid Energy Management System (refer to section 26 37 13 for requirements). Control power shall be provided from a control power transformer in the secondary equipment, a separate, external control power source or internal control power transformer.

B. The electrical insulation system shall utilize Class H material in a fully rated 220 degrees C system. Transformer design temperature rise shall be based on a 30 degrees C average ambient over a 24-hour period with a maximum of 40 degrees C. Solid insulation in the transformer shall consist of inorganic materials such as porcelain, glass fiber, electrical grade glass polyester, electrical grade epoxy, or Nomex. All insulating materials must be rated for continuous 220 degree C duty. The insulation between the high- and low-voltage coils shall be more than sufficient for the voltage stress without the need of a varnish.

C. The transformer shall be designed for a temperature rise of 80 degrees C and shall be capable of operating at 35% above base nameplate kVA capacity continuously without any loss of life.

D. The transformer shall be designed to meet the sound level standards for dry-type transformers as defined in NEMA TR1. The measurement procedure shall be as specified in ANSI C57.12.90.

E. The transformer shall be UL labeled.

F. The transformer shall be of explosion-resistant, fire-resistant, air-insulated, ventilated dry-type construction, and cooled by the natural circulation of air through the windings.

G. High-voltage and low-voltage windings shall be copper. Insulation between layers of the windings shall be by Insuldur paper or equal.

H. For enhanced environmental protection, the entire core and coil assembly shall be Vacuum Pressure Encapsulated (VPE) with a silicone resin per MIL-1-24092. The total VPE process shall apply a four (4) cycle shield of silicone resin to the coils and a two (2) cycle protective shield to the bus, core and support structure. The VPE process shall effectively encapsulate the entire core and coil assembly which results in a transformer which is virtually impermeable to moisture, dust, dirt, salt, air, and other industrial contaminants.

I. The high- and low-voltage coil assembly shall be preheated to evaporate any moisture, then placed into a vacuum pressure tank. The air in the tank shall be evacuated; and at extremely low absolute pressure, all air bubbles are to be drawn out of the insulating materials. The resin shall be introduced to a level that submerges all parts while the vacuum is maintained. Then the vacuum shall be released and pressure applied, after which the coil shall be removed and placed in an oven for several hours in order for the resin to catalyze into a composite mass, completely sealing and binding the winding.

J. The transformer shall be supplied in a knockdown case design, for ease in fitting through limited openings, and shall be of heavy gauge sheet steel construction, equipped with removable panels for access to the core and coils. Front and rear panels shall incorporate lowered ventilating grills.

K. Where outdoor dry-type transformers are shown on the drawings, they shall include thermostatically controlled space heaters fed from an external source which remains energized when the transformer is de-energized or a fused control power transformer connected to the primary side of the substation transformer. Provide NEMA 3R enclosure with special ventilating grills that restrict the passage of rain or spray.

2.4 ACCESSORIES

A. Transformer shall include:

1. Diagram instruction plate

2. Provisions for lifting and jacking

3. Removable center panel for access to high-voltage strap-type connector taps for de-energized tap changing

4. Two ground pads with continuous ground bus

2.5 FINISH

A. The paint shall be applied using an electrostatically deposited dry powder system to a minimum of three (3) mils average thickness. Outdoor dry-type transformer units shall include suitable outdoor paint finish. Units shall be painted ANSI 61 for indoor service or outdoor service and shall match the primary and secondary equipment.

PART 3 EXECUTION

3.1 FACTORY TESTING

A. The following standard factory tests shall be performed on all equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

1. Resistance measurements of all windings on the rated voltage connection of each unit and at the tap extremes of one unit only of a given rating on this project

2. Ratio tests on the rated voltage connection and on all tap connections

3. Polarity and phase-relation tests on the rated voltage connections

4. No-load loss at rated voltage on the rated voltage connection

5. Exciting current at rated voltage on the rated voltage connection

6. Impedance and load loss at rated current on the rated voltage connection of each unit and on the tap extremes of one unit only of a given rating on this project

7. Applied potential test

8. Induced potential tests

9. For dry-type and cast-coil units, the manufacturer shall perform additional 100% quality control impulse test on the primary windings of each unit

B. The manufacturer shall provide three (3) certified copies of factory test reports.

C. The following special factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest revision of ANSI and NEMA standards.

1. Temperature test(s) shall be made on [all units]. Tests shall not be required when there is an available record of a temperature test on an essentially duplicate unit. When a transformer is supplied with auxiliary cooling equipment to provide more than one rating, temperature tests as listed above shall be made on the lowest kVA OA or AA rating and the highest kVA FA rating

2. ANSI impulse test on all primary windings

D. Factory tests as outlined above shall be witnessed by the owner's representative.

1. The manufacturer shall notify the owner two (2) weeks prior to the date the tests are to be performed

2. The manufacturer shall include the cost of transportation and lodging for up to three (3) owner's representatives. The cost of meals and incidental expenses shall be the owner's responsibility

3.2 FIELD QUALITY CONTROL

A. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

3.3 MANUFACTURER'S CERTIFICATION

A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.

3.4 INSTALLATION

A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.

B. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

3.5 FIELD ADJUSTMENTS

A. Adjust taps to deliver appropriate secondary voltage.

3.6 FIELD TESTING

A. Measure primary and secondary voltages for proper tap settings.

B. Megger primary and secondary windings.

END OF SECTION

SECTION 26 13 13

SWITCHGEAR – METAL ENCLOSED MV BREAKER

PART 1 GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install the medium voltage metal enclosed switchgear equipment as specified herein and as shown on the contract drawings.

1.2 MEASUREMENT & PAYMENT

A. This item is to be included in lump sum cost for unit substations.

1.3 REFERENCES

A. The medium voltage metal-enclosed switchgear and all components shall be designed, manufactured and tested in accordance with the latest applicable standards as follows:

1. ANSI/IEEE C37.20.3
2. ANSI/IEEE C37.20.4
3. ANSI C37.22
4. ANSI C37.57, C37.58
5. EEMAC G8-3.3
6. NEMA SG5
7. NEMA SG6

1.4 SUBMITTALS – FOR REVIEW/APPROVAL

A. The following information shall be submitted to the Engineer by Contractor no later than 15 days after Contractor receives notice to proceed.

1. Master drawing index
2. Front view elevation
3. Floor plan
4. Top view
5. Single line
6. Nameplate schedule
7. Component list

8. Conduit entry/exit locations
9. Assembly ratings including:
    a. Short-circuit rating
    b. Voltage
    c. Continuous current
    d. Basic Impulse Level
10. Major component ratings including:
    a. Voltage
    b. Continuous current
    c. Interrupting ratings
11. Cable terminal sizes
12. Product data sheets

B. Where applicable, the following additional information shall be submitted to the Engineer:

1. Bus duct connection
2. Connection details between close-coupled assemblies
3. Composite floor plan of close-coupled assemblies
4. Key interlock scheme drawing and sequence of operations
5. Descriptive bulletins
6. Product data sheets

1.5 SUBMITTALS – FOR CONSTRUCTION

A. The following information shall be submitted for record purposes:

1. Final as-built drawings and information for items listed in Paragraph 1.04, and shall incorporate all changes made during the manufacturing process
2. Wiring diagrams
3. Certified production test reports
4. Installation information including equipment anchorage provisions
5. Seismic certification as specified

1.6 QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. Provide Seismic tested equipment as follows:

1. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the latest California Building Code (CBC) with OSHPD Amendments.

A. The Project Structural Engineer will provide site specific ground motion criteria for use by the manufacturer to establish SDS values required. See structural drawing S.1.

B. The Importance Factor rating of the equipment shall be 1.5.

C. Contractor shall provide seismic ratings and certifications of equipment as part of the submittal process for review by the Project Structural Engineer to verify equipment ratings are "equal to" or "greater than" those specified for the project site.

2. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.

a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared, and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon the above criteria to verify the seismic design of the equipment.

b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.

c. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

1.7 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer’s instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

B. Each switchgear assembly shall be split into shipping groups for handling as indicated on the drawings or per the manufacturer’s recommendations. Shipping groups shall be designed to

be shipped by truck, rail or ship. Shipping groups shall be bolted to skids. Accessories shall be packaged and shipped separately. Each switchgear shipping group shall be equipped with lifting eyes for handling solely by crane.

1.8 OPERATION AND MAINTENANCE MANUALS

A. Equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

PART 2 PRODUCTS

A. Example Product Manufacturers: Products and manufacturers specified are to establish a standard of quality for design, function, materials, and appearance. Products shall be modified as necessary by the manufacturer for compliance with requirements. The listed manufacturers are provided for example only and are not intended to represent all qualified manufactures. Contractor may select an alternate manufacturer provided the product(s) comply with all design requirements.

2.1 ACCEPTABLE MANUFACTURERS

A. ABB (Basis for Design)

B. Eaton

C. Schneider Electric

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will also be considered.

2.2 RATINGS – SWITCHGEAR, SWITCH AND CIRCUIT BREAKER

A. The 15 kV switchgear assembly ratings shall be as follows:

Maximum Design Voltage	15 kV
Lighting Impulse Voltage Withstand	95 kV
Nominal System Voltage	12 kV three-phase four wire
System Grounding	solid
Short-Time (2-Second) Current	_____Ka (See Note)

NOTE: SHORT-CIRCUIT CURRENT RATINGS SHALL BE COORDINATED WITH SAN DIEGO GAS & ELECTRIC AND APPROVED BY THE ENGINEER. REFER TO SECTION 2.10.

Main Cross Bus Continuous Current Rating	600 A (minimum)

B. Each circuit breaker shall have the following ratings:

Maximum Voltage	15 kV
BIL Rated	95 kV Peak
Continuous Current (15 kV)	600 A (minimum)
Short-Circuit Current at rated Maximum kV	_____kA RMS sym (See Note)
Rated Voltage Range Factor K	_____
Closing and Latching Capability	_____kA Crest (See Note)
Maximum Symmetrical Interrupting and 3-Second Rating	_____kA RMS SYM (See Note)
Rated Interrupting Time	5 Cycles

NOTE: SHORT-CIRCUIT CURRENT RATINGS SHALL BE COORDINATED WITH SAN DIEGO GAS & ELECTRIC AND APPROVED BY THE ENGINEER. REFER TO SECTION 2.10.

C. Load Interrupter Switches

A.	Non-Fused Switch (Continuous and Load Break)	600 Amperes
B.	Non-Fused Momentary Withstand	61 kA Asym RMS
C.	Non-Fused Switch Fault close	61 kA Asymmetrical RMS
D.	Non-Fused 2-Second short circuit current withstand	38 kA Sym RMS
E.	Fuse Rating	200 Amperes
F.	Type of Fuse	Boric Acid Expulsion
G.	Fuse Interrupting Rating	14.4 kA Sym RMS
H.	Fused Switch Fault Close	23 kA Asym RMS

NOTE: SHORT-CIRCUIT CURRENT RATINGS SHALL BE COORDINATED WITH SAN DIEGO GAS & ELECTRIC AND APPROVED BY THE ENGINEER.

2.3 CONSTRUCTION

A. The switchgear assembly shall consist of deadfront, completely metal-enclosed vertical sections each containing drawout vacuum circuit breakers and where shown, furnish additional vertical sections containing load interrupter switches and fuses or miscellaneous auxiliary apparatus of the number, rating and type noted on the drawings or specified herein.

B. The total width of the switchgear shall be no wider than 11’6” at any point and may consist of multiple sections in order to meet this constraint.

C. The following feature shall be supplied on every vertical section containing a drawout vacuum circuit breaker:

D. High voltage parts within circuit breaker compartments shall be isolated with grounded metal barriers.

E. Vertical section construction shall be of the universal frame type using die-formed and bolted parts. All enclosing covers and doors shall be fabricated from steel whose thickness shall be equal to or greater than those specified in ANSI/IEEE C37.20.3. No owner removable hardware for covers or doors shall be thread forming type. To facilitate installation and maintenance of cables and bus in each vertical section, a split removable top cover and hinged, bolted rear door with padlock provisions shall be provided. A high quality G90 grade galvanized base will isolate equipment from contact with the concrete pad providing protection from rust. Heavy-duty hot dipped galvanized anchor clips shall be provided to anchor the switchgear to the concrete pad.

F. Each vertical section shall be ventilated at the top and bottom, both front and rear, to allow airflow to help prevent buildup of moisture within the structure. For dust-resistant or outdoor applications, the ventilated covers shall be externally removable to allow safe maintenance of the filter media without providing access to live parts.

G. Each vertical section containing a switch shall have a single, full-length, flanged front door and shall be equipped with two rotary latch-type padlockable handles. A nameplate shall be mounted on the front door of each vertical section.

2.4 BUS

A. All buses shall be tin-plated copper or silver-plated copper.

B. Ground bus shall be silver-plated copper and be directly fastened to a galvanized metal surface of each vertical section and be of a size sufficient to carry the rated (2-second) current of the switchgear assembly.

C. A neutral bus shall be provided when indicated on the drawings. It shall be insulated for 1000 Vac to ground. The current rating of the neutral bus shall be 600 amperes.

2.5 BUS SUPPORTING SYSTEMS

A. All bus shall be supported utilizing a high strength and high creep, support providing a minimum of 10.5-inch of creep between phases and ground. The molded fins shall be constructed of high track-resistant aramid nylon, silicone rubber, or cycloaliphatic epoxy.

B. All standoff insulators on the primary switches and fuse mountings shall be glass polyester or cycloaliphatic epoxy

2.6 WIRING/TERMINATIONS

A. One terminal pad per phase shall be provided for attaching Contractor supplied cable terminal lugs for a maximum of two conductors per phase of the sizes indicated on the drawings. Sufficient space shall be allowed for Contractor supplied electrical stress relief termination devices.

B. Small wiring, fuse blocks and terminal blocks within the vertical section shall be furnished as indicated on the drawings. Each control wire shall be labeled with wire markers. Terminal blocks shall be provided for owner connections to other apparatus.

2.7 CIRCUIT BREAKER

A. Each circuit breaker shall be operated by a motor-charged spring stored energy mechanism. The spring may be charged manually in an emergency or during maintenance procedures.

B. Each circuit breaker shall have three (3) vacuum interrupter assemblies that are separately mounted on glass polyester insulators. Each vacuum interrupter shall have a contact wear indicator which does not require any tools to indicate the contact wear. The current transfer from the vacuum interrupter moving stem to the breaker main conductor shall be a non-sliding design. The breaker front panel shall be removable when the compartment door is open for ease of inspection and maintenance of the mechanism.

C. The breakers shall be electrically operated using the same control voltage as other equipment in the Unit Substation as described in related sections of this specification:

1. Contractor to coordinate all equipment procured to determine voltages for control signals. Acceptable voltages are 120 or 240 Vac and 48 or 125 Vdc.

2. Each breaker shall be complete with control switch and red and green indicating lights to indicate breaker contact position.

D. The control voltage shall be derived from a control power transformer mounted in the switchgear and shall meet the requirements described in section 26 37 13 Microgrid Energy Management System and section 26 11 16 Secondary Unit Substation.

2.8 PROTECTIVE RELAYS

A. The switchgear manufacturer shall furnish and install, in the metal-enclosed switchgear, the quantity, type and rating of protection relays as indicated on the drawings and described hereinafter in this specification and in related specification sections.

B. Microprocessor Three-Phase Protective Relay, providing the following functions at a minimum, as well as any functions needed to support the requirements indicated on the drawings and in related sections of this specification.

1. Microprocessor-based multi-function overcurrent relay, ANSI device function 51/50, 51/50N, or 51/50G, and 86.

2.9 LOAD INTERRUPTER SWITCHES

A. Each load interrupter switch shall have a manual over-toggle type mechanism that does not require the use of a chain or a cable for operation and utilizes a heavy-duty coil spring to provide opening and closing action. The speed of opening and closing the switch shall be independent of the operator, and it shall be impossible to tease the switch into any intermediate position.

B. The interrupter switch shall have separate main and break contacts to provide maximum endurance for fault close and load interrupting duty.

C. The interrupter switch shall have insulating barriers between each phase and between the outer phases and the enclosure.

D. A maintenance provision shall be provided for slow closing the switch to check switch-blade engagement and slow opening the switch to check operation of the arc interrupting contacts.

E. For fused switch cubicles, fault protection shall be furnished by fuses with continuous ratings as shown in the contract documents. The fuses shall be RBA expulsion type or approved equivalent with three (3) spare fuse refills for each fused switch.

F. The following features shall be supplied on every vertical section containing a three-pole, two-position open-closed switch or switch and fuse:

1. The door shall be interlocked with the switch so that:

   a. The switch must be opened before the door can be opened

   b. The door must be closed before the switch can be closed

2. A minimum 8-inch x 16-inch high-impact viewing window that permits full view of the position of all three switch blades through the closed door. The window shall not be more than 58-inches above the switch pad level to allow ease of inspection

3. A hinged grounded metal barrier bolted closed in front of every switch to prevent inadvertent contact with any live part, yet allow for a full-view inspection on the switch blade position

4. Provision for padlocking the switch in the open or closed position

5. Green OPEN, Red CLOSED switch position indicators with the words “Open” and “Closed” in French, Spanish and English

6. A hinged cover with rustproof quarter turn nylon latches over the switch operating mechanism to discourage casual tampering

7. The switch shall be removable as a complete operational component

8. Provision shall be made for operating the switch and storing the removable handle without opening the full-length door.

2.10 UTILITY METERING & COORDINATION STUDY

A. Contractor shall coordinate with local electric utility and provide metering section and underground pull section on Substation A that meets the requirements of the local utility. Each utility metering vertical section shall contain provisions for current transformers and voltage transformers as required by the utility. The construction shall conform to the utility company’s metering standards. It shall also conform to the general electrical and construction design of the switchgear specified above.

B. Include a complete coordination, short circuit and arc flash hazard analysis study from incoming power lines through the medium voltage and low voltage switchgear prior to installation. Obtain available short circuit current, inrush current, and upstream protective device time current curves from the local electric utility as needed. Include arc flash hazard labels on equipment where appropriate according to local and national codes. See Section 26 05 73 Electrical System Study.

2.11 TRANSFORMER CONNECTIONS

1. A transformer primary load interrupter switch shall include the following when connecting to an indoor ventilated dry type secondary unit substation transformer, such as VPI, VPE or Cast Coil design

   a. Cable or bus bar connection from the load side of the fuse (or load side of an unfused switch) to the HV terminal pad locations of the transformer

   b. Include a connection for the ground bar termination to connect the switch enclosure to the transformer enclosure

   c. A bus transition section is not required for indoor applications. When the transformer and switch are outdoor, provide a 15” throat with a 5” flange (20” altogether) with flange dimensions to match the dimensions of the transformer flange.

2. A transformer primary load interrupter switch shall include the following when connecting to an indoor or outdoor liquid filled transformer, such as mineral oil, FR3, or silicone filled transformer

   a. Cable or bus bar connection from the load side of the fuse (or load side of an unfused switch) to the HV bushing terminal pad on the primary of the transformer.

   b. Include a connection for the ground bar to connect the switch enclosure to the transformer enclosure

   c. A 20”W bus transition section shall be provided. If outdoor, provide a 15” throat with a 5” flange (20” altogether) with flange dimensions to match the dimensions of the transformer flange.

2.12 ACCESSORIES

A. Furnish, distribution class surge arresters with ratings in accordance with manufacture’s recommendations.

2.13 ENCLOSURES

A. Each vertical section shall have a sloped weatherproof roof with labyrinth shaped joints. Use of gasket or caulking to make roof joints weatherproof shall not be permitted. All exterior openings shall be screened to prevent the entrance of small animals and barriered to inhibit the entrance of snow, sand, etc. A minimum of one (1) 250-watt, 120-volt space heater shall be provided in each vertical section. Power for the space heater(s) shall be furnished by a fused control power transformer. The design shall be non-walk-in type.

B. Enclosure shall be Dust Resistant. All ventilated openings shall be filtered to inhibit the ingress of dust. The ventilated covers shall be externally removable to allow safe maintenance of the filter media without providing access to live parts. All external doors and covers shall be gasketed.

C. Enclosures shall be constructed per IEEE/ANSI C37.20.3 Outdoor specifications. (Meets or Exceeds NEMA 3R.)

2.14 NAMEPLATES

A. A nameplate shall be mounted on the front door of each switch vertical section in accordance with the drawings.

2.15 FINISH

A. Prior to assembly, all enclosing steel shall be thoroughly cleaned and phosphatized. A powder coating shall be applied electrostatically, then fused on by baking in an oven. The coating is to have a thickness of not less than 1.5 mils. The finish shall have the following properties:

Impact resistance (ASTM D-2794)	60 direct/60 indirect
Pencil hardness (ASTM D-3363)	H
Flexibility (ASTM D-522)	Pass 1/8-inch mandrel
Salt spray (ASTM B117-85 [20])	600 hours
Color	ANSI 61 gray

2.16 MISCELLANEOUS DEVICES

A. Communication equipment where indicated on the drawings, shall have the following features and shall be compatible with, and meet the requirements of section 26 37 13 Microgrid Energy Management System.

1. Each breaker or load interrupter switch position (open and closed), where shown, shall be communicated via an addressable relay. This relay shall communicate over a local area network (LAN). The relay shall monitor an auxiliary switch contact that monitors the breaker or switch position and shall be rated for the application. Each relay shall have a unique address so that it is possible to “call up” and “read” each load interrupter switch’s position from a host computer.

2. A blown high voltage fuse condition on each set of three fuses shall be monitored by an addressable relay. Any blown fuse operation shall be communicated immediately over a local area network (LAN) via the monitoring addressable relay. Each relay shall have a unique address so that it is possible to “call up” and “read” a fuse blown operation for a set of fuses with the communication system

3. The manufacturer shall wire a LAN within the switchgear to all communication capable devices with the same protocol and wire the LAN to a set of easily accessible terminal blocks

4. Control power for addressable relays shall be as described in section 26 37 13 Microgrid Energy Management System.

PART 3 EXECUTION

3.1 FACTORY TESTING

A. The following standard factory tests shall be performed on the circuit breaker element provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

1. Circuit breaker operated over the range of minimum to maximum control voltage

2. Factory setting of contact gap

3. One (1) minute dielectric test per ANSI standards

4. Final inspections and quality checks.

B. The following production test shall be performed on the circuit breaker housing:

1. One (1) minute dielectric test per ANSI standards on primary and secondary circuits

2. Operation of wiring, relays and other devices verified by an operational sequence test

3. Final inspection and quality check.

C. The manufacturer shall provide three (3) certified copies of factory test reports.

3.2 FIELD QUALITY CONTROL

A. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

3.3 INSTALLATION

A. The Contractor shall install all equipment per the manufacturer's recommendations and the contract drawings.

B. All necessary hardware to secure the assembly in place shall be provided by the Contractor.

3.4 FIELD ADJUSTMENTS

A. The relays shall be set in the field by:

1. The Contractor in accordance with settings designated by the Engineer

END OF SECTION

SECTION 26 24 13

SWITCHBOARDS

PART 1 GENERAL

1.1 SUMMARY

A. Scope: Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, configuration and installation for low voltage switchboards (also identified as SWBDs) as required for the complete performance of the Work, as shown on the Drawings, as specified herein.

B. Related Sections: Related sections include, but shall not be limited to, the following:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2. Applicable general requirements for electrical Work specified within Division 26 Specification Sections apply to this Section.

3. The following SWBD information is typically depicted on the Drawings: bus configuration, bus ratings, interrupting ratings, component size and type, power line and feeder connections, application specific control wiring, elevation and footprint, etc. Where not shown on or able to be derived from the Drawings, the minimum requirements specified herein shall be provided.

4. Section 26 37 13 Microgrid Energy Management System

5. Section 26 11 16 Secondary Unit Substation

6. Section 26 43 13 Surge Protection Devices

1.2 MEASUREMENT AND PAYMENT

A. This item is to be included in lump sum cost for Unit Substations.

1.3 REFERENCES

A. General, Publications: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

1. ASTM (ASTM):

a. ASTM E 329, "Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction."

2. Federal Specifications (FS):

a. FS W-C-375, "Circuit Breakers, Molded Case, Branch Circuit and Service."

3. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

    a. ANSI/IEEE C57.13, "Standard Requirements for Instrument Transformers".

4. International Electrical Testing Association (NETA):

    a. NETA ATS, "Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems."

5. International Organization for Standardization (ISO):

    a. ISO 9001, "Quality Management Systems - Requirements."

    b. ISO 14001, “Environmental Management Systems – Requirements”

6. National Electrical Contractors Association (NECA):

    a. NECA 400, “Standard for Installing and Maintaining Switchboards"

7. National Electrical Manufacturers Association (NEMA):

    a. NEMA EI 21.1, "Instrument Transformers for Revenue Metering (110 kV BIL and Less).”

    b. NEMA KS 1, "Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)"

    c. NEMA PB 2, "Deadfront Distribution Switchboards."

    d. NEMA PB 2.1, "General Instructions for Proper Handling, Installation, Operation and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less."

8. National Fire Protection Association (NFPA):

    a. NFPA 70, "National Electrical Code" (NEC)

    b. NFPA 70B, “Electrical Equipment Maintenance”

    c. NFPA 70E, “Standard for Electrical Safety in the Workplace”

9. Underwriters Laboratories, Inc. (UL):

    a. UL 98, "Standard for Enclosed and Dead-Front Switches"

    b. UL 489, "Standard for Molded-Case Circuit Breakers and Circuit Breaker Enclosures."

    c. UL 891, "Standard for Dead-Front Switchboards"

    d. UL 943, "Standard for Ground-Fault Circuit Interrupters"

    e. UL 1283, “Standard for Safety for Electro-Magnetic Interference Filters"

f. UL 1449, "Standard for Surge Protective Devices"

1.4 DEFINITIONS

A. Unless specifically defined within the Contract Documents, the words or acronyms contained within this specification shall be as defined within, or by the references listed within this specification, the Contract Documents, or, if not listed by either, by common industry practice.

1.5 SUBMITTALS

A. General: Submittals shall be in accordance with the requirements of Section [01 33 00] Submittals and Section [26 00 10] Electrical Requirements, in addition to those specified herein.

1. Submit sufficient information to determine compliance with the Contract Documents. Identify submittal data with the specific equipment tags and/or service descriptions to which they pertain. Submittal data shall be clearly marked to identify the specific model numbers, options, and features of equipment and work proposed.

2. Submit required product data and shop drawings specific to each product and accessory proposed. In addition, include the following information, including dimensions and manufacturer's technical data on features, performance, ratings and finishes:

a. Each type of SWBD overcurrent protective device

b. Surge Protective Devices (SPD)

c. Ground Fault Protectors

d. Additional accessories and components indicated herein.

e. Indicate front and side enclosure elevations with overall dimensions, conduit entrance locations and requirements, nameplate legends, one-line diagrams, equipment schedule and switchboard instrument details.

f. Submit mimic-bus diagram.

3. Wiring Diagrams: Submit wiring diagrams detailing power, signal, and control systems, clearly differentiating between manufacturer-installed wiring and field-installed wiring, and between components provided by the manufacturer and those provided by others.

4. Quality Control Submittals:

a. Test Reports: Submit field quality control test reports.

B. Operation & Maintenance (O&M) manuals shall be provided in accordance with the minimum requirements specified in Section [01 78 23] Operation and Maintenance Data, Section [26 00 10] Electrical Requirements and additional requirements specified herein.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 20 years.

1. The manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system that is regularly reviewed and audited by a third-party registrar. Manufacturing, inspection, and testing procedures shall be developed and controlled under the guidelines of the quality assurance system.

2. The manufacturer shall have the ISO 14001 Environment Certification and shall supply the Product Environmental Profile (P.E.P.) upon request of the Engineer.

B. Provide Seismic tested equipment as follows:

1. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the latest California Building Code (CBC) with OSHPD Amendments.

2. The Project Structural Engineer will provide site specific ground motion criteria for use by the manufacturer to establish SDS values required. See structural drawing S.1.

3. The Importance Factor rating of the equipment shall be 1.5.

4. Contractor shall provide seismic ratings and certifications of equipment as part of the submittal process for review by the Project Structural Engineer to verify equipment ratings are "equal to" or "greater than" those specified for the project site.

5. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.

a. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared, and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon the above criteria to verify the seismic design of the equipment.

b. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.

c. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

C. Installer Qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing switchboards similar in type and scope to that required for this Project.

D. Inspecting and Testing Agency Qualifications: To qualify for acceptance, an independent inspecting and testing agency hired by the Contractor or manufacturer to test products shall demonstrate to the Architect/Engineer's satisfaction that they are qualified according to ASTM E 329 to conduct testing indicated.

E. All work performed and all materials used shall be in accordance with the National Electrical Code, and with applicable local regulations and ordinances. Equipment, assemblies and materials shall be listed and labeled by Underwriter's Laboratories or by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Prior to delivery to the Project site, ensure that suitable storage space is available to store materials in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres. Materials shall be protected during delivery and storage and shall not exceed the manufacturer stated storage requirements. As a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. In addition, protect electronics from all forms of electrical and magnetic energy that could reasonably cause damage.

B. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified within the Contract Documents.

C. Inspect and report any concealed damage or violation of delivery storage, and handling requirements to the Engineer.

1.8 WARRANTY

A. General: Refer to Section 01 77 00 - Closeout Procedures

B. Surge Protective Devices: Warranty shall be provided by the equipment manufacturer and supported by their respective field services organization, for a period of five years, incorporating unlimited replacement of suppressor parts.

C. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1.9 SPECIAL TOOLS AND SPARE PARTS

A. The Contractor shall provide a recommended spare parts list with the following information provided as a minimum:

1. Contact information for the closest parts stocking location to the Owner.

2. Critical spare parts shall be identified as those parts being associated with long lead times and/or those being critical to the unit's operation.

3. Maintenance spares shall be identified as being those parts required to regularly perform scheduled maintenance on the furnished equipment. These spares shall include, but shall not be limited to, consumable spares that are required to be exchanged during scheduled maintenance periods.

B. Spare parts shall be provided for each type and size of unit installed. At a minimum, the following shall be provided:

1. Provide the minimum spare parts recommended by the manufacturer.

C. Any manufacturer specific special tool, not normally found in an electrician's toolbox, required to remove and install recommended or furnished spare parts shall be furnished. At a minimum the following shall be provided:

1. If available from manufacturer, provide PC-based configuration software tool and a minimum of [one] communication interface cable for each type of cable required to connect a PC-based computer to the devices specified herein for configuration and programming.

2. Electronic configuration files, in a media format acceptable by the Owner (e.g. CD, USB stick, etc.), updated to an as-installed and commissioned state.

3. Provide a minimum of one compatible communication interface and programming device and required connection cable for each device specified herein for configuration and programming.

D. Spare parts shall be properly marked and packaged for long term storage. Printed circuit boards shall be provided in separate anti-static containers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Example Product Manufacturers: Products and manufacturers specified are to establish a standard of quality for design, function, materials, and appearance. Products shall be modified as necessary by the manufacturer for compliance with requirements. The listed manufacturers are provided for example only and are not intended to represent all qualified manufactures. Contractor may select an alternate manufacturer provided the product(s) comply with all design requirements.

- Eaton (basis for design)
- ABB
- Schneider Electric

2.2 General Requirements

A. The following SWBD information is typically depicted on the Drawings: bus configuration, bus ratings, interrupting ratings, component size and type, power line and feeder connections, application specific control wiring, elevation and footprint, etc. Where not shown on or able to be derived from the Drawings, the minimum requirements specified herein shall be provided.

B. Front Accessible Switchboard: Provide main & branch breakers with sections front and rear aligned.

C. Nominal System Voltage: Nominal AC system voltage shall be 480Y/277 volts. If applicable, auxiliary DC systems shall be rated up to 250V.

D. Main bus continuous rating: as shown on drawings

E. Short circuit current ratings: 100 kA

F. Enclosure: Provide steel enclosure, in compliance with UL 891, NEMA Type 3R.

G. Enclosure Finish: Provide factory-applied finish in manufacturer's paint over a rust-inhibiting primer on treated metal surface.

H. Barriers: Provide barriers between adjacent switchboard sections.

I. Insulation and isolation: Provide taped bus for through bus.

J. Strip Heaters: Provide factory-installed electric strip heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.

1. Strip Heater Control: Provide thermostats to maintain temperature of each section above expected dew point and humidistat to control humidity of each section.

2. Strip Heater Power Source: Provide transformer, factory-installed in switchboard.

K. Bussed Auxiliary Section: If required to satisfy design requirements per the drawings, Auxiliary section shall be matched and aligned with basic switchboard.

L. Bus Transition and Incoming Pull Sections: Match and align with basic switchboard.

M. Front Covers and Doors:

1. Front covers shall be screw removable with a single tool.

2. All doors shall be hinged with removable hinge pins.

N. Buses and Connections: Three phase, four wire, unless otherwise indicated. Provide hard-drawn plated copper of 98 percent conductivity.

1. Group-Mounted Feeder Vertical Bus Stack:

a. Bus stack shall be capable of mounting feeder breakers with different frame sizes and number of poles across from one another on the bus stack.

b. Non-conducting surface films shall be removed during circuit breaker installation by a wiping action of the circuit breaker jaws.

c. The design of the circuit breaker jaws and bus stack shall create blow-on forces under fault conditions.

d. Bolted lap joint connections for feeder breakers shall not be allowed for group-mounted feeders.

2. Ground Bus: Size per current NEC and UL 891 Tables 28.1 and 28.2, hard-drawn copper of 98 percent conductivity, equipped with pressure connectors for feeder and branch circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

3. Bus Composition: Tin plated copper. Plating shall be applied continuously to bus work. The switchboard bussing shall be of sufficient cross-sectional area to meet UL 891 temperature rise requirements. The phase and neutral through-bus shall have an ampacity as shown on the Drawings. For four-wire systems, the neutral shall be of equivalent ampacity as the phase bus bar. Tapered bus is not permitted. Full provisions for the addition of future sections shall be provided. Bussing shall include, but shall not be limited to, necessary hardware to accommodate splicing for future additions.

4. Isolation Barrier Access Provisions: Allows for inspection access to check bus bolt torque values.

O. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit breaker compartment.

P. Switchgear shall be seismic zone 4 and have seismic certification as required by the Authority Having Jurisdiction.

Q. All main circuit breakers utilized within the Microgrid Energy Management System (MEMS) for control shall be electrically operated and capable of being opened and closed by commands over the MEMS Ethernet network. Branch circuit breakers used to supply battery electric bus charging circuits shall at a minimum be capable of being shunt-tripped by the MEMS with manual reset. The circuit breakers should also allow for manual operation. See Section 26 37 13 - MICROGRID ENERGY MANAGEMENT SYSTEM for additional details.

2.3 SURGE PROTECTIVE DEVICES (SPD)

A. Install surge protective devices that meet or exceed the following criteria:

1. Minimum surge current capability (single pulse rated) per phase shall be 240 kA,

2. UL 1449 suppression voltage rating, voltage L-N, L-G, N-G, shall be 480Y/277 volts.

B. EMI/RFI filtering shall be minimum -50 dB at 100 kHz with insertion ratio of 50:1 using MIL-STD-220 methodology.

C. Provide with one set of NO/NC dry contacts.

D. Accessories shall include but shall not be limited to, six-digit transient counter set to total transient surges that deviate from the sine wave envelope by more than 125 volts.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Breaker Type:

1. Molded case circuit breakers

2. Insulated case circuit breaker

3. Electronic trip, standard and advanced.

B. Molded Case Circuit Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Compression style, suitable for number, size, trip ratings, and conductor material.

2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

3. Trip units shall be interchangeable within frame size.

4. Ground Fault Protection: Integral to circuit breaker with adjustable pickup and time delay settings, push-to-test feature, and ground fault indicator.

5. Remote: Where indicated on drawings, circuit breaker must be capable of remote operation (open and close) as well as reporting status (open, close, and tripped). Coordinate remote features with Section 26 37 13 - MICROGRID ENERGY MANAGEMENT SYSTEM.

6. Communication Capability: See Section 26 24 13, 2.8

7. Shunt Trip: 120 volt trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.

8. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1 second to 0.6 second time delay.

9. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts shall mimic circuit breaker contacts, "b" contacts shall operate in reverse of circuit breaker contacts.

10. All molded case circuit breakers shall be capable of being permanently locked open (lock-out tag-out) without the use of an additional device.

C. Enclosed, Insulated Case Circuit Breaker: Fully rated, encased power circuit breaker with interrupting capacity rating to meet available fault current.

1. Mounting: Drawout circuit breaker mounting or fixed mount as indicated on drawings.

2. Closing: Two-step, stored energy closing.

3. Trip Units: Microprocessor-based trip units with interchangeable rating plug, LED trip indicators, and the following field-adjustable settings:

a. Instantaneous trip.

b. Long-time and short-time pickup levels.

c. Long-time and short-time time adjustments with I2t response.

d. Ground fault pickup level, time delay, and I2t response.

4. Remote: Where indicated on drawings, circuit breaker must be capable of remote operation (open and close) as well as reporting status (open, close, and tripped). Coordinate remote features with Section 26 37 13 - MICROGRID ENERGY MANAGEMENT SYSTEM.

5. Shunt Trip: 120 volt trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.

6. Communication Capability: See Section 26 24 13, 2.8

7. Control Voltage: See Section 26 37 13 - MICROGRID ENERGY MANAGEMENT SYSTEM

8. All circuit breakers shall be capable of being permanently locked open (lock-out tag-out) without the use of an additional device.

2.5 CONTROL POWER

A. Control Circuits: 120 volts, supplied through secondary disconnecting devices from control power transformer.

2.6 ACCESSORIES

A. Provide accessory set, including, but not limited to, tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Provide one remote racking device for drawout circuit breakers.

C. Provide portable test set to test functions of solid state trip devices without removal from switchboard. Include relay and meter test plugs suitable for testing switchboard meters and switchboard class relays.

D. Provide one portable, floor-supported, roller-based, elevating carriage arranged for movement of circuit breakers in and out of compartments for present and future circuit breakers.

E. Provide overhead circuit breaker lifting device, mounted at top front of switchboard, with hoist and lifting yokes matching each drawout circuit breaker.

2.7 POWER Metering

A. Provide a power meter for each application as described in section 26 37 13 Microgrid Energy Management System.

B. Instrument Transformers: NEMA EI 21.1, ANSI/IEEE C57.13, and the following:

1. Potential Transformers: Secondary voltage rating of 120 volts and NEMA accuracy class of 0.3 with burdens of W, X, and Y.

2. Current Transformers: Ratios shall be as indicated with accuracy class and burden suitable for connected relays, meters, and instruments.

3. Control Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kV.

4. Current Transformers for Neutral and Ground Fault Current Sensing: Connect secondaries to ground overcurrent relays to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit breaker ground fault protection.

2.8 COMMUNICATIONS

A. Switchgear/switchboard lineup shall include communications capabilities as specified in section 26 37 13 Microgrid Energy Management System.

2.9 ELECTRICAL POWER MANAGEMENT SYSTEM

A. Switchgear/switchboard lineup shall include power management capabilities as specified in Section 26 37 13 - MICROGRID ENERGY MANAGEMENT SYSTEM.

2.10 SWITCHBOARD LIGHTING

Provide convenience lights inside cabinet. Lights should be activated when weatherproof door is opened and shall provide illumination of equipment on switchboard.

2.11 MARKINGS AND LABELING

A. All identification and warning labels and nameplates exterior to the SWBD shall be resistant to weather, UV and their intended installation environment.

B. Each SWBD shall be provided with an engraved nameplate identifying the project specific equipment tag and service description.

C. Warning labels and nameplates shall be present at access locations to advise personnel of possible hazards. The SWBD shall be marked in accordance with UL, NFPA 70 NEC, NFPA 70E, and other applicable standards.

D. Mimic Bus: Provide an anodized aluminum or plastic engraved plaque. Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic bus diagram. Produce a concise visual presentation of principal switchboard components and connections.

PART 3 - EXECUTION

3.1 GENERAL

A. In addition to the requirements specified herein, execution shall be in accordance with the requirements of Specification Section 26 05 05 and Drawings.

B. Examine equipment exterior and interior prior to installation. Report any damage and do not install any equipment that is structurally, moisture, or mildew damaged.

C. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

D. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

E. Install equipment in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings.

F. Functional testing, commissioning, and first parameter adjusting shall be carried out by a factory trained manufacturer's representative field service engineer. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment. Report to the Engineer any discrepancies or issues with the installation.

G. Provide final protection and maintain conditions in a manner acceptable to the manufacturer that shall help ensure that the equipment is without damage at time of Substantial Completion.

3.2 INSTALLATION

A. Pre-Installation Conference: Conduct pre-installation conference. Prior to commencing the installation, meet at the Project site to review the material selections, installation procedures, and coordination with other trades. Pre-installation conference shall include, but shall not be limited to, the Contractor, the Installer, and any trade that requires coordination with the work. Date and time of the pre-installation conference shall be acceptable to the Owner and the Engineer.

B. Install switchboards and accessories according to NEMA PB 2.1 and NECA 400.

C. Install and anchor switchboards level on concrete bases. Concrete base is specified in drawings, and concrete materials and installation requirements are specified in Division 03 - Concrete.

D. Frame and mount the printed basic operating instructions for switchboards, including, but not limited to, control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

E. Adjust circuit breaker trip and time delay settings to values indicated within coordination study or as instructed by the Engineer.

F. Measure, using a Megger, the insulation resistance of each bus structure phase-to-phase and phase-to-ground for one minute each, at minimum test voltage of 1000 Vdc; minimum acceptable value for insulation resistance is 1 megohms. Refer to manufacturer's literature for specific testing procedures.

3.3 TESTING AND COMMISSIONING

A. Switchboard and related equipment shall be commissioned and tested as a system for conformance to specification requirements prior to scheduling the acceptance tests. Contractor shall conduct performance verification tests in the presence of Owner's representative,

observing and documenting complete compliance of the system to the specifications. Contractor shall submit a signed copy of the test results, certifying proper system operation before scheduling tests.

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

3. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections 7.1, 7.5, 7.6, 7.9, 7.10, 7.11, and 7.14 as appropriate. Certify compliance with test parameters.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install panelboards.

B. Related Sections:

1. Section 26 05 05, General Provisions for Electrical Systems.

2. Section 26 05 53, Identification for Electrical Systems.

3. Section 26 22 00, Low Voltage Transformers

4. Section 26 43 13, Surge Protective Devices.

1.2 MEASUREMENT AND PAYMENT

1. Panelboards indicated on drawings as part of a unit substation shall be included in lump sum cost for Unit Substations.

2. Any panelboards not indicated on drawings as part of a unit substation shall be included in lump sum cost for Division 26 Electrical Equipment & Installation.

1.3 REFERENCES

A. Standards referenced in this Section are:

1. NEMA PB 1, Panelboards.

2. NETA, InterNational Electrical Testing Association

3. UL 67, Panelboards.

1.4 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.5 SUBMITTALS

A. Action Submittals. Submit the following:

1. Product Data

a. Panelboards - Product Data

1) Submit technical information for panelboards proposed for use, including product literature and specifications. Indicate options and features to be provided.

2. Shop Drawings

a. Listing of Panelboards and Proposed Locations

1) Listing of panelboards to be furnished with identification of their proposed location, and all electrical characteristics, including number and rating of branch circuit breakers and enclosure type.

2) Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.

3) Include evidence of NRTL listing for series rating of installed devices.

4) Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

5) Include wiring diagrams for power, signal, and control wiring.

6) Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.

7) Detail enclosure types and details for types other than NEMA 250, Type 1.

8) Detail bus configuration, current, and voltage ratings.

9) Short-circuit current rating of panelboards and overcurrent protective devices.

b. Panelboard Schedule

1) For installation in panelboards. Submit final versions after load balancing.

B. Informational Submittals. Submit the following:

1. Field Quality Control Submittals

a. Panelboards Testing Plan, Procedures and Results

1) Submit test procedures used.

2) Submit test results that comply with requirements.

3) Include results of failed tests and corrective action taken to achieve test results that comply with requirements.

C. Closeout Submittals. Submit the following:

1. Operation and Maintenance Data

a. Panelboard - Operation and Maintenance Data

1) Operation, and maintenance manuals for panelboards and components to include in emergency.

2) Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

3) Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

2. Record Documentation

a. Panelboard Record Documentation

1) Provide an electronic modifiable copy of each updated and/or new panel board schedule with date of change(s).

2) Submit final versions after load balancing.

D. Maintenance Material Submittals. Submit the following:

1. Spare Parts

a. Fuses for Fused Power-Circuit Devices:

1) 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

B. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

C. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Regulatory Requirements; Comply with the following:

1. NEC Article 408, Switchboards and Panelboards.

2. Comply with NEMA PB 1.

3. Comply with NFPA 70.

1.7 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:

1. Packing:

a. Inspect prior to packing to assure that assemblies and components are complete and undamaged.

b. Protect mating connections.

c. Cover all openings into enclosures with-vapor inhibiting, water-repellent material.

2. Deliver materials and equipment to Site to ensure uninterrupted progress of the Work. Deliver anchorage materials to be embedded in concrete in ample time to prevent delaying the Work. Upon deliver, check materials and equipment for evidence of water that may have entered equipment during transit.

3. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:

1. Store panelboards in a clean, dry location with controls for uniform temperature and humidity. Protect equipment with coverings and maintain environmental controls.

2. Comply with Section 01 66 00, Product Storage and Handling Requirements.

1.8 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding [minus 22 deg F (minus 30 deg C)] to plus 104 deg F (plus 40 deg C).

3. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.

2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Engineer no fewer than 14 days in advance of proposed interruption of electric service.

2. Do not proceed with interruption of electric service without Engineer's written permission.

3. Comply with NFPA 70E.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

PART 2 PRODUCTS

2.1 MANUFACTURERS

1. Provide products of one of the following:

a. Cutler-Hammer (Eaton).

b. Siemens.

c. Square D (Schneider Electric).

2.2 MATERIALS

A. Panelboards:

1. Rating: Voltage rating, current rating, number of phases, number of wires and number of poles as shown or indicated on the Drawings.

2. Circuit Breakers: Molded case, bolt-in thermal magnetic type with number of poles and trip ratings as shown or indicated. Where indicated on the Drawings, circuit breakers shall be ground fault circuit interrupting type equipped with solid state sensing and five-milliamp sensitivity.

3. Circuit breakers for 480-volt panelboards shall have minimum interrupting rating of 14,000 ampere RMS symmetrical, unless otherwise indicated on the Drawings. Circuit

breakers for other panelboards shall have minimum interrupting rating of 10,000 ampere RMS symmetrical, unless otherwise indicated on the Drawings.

4. Bus Bars: Bus bars shall be 98 percent conductivity copper. Four-wire panelboards shall have solid neutral bar. Each panel shall have ground bus bar.

5. Main: Panelboards shall have main circuit breaker, unless the Drawings specifically indicate main lugs only.

6. Connect branch circuit breakers for sequence phasing.

7. Enclosures: Panel enclosures shall be as required for the area classifications indicated in Section 26 05 05, General Provisions for Electrical Systems, unless otherwise indicated on the Drawings.

8. Construction: Code-grade steel, ample gutter space, flush door, flush snap latch and lock. Panelboards shall comply with NEMA PB 1 and UL 67.

9. Trim: Surface or flush as required. Provide Door-In-Door Construction.

10. Directory: Typed or computer-printed card, with transparent protective cover in frame on back of door giving circuit numbers and area or equipment served.

11. Identification: Identify panelboards in accordance with Section 26 05 53, Identification for Electrical Systems. Identification shall indicate panel number and voltage.

12. Directory of Existing Panelboards: When adding or removing breakers or loads from existing panelboards, provide a new typed or computer-generated directory card, indicating the circuit numbers and equipment served.

13. Provide surge protective device in accordance with Section 26 43 00, Surge Protective Devices, for each panelboard shown or indicated on the Drawings. Surge protective device shall be included and factory-mounted within panelboard by panelboard manufacturer. Surge protective device monitoring and display shall be visible from front of panelboard.

14. Front: Secured to box with concealed trim clamps, unless otherwise indicated. Front for surface-mounted panelboards shall be same dimensions as box. Fronts for flush panelboards shall overlap box, unless otherwise indicated.

15. Main and Neutral Lugs: Compression type.

16. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors. Bonded to box.

17. Service Equipment Approval: Listed for use as service equipment for panelboards with main service disconnect.

18. Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for overcurrent protective device ampere ratings indicated for future installation of devices.

19. Special Features: Include following features for panelboards as indicated:

    a. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box.

20. Extra Gutter Space: Dimensions and arrangement as indicated.

    a. Subfeed: Overcurrent protective device or lug provision as indicated.

21. Feed-through Lugs: Sized to accommodate feeders indicated.

B. Integrated Panelboard and Transformer:

1. Products and Manufacturers: Provide products of one of the following:

    a. Mini-Power Center by Cutler-Hammer (Eaton).

    b. Integrageted Power Systems by Siemens.

    c. Mini-Power Zone by Square D (Schneider Electric).

2. General: Unit shall consist of encapsulated dry-type transformer, primary and secondary main circuit breakers, and secondary panelboard all in one enclosure.

3. Transformer Rating: Transformer portion shall comply with Section 26 22 14, Dry-type Low-Voltage Distribution Transformers. KVA, primary voltage, secondary voltage, frequency and number of phases shall be as shown or indicated on the Drawings.

4. Branch Circuits: Molded case circuit breakers, plug-in thermal magnetic type with number of poles and trip ratings as shown or indicated on the Drawings.

5. Enclosure: Enclosures shall be as required for the area classifications indicated in Section 26 05 05, General Provisions for Electrical Systems, unless otherwise indicated on the Drawings.

2.3 BRANCH CIRCUIT OR DISTRIBUTION PANELBOARDS

A. Doors: Door-In Door type panelboard front, with concealed hinges. Secure with flush catch and tumbler lock, keyed alike.

B. Branch-Circuit Breakers: Where overcurrent protective devices are indicated to be circuit breakers, use bolt-on circuit breakers, except circuit breakers 225-A frame size and greater may be plug-in type where individual positive-locking device requires mechanical release for removal.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, handle lockable.

1. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting capacity rating to meet available fault current.

2. Circuit Breakers, 200 A and Larger: Trip units interchangeable within frame size.

3. Circuit Breakers, 400 A and Larger: Field-adjustable short-time and continuous current settings.

4. Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.

5. Current Limiters: Where indicated, integral fuse listed for circuit breaker.

6. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.

7. Shunt Trip: Where indicated.

2.5 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items as required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: Arranged to permit testing of functions of solid-state trip devices without removal from panelboard.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work is to be installed and notify Engineer in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

B. Receive, inspect, handle, and store panelboards according to NECA 407 and NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

3.2 INSTALLATION

A. Identify panelboards in accordance with Section 26 05 53, Identification for Electrical Systems.

B. Install panelboards and accessory items according to NEMA PB 1.1.

C. Mounting Heights: Top of trim 74 in. (1880 mm) above finished floor, unless otherwise indicated.

D. Mounting: Plumb and rigid without distortion of box. Mount flush panelboards uniformly flush with wall finish.

E. Circuit Directory: Type directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing.

F. Install filler plates in unused spaces.

G. Provision for Future Circuits at Flush Panelboards: Stub four 1 in. (27 mm) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in future. Stub four 1 in. (27 mm) empty conduits into raised floor space or below slab not on grade.

H. Wiring in Panelboard Gutters: Arrange conductors into groups, and bundle and wrap with wire ties after completing load balancing.

3.3 GROUNDING

A. Make equipment grounding connections for panelboards.

B. Provide ground continuity to main electrical ground bus.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

F. Panelboards will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable pick-up and time-sensitivity ranges in accordance with Section 26 05 73.

3.7 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install wiring devices.

2. Section includes:

a. Straight-blade Devices, 125 V, 20 A.

b. GFCI Receptacles, 125 V, 20A.

c. Pendant Cord-Connector Devices.

d. Cord and plug sets.

e. Toggle switches, 120/277 V, 20 A.

f. Wall plates.

B. Coordination:

1. Review installation procedures under other Sections and coordinate installation of items to be installed with or before Wiring Devices.

C. Related Sections:

1. Section 26 05 05, General Provisions for Electrical Systems.

2. Section 26 05 19, Low-Voltage Electrical Power Conductors and Cables.

3. Section 26 05 26, Grounding and Bonding for Electrical Systems.

4. Section 26 05 33, Raceways and Boxes for Electrical Systems.

5. Section 26 05 53, Identification for Electrical Systems.

1.2 MEASUREMENT AND PAYMENT

1. This item is to be included in lump sum cost for Division 26 Electrical Equipment & Installation.

1.3 REFERENCES

A. Definitions referenced in this Section are:

1. Abbreviations of Manufacturers' Names:
    a. Eaton: Eaton; Arrow-Hart Wiring Devices.
    b. Hubbell: Hubbell Incorporated; Hubbell Wiring Devices-Kellems.
    c. Leviton: Leviton Mfg. Company, Inc.
    d. P & S: Pass & Seymour/Legrand.

B. Standards referenced in this Section are:
1. FS – Federal Specifications:
    a. FS WC-596, Electrical Power Connector, Plug, Receptacle, and Cable Outlet.
    b. FS W-S-896-E, Switch, Toggle
2. UL 498, Standard for Attachment Plugs and Receptacles
3. ULK 1682, Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type
4. NEMA WD 1, General Color Requirements for Wiring Devices.
5. NEMA OS 3, Selection and Installation Guidelines for Electrical Outlet Boxes.
6. NEMA WD 6, Wiring Devices – Dimensional Requirements.
7. NEMA FB 11, Plugs, Receptacles and Connectors of the Pin and Sleeve Type for Hazardous Locations.
8. NFPA 70, National Electrical Code.

1.4 DEFINITIONS

A. Definitions referenced in this Section are:
1. BAS: Building automation system.
2. EMI: Electromagnetic interference.
3. GFCI: Ground-fault circuit interrupter.
4. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
5. RFI: Radio-frequency interference.
6. SPD: Surge protective device.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:

1. Product Data

    a. Wiring Devices - Product Data

        1) For each type of product.

B. Informational Submittals. Submit the following:

1. Test and Evaluation Reports

    a. Wiring Devices – Test and Evaluation Reports

        1) Results of required Test and Evaluation Reports.

C. Closeout Submittals. Submit the following:

1. Operation and Maintenance Data:

    a. Wiring Devices - Operation and Maintenance Data

        1) Submit complete installation, operation and maintenance manuals including all manufacturer's packing-label warnings and instruction manuals that include labeling conditions.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:

1. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.

B. Manufacturer:

1. Manufacturer shall have not less than five years of experience producing substantially similar equipment to that required and, upon request, shall submit documentation of not less than five installations in satisfactory operation for not less than five years in the United States.

2. Wiring Devices and Wall Plates shall be product of a single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in unopened cartons or bundles as appropriate, clearly identified with manufacturer's name, Underwriter's or other approved label, grade or identifying number.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

PART 2 –PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by the following:

1. Eaton
2. Hubbell
3. Leviton
4. P & S

B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with NEMA WD 1.

D. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranded building wire.
2. Devices shall comply with the requirements of this Section.

E. Devices for Owner-Furnished Equipment:

1. Receptacles: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

2.3 STRAIGHT-BLADE DEVICES, 125 V, 20A

A. Duplex Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Eaton: AH5351 (single), AH5352 (duplex).
b. Hubbell: HBL5351 (single), HBL5352 (duplex).
c. Leviton: 5361 (single), 5352 (duplex).
d. P & S: 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES, 125 V, 20 A

A. General Description for dry location:

1. 125 V, 20 A, straight blade, feed-through type.

2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.

3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

   a. Eaton: SGF20.

   b. Hubbell: GF20.

   c. Leviton: G5362.

   d. P & S: 2097TR

B. General Description for wet location:

1. 125 V, 20 A, straight blade, feed-through type, weather-proof.

2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.

3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

   a. Eaton: WRSGF20.

   b. Hubbell: GFTR20.

   c. Leviton: G5362-WT

   d. P & S: 2097TRWR

2.5 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking type plug and receptacle body connector, heavy-duty grade.

2. Configuration: NEMA WD6, type L5-20P and L5-20R.

3. Body: Nylon with screw-open, cable-gripping jaws and provision for attaching external cable grip.

4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

5. Standards: Comply with FS W-C-596.

B. Use GFCI type circuit breaker for GFCI applications.

2.6 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.

2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.

3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

B. Use GFCI type circuit breaker for GFCI applications.

2.7 TOGGLE SWITCHES, 120/277 V, 20A

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole:

a. Products: Subject to compliance with requirements, provide one of the following:

1) Eaton: AH1221.

2) Hubbell: HBL1221.

3) Leviton: 1221-S.

4) P & S: PS20AC1.

2. Three Way:

a. Products: Subject to compliance with requirements, provide one of the following:

1) Eaton: AH1223.

2) Hubbell: HBL1223.

3) Levition: 1223-S.

4) P & S: PS20AC3.

3. Four Way:

a. Products: Subject to compliance with requirements, provide one of the following:

1) Eaton: AH1224.

2) Hubbell: HBL1224.

3) Leviton: 1224-S.

4) P & S: PS20AC4.

4. Lighted Toggle:

a. Products: Subject to compliance with requirements, provide one of the following:

1) Eaton: AH1221LTW (SP), AH1223LTW (3-Way)

2) Hubbell: HBL1221IL (SP), HBL1223IL (3-Way)

3) Leviton: 1221-LH (SP), 1223-LH (3-Way)

4) P & S: PS20AC1SL (SP), SP20AC3SL (3-Way)

b. Pilot Light (Red):

1) Eaton: AH1221PL (SP), AH1223PL (3-Way), AH1224PL (4-Way)

2) Hubbell: HBL1221PL (SP), HBL1223PL (3-Way)

3) Leviton: 1221-PL (SP), 1223-PL (3-Way)

4) P & S: PS20AC1PL (SP), PS20AC3PL (3-Way)

2.8 WALL-BOX DIMMERS

A. Audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

C. LED Lamp Dimmer Switches: Modular; compatible with LED lamps and drivers; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 10 percent of full brightness.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Eaton:SF10P.

b. Leviton: IP710-LFZ.

c. Lutron: DVSTV (Diva Series)

d. P & S: CD4FBL3P (Titan Series).

2.9 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.

2. Material for Finished Spaces: 0.035-inch-thick, satin-finished, Type 302 stainless steel.

3. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

4. Material for areas classified as hazardous locations: Where required by NEC, shall be NEMA 7 explosion-proof and comply with UL 886.

5. In corrosive locations, where the conduit system is PVC-coated, wall plates shall be Type 316 stainless steel, or non-metallic thermoplastic or fiberglass reinforced plastic material.

2.10 EXTERIOR WALL COVER PLATES

A. Single and combination types shall be as follows:

1. All exterior device cover plates shall be while-in-use style.

2. All exterior device cover plates shall be cast aluminum.

3. Manufacturers and model shall be as follows:

a. Single Gang Horizontal Mount:

1) Hubbell: WP26EH.

2) Leviton: IUM1H-GY.

3) P & S: WIUCAST1.

b. Single Gang Horizontal Mount:

1) Hubbell: WP26E.

2) Leviton: IUM1V-GY.

3) P & S: WIUCAST1.

c. Double Gang Mount:

1) Hubbell: WP262E.

2) Leviton: IUM2V-GY.

3) P & S: WIUCAST2.

2.11 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Engineer unless otherwise indicated or required by NFPA 70 or device listing.

2. Wiring Devices Connected to Emergency Power System: Red.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.

2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.

3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.

4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.

2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.

b. Straighten conductors that remain and remove corrosion and foreign matter.

c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.

2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by manufacturer.

7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

8. Tighten unused terminal screws on the device.

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.

2. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 26 0553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.

2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

D. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.

2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.

3. Ground Impedance: Values of up to 2 ohms are acceptable.

4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.

5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

E. Wiring device will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION

SECTION 26 31 00

PHOTOVOLTAIC SYSTEM

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Divisions under Notice to Bidders and Special Provisions, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Performance Requirements
2. PV System Description
3. PV Modules
4. PV Inverters
5. PV Module Framing
6. PV Array Construction
7. System Overcurrent Protection.

B. Related Requirements and Sections:

1. Notice to Bidders and Special Provisions for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. 260505 General Provisions for Electrical Systems
3. 260519 Low-Voltage Electrical Power Conductors and Cables
4. 260526 Grounding and Bonding for Electrical Systems

1.3 DEFINITIONS

A. ETFE: Ethylene tetrafluoroethylene.

B. FEP: Fluorinated ethylene propylene.

C. IP Code: Required ingress protection to comply with IEC 60529.

D. MPPT: Maximum power point tracking.

E. PV: Photovoltaic.

F. PVUSA: Photovoltaics for Utility Systems Applications.

G. STC: Standard Test Conditions defined in IEC 61215.

H. XLPE: Cross-Linked Polyethylene conductor insulation.

1.4 SUBMITTALS

A. Product Submittals: Product submittals shall be provided with manufacturer's current data for submitted product. All non-applicable data shall be crossed out with a red 'X'

1. PV Module: All electrical characteristics, mechanical specifications, dimensions, 3rd party listings / certificates, temperature coefficients and physical dimensions.

2. Inverter: All electrical characteristics, mechanical specifications, dimensions, 3rd party listings / certificates, temperature coefficients and physical dimensions.

3. DC Optimizer: All electrical characteristics, mechanical specifications, dimensions, 3rd party listings / certificates and physical dimensions.

4. PV Cable: All electrical characteristics, mechanical specifications, dimensions, 3rd party listings / certificates.

5. PV Support System: All physical components of system, 3rd party listings / certificates and physical dimensions.

B. Coordination Drawings: Provide ANSI D size (34" x 22") coordination drawings showing all components of system along with all other planned structural, architectural, electrical and equipment. Include dimensioned plan views and sections indicating locations of system components, required clearances, attachment locations and details, and proposed size, type, and routing of conduits and cables. Include system interconnection schematic diagrams showing all factory and field connections.

C. Solar Photovoltaic Calculations: Where products other than those used as the basis of design are proposed, submit detailed solar energy calculation reports showing proposed products meet or exceed the system's specified output power rating. Reports shall include annual energy production metrics of the proposed system. Calculations shall be done in computer software, HelioScope by Aurora Inc. or approved equal.

D. Design Data: Include stamped structural drawings and calculations, certified by a structural engineer licensed in the state of California, for PV mounting and attachment systems.

E. Manufacturer's warranty data.

F. Informational Submittals (Not for Approval):

1. Field Quality Control Reports

2. Commissioning Report: Sample inspection and commissioning procedure.

1.5 COMMISSIONING

A. Third-Party commissioning agent shall be contracted to provide independent commissioning of the PV system. Commissioning agent shall be NABCEP (or equivalent) accreditation for commissioning of PV systems.

1.6 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of PV system components (modules, inverters, DC optimizers and other appurtenances) that fail in materials or workmanship within specified warranty period.

1. Manufacturer's materials and workmanship warranties include, but are not limited to, the following:

a. PV modules

b. Inverter

c. DC Optimizers

2. Warranty Period: Twelve (12) years from date of Substantial Completion.

B. Manufacturer's Special Minimum Power Output Warranty: Manufacturer agrees to repair or replace components of PV modules that fail to exhibit the minimum power output within specified warranty period. Special warranty, applying to modules only, applies to materials only, on a prorated basis, for period specified.

1. Specified minimum power output to 80 percent or more, for a period of 25 years.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a nationally recognized testing lab (NRTL), and marked for intended location and application.

B. Seismic Qualification Certificates: For PV modules, PV rails, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

2.2 PV SYSTEMS DESCRIPTION

A. Overview: PV System: Rooftop photovoltaic array mounted to a modular PV rail system. This PV rail system shall be connected to structural framing utilizing compatible connection hardware. The PV system shall consist of PV Modules, SolarEdge P860 Optimizers, SolarEdge String Inverters and associated appurtenances to comprise a complete and fully functional grid-tied photovoltaic system.

B. PV system connected in parallel to the electrical utility (utility-interactive); and capable of providing power for Project and supplying power to a distributed network.

1. Nominal Capacities:

a. Bus Canopy Array: 194 KW

b. Tire Shop Array: 31 KW

2. System Components:

a. Mounting Structure

b. PV modules.

c. DC Optimizers

d. Inverter

e. DC Power Cabling and cable management.

2.3 PV MODULES

A. Accepted Manufacturers:

1. SILFAB SIL-490 HN (490W)

2. Or Approved Equal

B. PV Panel Optimizers:

1. Solaredge P860

2.4 PV INVERTER

A. Inverter Type – Bus Canopy: SolarEDGE SE100KUS

B. Inverter Type – Tire Shop: SolarEDGE SE30KUS

2.5 PV ARRAY CONSTRUCTION

A. PV Rails:

1. Manufacturers: UniRAC, Iron Ridge, QRail Tilt

2. Overview: extruded aluminum structure utilized for attachment of PV modules. Extruded structure shall have slotted entries for module attachment hardware and for wire management systems.

3. Bus Canopy PV mounting system shall attach to the structural steel canopy. Provide additional structural steel and strut channel as required to support selected PV mounting system.

4. Tire Shop PV mounting system shall attach to the standing seam metal roof structure with non-penetrating hardware.

5. The contractor shall be responsible to design, furnish, and install a suitable attachment system based on the selected PV mounting system manufacturer's requirements.

6. Module array tilt – Bus Canopy: 5 degrees (South)

7. Module array tilt – Tire Shop: Parallel and flush to roof plane.

8. Wire Management Systems: Modular attachments integrated with PV Rail system. Wire management attachment shall be constructed to be integrated/inserted to PV Rail system through pre-slotted channel. Wire Ties (or similar) will not be acceptable.

2.6 LABELING

A. General: The entire PV system shall be labeled in accordance with requirements latest edition of the California Electrical Code Article 690.

B. Equipment Labels: Hellerman Tyton, or approved equal

1. Combiner Boxes

2. Enclosures

3. DC Disconnect

4. DC Breaker

5. Inverter

6. AC Disconnect

7. Main Service Disconnect

8. Building / Structure – Rapid Shutdown

C. Raceway Labels: Hellerman Tyton, or approved equal.

D. All data shall be typed. Handwritten data on labels shall not be acceptable.

2.7 RAPID SHUTDOWN

A. Rapid Shutdown Pushbutton: EATON M22-PVT-K01 in NEMA 4x enclosure. Location to be coordinated with local Authority having jurisdiction. Button shall interconnect with Microgrid controller to trip AC breakers for PV Inverters.

2.8 XLPE PV CONDUCTORS

A. Insulation Rating: 2 kV, RHW-2.

B. Listings: UL 44 RHW-2, UL 854 USE-2, UL 4703 PV Wire

C. Conductors: Copper (soft or annealed), Stranded.

D. Temperature Rating: 90°C Wet/Dry

E. Sunlight Resistant, Gasoline and Oil Resistant II

F. Products: Service Wire Co. Service Solar PV2K, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Do not begin installation until mounting surfaces have been properly prepared.

1. Per approved shop drawings, install additional structural steel supports and strut channel in canopy as required to support PV mounting hardware.

2. Examine modules, module connectors and array frame before installation. Reject modules and arrays that are wet, moisture damaged, or mold damaged. Modules shall not be stored in locations exposed to an exterior environment or open to elements of weather.

3. Examine roofs, supports, and supporting structures for suitable conditions where PV system will be installed.

4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with latest edition of California Electrical Code.

B. Coordinate layout and installation of PV panels with roof assembly and other construction.

C. Install PV inverters, PV modules, Optimizers, PV Rails, PV Wire Management, supporting structures and electrical raceways in locations indicated on Drawings. Notify Engineer of any conflicts.

D. Wiring Method:

1. PV module to DC Optimizer: Install cables utilizing cable management system. Module to DC Optimizer connections are to be made utilizing factory-made genuine Staubli MC4 connectors. No field wiring, or jumpers, are permitted. Notify Engineer if modules or optimizers do not contain these connectors. Nylon cable ties, or similar supporting methods, will not be acceptable.

2. DC Optimizer to DC Optimizer: All connections between optimizers shall be made utilizing factory wiring. No field wiring or jumpers are permitted. Notify Engineer if a conflict exists. Nylon cable ties, or similar supporting methods, will not be acceptable.

3. Optimizer to inverter: Field-made genuine Staubli MC4 connectors shall be installed on all wiring that will mate with optimizer cables. Crimp shall only be made by Staubli PV-CZM-22100 MC4 crimp tool. No substitutions.

4. All wiring methods outside the PV arrays shall be installed in rigid galvanized steel raceway sized in accordance with the National Electrical Code.

5. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. CONNECTIONS

1. Coordinate PV array cabling to equipment enclosures to ensure proper connections.

2. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B. Provide evidence of proper torque in field data sheets.

END OF SECTION

SECTION 26 31 01

BATTERY ENERGY STORAGE SYSTEM

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Divisions under Notice to Bidders and Special Provisions, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Battery Inverter

2. Battery Storage

3. Battery Modules

1.3 STANDARDS AND CODES

A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

B. Institute of Electrical and Electronics Engineers (IEEE):

1. 100 CD-13.....The Authoritative Dictionary of IEEE Standards Terms

2. 519-14.....Recommended Practices and Requirements for Harmonic Control in Electric Power Systems

3. 937-07.....Recommended Practice for Installation and Maintenance of Lead-Acid Batteries for Photovoltaic (PV) Systems

4. 1013-07.....Recommended Practice for Sizing Lead-Acid Batteries for Stand-Alone Photovoltaic (PV) Systems

5. 1361-14.....Guide for Selection, Charging, Test and Evaluation of Lead-Acid Batteries Used in Stand-Alone Photovoltaic (PV) Systems

6. 1547-03.....Standard for Interconnecting Distributed Resources with Electric Power Systems

7. 1561-07.....Guide for Optimizing the Performance and Life of Lead-Acid Batteries in Remote Hybrid Systems

8. 1661-07.....Guide for Test and Evaluation of Lead-Acid Batteries Used in Photovoltaic (PV) Hybrid Power Systems

C. International Code Council (ICC):

1. IBC-15 International Building Code

2. IFC-15.....International Fire Code

D. National Electrical Manufacturer's Association (NEMA)

1. 250-14.....Enclosures for Electrical Equipment (1,000 Volts Maximum)

E. National Fire Protection Association (NFPA)

1. 70-17 National Electrical Code (NEC)

F. Underwriters Laboratories (UL):

1. 6-07.....Electrical Rigid Metal Conduit – Steel

2. 969-17.....Standard for Marking and Labeling Systems

3. 1741-10.....Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources

1.4 SUBMITTALS

A. Submittals shall comply with the following requirements:

B. Shop Drawings:

1. Submit sufficient information to demonstrate compliance with drawings and specifications.

2. Include electrical ratings, dimensions, mounting details, materials, required clearances, terminations, weight distribution, wiring and connection diagrams, accessories, and nameplate data.

a. Include shop drawings for foundations and other support structures.

C. Product Data:

1. Manufacturer's cut sheets for each product.

D. Manufacturer's warranty data.

1.5 COMMISSIONING

A. Third-Party commissioning agent shall be contracted to provide independent commissioning of the PV system. Commissioning agent shall be NABCEP (or equivalent) accreditation for commissioning of PV systems.

1.6 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace Battery Electric Storage System components (batteries, inverters, and other appurtenances) that fail in materials or workmanship within specified warranty period.

1. Manufacturer's materials and workmanship warranties include, but are not limited to, the following:

a. Battery Modules

b. Power Conversion System

c. Battery Management System

d. System Enclosure and Ancillary Support Systems

2. Warranty Period: Twelve (12) years from date of Substantial Completion.

B. Manufacturer's Special Minimum Power Output Warranty: Manufacturer agrees to repair or replace Battery Electric Storage System components that fail to exhibit the minimum power output within specified warranty period. Special warranty, applying to modules only, applies to materials only, on a prorated basis, for period specified.

1. Specified minimum energy storage capacity to be 80 percent or more, for a period of 15 years.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. The system shall confirm to the following specification.

B. BESS shall consist of:

1. A power conversion system (PCS) suitable for outdoor installation on a user-furnished concrete pad or the user-furnished box pad;

2. An energy storage unit of at least 0.5MW/ at least 1.0 MWh at 20%-95% SOC.

3. Lithium-ion battery with life expectancy rating of 10 years under normal operating conditions, suitable for outdoor installation, and a battery management system (BMS).

C. Seismic Qualification Certificates: For battery enclosure and system.

1. Certification of Seismic for planned installation

2.2 POWER CONVERSION SYSTEM (PCS)

A. General: Grid-tied energy storage units are predominately DC in nature. To utilize the energy storage capability on the AC electric grid, the energy from batteries must be

converted to a standard AC level and regulated through a converter, generally known as the Power Conversion System (PCS). The PCS serves as the interface between the DC battery system and the AC system, providing bi-directional conversion from DC to AC (for discharging batteries) and AC to DC (for charging batteries). The PCS may consist of one or more parallel units. The PCS shall be bi-directional converter that can be operated in inverting mode for battery discharging and rectifying mode for battery charging.

1. Converter area: The converter area shall contain an AC circuit breaker, converter and DC circuit breaker.

2. AC Termination Area: The user-accessible AC termination area shall include bus terminal pads for connection of utility source and the customer load cables

3. DC Termination Area: The user-accessible DC termination area shall include terminations for cables from the battery pack.

4. Controls Area: The user-accessible controls area shall contain the master controls and associated circuitry to support operation. Within the control area shall be the following:

    a. Control panel – The control panel shall include a three-position rotary switch for selecting the control mode of the power unit (MGC-enabled, MGC- disabled, and Remove From Service).

    b. Master control board – The master control board shall provide the main processing and control functions of the converter.

    c. Power supply – The power supply shall provide the necessary DC control power for the system controls.

B. System Operation

1. Start/stop characteristics: The PCS starts or stops by pushing buttons “RUN” or “STOP”, respectively, or receiving control commands from a local HMI or MGC.

2. Operation during normal condition: The following functions shall be required with the PCS for the grid-connected and islanded (off grid) operation.

    a. The AC power transformed efficiently from the DC power of the battery arrays shall be bi- directionally transferred to or from the distribution line without causing harmonics higher than the PEA regulation.

    b. The following operation modes shall be provided:

        1) Virtual synchronous generator

        2) Active and reactive power control

        3) Voltage and frequency control

        4) Voltage and frequency droop for parallel operation (BESS may be paralleled with PV)

c. Black start capability

d. The PCS shall contain a remote synchronization feature, as well as the standard synchronization used when starting the PCS online. The remote synchronization feature allows the PCS to synchronize its voltage and frequency to any other remote AC bus or generator.

e. PCS shall be stable against the usual change in voltage and frequency of the grid.

3. Operation during abnormal condition: The PCS shall operate as follows during abnormal operation:

a. The PCS stops automatically when serious abnormal conditions are detected.

b. When not-serious errors are detected, the PCS continues operation with error signals which shall be reported to MGC.

C. Detailed Technical Specifications: Table 1 Summarize PCS Technical Specifications:

TABLE 1 – PCS TECHNICAL SPECIFICATIONS

Details	Technical requirement
AC ratings	
Total rated output power to load @ nominal voltage	0.5 (charge) to 0.5 MW (discharge)
Rate output power of each unit	0.5MW
Real and reactive power control accuracy	±1%
Voltage range	480VAC
Type of output	AC three-phase system
Frequency	60 Hz ±1%
VAR production	Full VAR production at rated voltage
Harmonics	according to PEA standards
DC input ratings	
Voltage range	as defined by bidder
Ripple voltage	Less than 4V RMS
Ripple current	Less than 10% of full current peak to peak
Environmental ratings	
Operating temperature	0ºC - 45ºC without derating
Humidity	0 – 95% non-condensing
Maximum altitude	1,000* m without derating
Seismic Rating	Zone 4
Functions/Features	
Power flow operation	Yes, support four-quadrant control
Real power control	Yes, positive and negative
Reactive power control	Yes, capacitive and inductive
Combination of real and reactive power control	Yes, with real power taking priority
Load following (renewable smoothing)	Yes, allowing renewable smoothing

Details	Technical requirement
Low-voltage ride through	Yes, supporting transition from grid connected to islanded operation
Synchro-check function	Yes, supporting parallel operation with the grid, PV and diesel generator
Operation modes	
Black start	Yes, external command
Commanded power	Yes, external command
Commanded VAR	Yes, external command
Frequency regulation	Yes, external command
Frequency response	Yes, automatic
Islanding	Yes, automatic (when utility source is lost) or external command (from MGC or ADDC)
Renewable smoothing	Yes, automatic
Scheduled power	Yes, preconfigured time/date of work power profiles
Voltage regulation	Yes, external command
Response time of PCS to the command received	< 100 ms
Communications	
Communications with MGC	Yes, via DNP 3.0 over IP or IEC61850
Communications with ADDC	Yes, via DNP 3.0 over IP
Battery technologies	
Battery technologies supported	Li-ion
Physical systems	
Protection class	Containerized solution for indoor installation or IP54 for outdoor installation
Cooling system	Yes
Time source	
Time source	CSCS via MGC
Monitoring and control	
Interface, status and control panel	Yes
Battery voltage (AC/DC)	Yes
Battery current (AC/DC)	Yes
Active power (AC/DC)	Yes
Reactive power	Yes
Energy (AC/DC)	Yes
Capacity (Ah)	Yes
Power factor	Yes
Fault	Yes
Battery information	Yes
Audible alarm	Yes
Battery temperature (average/extreme)	Yes
State of Charge (SOC)	Yes
Warning messages	Yes
Efficiency	
Efficiency of power conversion	≥ 95%
Protection system	
Under/over voltage (DC and AC)	Yes

Details	Technical requirement
Under/over frequency	Yes
Over current protection	Yes
Ground fault protection	Yes
Over heat protection	Yes
Smoke detection (Trip/Alarm)	Yes
Surge protection (DC and AC)	Yes
Automatic AC & DC open circuit when fault detection	Yes
Insulating monitoring	Yes
Function Features	
Overload capability of 3 MW Switching frequency	120% 30 seconds >= 1 kHz
Insulation resistance	Over 3 M-Ohm at DC 1000 V (exclude the circuit less than DC 60V)
Withstand voltage	AC 2000V 1 minute (exclude the circuit less than DC 60V)
Withstand impulse voltage	± 5000V 1.2 x 50μS each 3 times
Noise level	
Noise level	Less than 50 dBA at 10 meters from the BESS

2.3 ENERGY STORAGE

A. Battery Type: Battery shall be off Lithium-Ion type suitable for utility scale BESS. Different chemistry of Lithium-Ion batteries, such as Lithium Manganese (LMO), Lithium Phosphate (LFP), Lithium Nickel Manganese Cobalt Oxide (NMC), Lithium Nickel Cobalt Aluminum Oxide (NCA), can be proposed.

B. Detailed Technical Specifications: Table 2 Summarizes technical specifications of the battery energy storage system (BESS).

TABLE 2 – ENERGY STORAGE UNIT TECHNICAL SPECIFICATIONS

Details	Technical requirement
Rated output power @ nominal voltage	0.5MW (charge) to 0.5MW (discharge) (Continuous discharge measured at PCS output)
Energy	At least 1 MWh at 20%-95% SOC, at least 4 hours at 0.25MW to load
Type	Li-ion
Allowable charging capacity	See Note #1 below table
Discharging capacity	See Note #1 below table
Round-trip AC energy efficiency (including auxiliaries) at 22 kV system	> 80%
Cycle life	> 4,000 at 20-80% SOC

Note #1 – Charging and discharging requirements shall meet the requirements of the worst case solar smoothing requirements, full charge and full discharge

C. Standard: Battery preferable produced by a manufacturer certified with ISO 9001 or equivalent

D. Battery Module/Tray

1. Battery module shall consist of many battery cells connected in series/parallel.

2. Module/tray battery management system (BMS) shall be provided.

3. Automatic module balancing shall be provided.

4. Module/tray cooling system shall be provided

E. Battery Rack

1. Battery modules shall be connected in series/parallel in the battery rack so that the nominal voltage of the DC is more than 480V, suitable for PCS DC voltage.

2. Rack BMS with battery fuse, DC current measurement devices and contractors shall be provided.

3. Electrical connection shall be at rack front side.

4. Many racks shall be connected in parallel to total capacity required for this project.

5. All racks shall seismic rated for the location.

F. Battery Protection: The following protections shall be provided:

1. Over-charge protection

2. Over-discharge protection

3. Over-temperature protection

4. Over-current protection

5. Ground-fault detection

6. Internal battery fault detection

7. Cell balancing

8. Protective devices should include for DC-side protection:

a. Battery fuse for each battery cell and module (preferred)

b. DC contactor for each battery rack

9. Grounding over current (76G)

G. Cycle Life

1. If the product is sensitive to depth of discharge, the manufacturer must state the limitations and the product should be sized such that the depth of discharge corresponds to the required cycle life.

2. For purposes of estimating and demonstrating cycle life, cycles are defined in the same manner as system efficiency.

3. For lifetime assessment the supplier should provide a graph that displays the relationship between depth of discharge and the corresponding number of cycles available within the system's life.

4. Results of charging and discharging are tested at 1C.

2.4 BATTERY MAINTENANCE SYSTEM (BMS)

A. General: BMS is used to monitor, protect, maintain safety and optimal operation of each battery cell, module and rack. BMS consist of: Module/tray BEMS, rack BMS and system BMS.

B. Minimum Functions of Module/Tray BMS:

1. Metering and monitoring

2. Battery cell voltage (all cells)

3. Battery module voltage

4. Battery cell temperature (at least one or several measured locations in battery module/tray)

5. Battery module current

6. Cell balancing

7. Module/tray BMS should balance voltage of cells

8. Safety protection

9. Module/tray BMS should protect the battery cells and module/tray from:

10. Over and under voltage

11. Over current

12. Short circuit current

13. Over and under temperature

14. Data communication: all metering items and contactor status shall be provided for rack BMS control and monitoring system.

C. Minimum Functions of Rack BMS

1. Metering and monitoring
2. Battery rack voltage
3. Battery rack current
4. Battery rack temperature (one or several locations in battery rack)
5. Battery SOC of battery modules
6. Module/tray balancing
7. Balancing battery modules/trays scheme
8. Safety protection
9. Rack BMS should protect the battery rack from:
10. Over and under voltage
11. Over current
12. Short circuit current
13. Over and under temperature

2.5 ALARMS AND RESETS

A. Alarms:

1. Informational Notification—indicates the status of the unit.
2. Warning Alarm—indicates a problem with the converter requiring attention (not affecting proper operation).
3. Converter Inhibit—indicates a problem with the converter affecting proper operation. The converter will stop operation.
4. Trip Offline Alarm—indicates a severe problem with the converter. The system will not operate.
5. Isolate Alarm—indicates a problem affecting proper operation of the system. The system will operate with limited functionality.
6. Fire detection remote alarm status for main fire alarm control panel, and control and monitoring system.
7. These alarms shall be reported to MGC and HMI of BESS system.

B. Resets: Energy storage unit alarms shall be reset by any of the following means.

1. Manual Reset—via the reset button located on the control panel, or via a personal computer connected to the control panel Ethernet port.

2. Auto Reset—automatically performed until reaching a predetermined reset count.

3. Self Reset—automatically performed whenever required.

2.6 ENCLOSURE CONSTRUCTION

A. The PCS shall be contained within a weatherproof, moisture-sealed, tamper-resistant, metal enclosure with a minimum IP54 or equivalent rating suitable for outdoor installation on a concrete pad or cover of a fiberglass box pad, in accordance with the following requirements.

1. The enclosure shall not utilize replaceable filters, dehumidifiers, or similar features requiring periodic maintenance. Air intakes are designed so that any entrance of water or dust is directed away from internal components and does not affect operation of the unit.

2. The enclosures shall be equipped with complete and failsafe fire detection/extinguishing system.

3. The overall enclosure footprint shall not exceed 20’-0” x 8’-0”.

4. The enclosure shall comply with security requirements of IEEE C57.12.28 Section 4. The enclosure shall limit access to the controls and physical network connections.

5. The enclosure shall comply with coating system requirements of IEEE C57.12.28 Section 5.

6. Enclosure grounding shall be provided.

7. The enclosure shall have access control.

8. If applicable, wiring and weather-tight enclosure egress to an external antenna shall be provided.

9. A nameplate shall be provided specifying the following:

   a. Manufacturer name

   b. Connection diagram

   c. Unit ratings: Power, energy, voltage, BIL

   d. Specimen data: serial number, date of manufacture

10. Signage shall indicate Source and Load-Side AC Buses, Neutral Bus, DC Bus, Isolation Contactor, and Module names. Custom signage will be in accordance with specific utility requirements.

11. All necessary safety signs and warnings as described in ANSI Z535-2002 shall be included on the unit.

12. All necessary signs and warnings for identification of hazardous materials as described in NFPA 704 shall be included on the unit.

2.7 SAFETY

A. General:

1. The BESS must be compliant with IEEE 1547, IEC 62619, and UL 1973 as appropriate. Systems must be able to protect themselves from internal failures and utility grid disturbances.

2. For all BESS equipment, the Supplier shall provide information on specific safety issues related to the equipment, including appropriate responses on how to handle the energy storage system in case of an emergency, such as fires or module ruptures.

B. Fire Mitigation

1. Provisions shall be included to extinguish internal container fires without the need to open container doors.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrate areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Do not begin installation until mounting surfaces have been properly prepared.

C. If preparation of mounting surfaces is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Examine modules, module connectors and array frame before installation. Reject modules and arrays that are wet, moisture damaged, or mold damaged. Modules shall not be stored in locations exposed to an exterior environment or open to elements of weather.

E. Examine roofs, supports, and supporting structures for suitable conditions where container battery system will be installed.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with latest edition of California Electrical Code.

END OF SECTION

SECTION 26 32 13

GAS ENGINE DRIVEN GENERATOR SETS

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 WORK INCLUDED

A. The installation of the power generation system shall include the following:

1. Engine-driven generator set
2. Control system
3. Cooling system
4. Fuel supply system
5. Generator set accessories
6. Mounting system
7. System control
8. Outdoor Enclosure

B. Roughing-in, installation of equipment, and final connection of utilities, with labor, services, and incidentals necessary for complete and operational equipment installation.

C. Piping, wiring, and switching between equipment and utilities.

1.2 CODES, STANDARDS AND REGULATORY REQUIREMENTS

A. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic and fire codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings. All materials, design, fabrication, assembly and test procedures shall be in accordance with the requirements of all applicable codes, standards or regulations having jurisdiction over the work.

B. The organizations having jurisdiction include, but are not limited to, the following:

1. ANSI/IEEE 112 Test Procedures for Polyphase Induction Motors and Generators.
2. ANSI/IEEE 115 Test Procedures for Synchronous Machines.
3. ANSI/IEEE C.2 National Electric Safety Code.

4.	ANSI/ISA S18.1	Annunciator Sequence and Specification.
5.	ASCE/SEI 7 Institute	American Society of Civil Engineers/Structural Engineering
6.	ASME	American Society of Mechanical Engineers
7.	EEC 89/392	Safety and Health
8.	EGSA	Electrical Generating Systems Association
9.	EPA Agencies	Federal, State and Local Environmental Protection
10.	IBC	International Building Code, California Edition
11.	IEEE	Institute of Electrical and Electronics Engineers
12.	IEC	International Electrotechnical Commission
13.	ISO	International Standards Organization 9000
14.	NEC	National Electrical Code.
15.	NEMA ICS-2	Enclosures for Industrial Control and Systems.
16.	NEMA MGI	Motors and Generators.
17.	NEMA MG2	Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators.
18.	NESC	National Electrical Safety Code.
19.	NFAC	National Fire Alarm Code.
20.	NFPA 37	Installation and Use of Stationary Combustion Engines and Gas Turbines.
21.	OSHA Administration.	Regulations of the Occupations Safety and Health
22.	SAE	Society of Automotive Engineers
23.	UL	Underwriter's Laboratories Inc.

24. The state, county or municipal laws and regulations governing the location where the equipment is to be installed

C. Reference to any code, standard or regulation shall mean the latest published edition, including addenda, supplements and revisions thereto, which are in effect when the purchase order is awarded.

D. In the event of conflict between codes, standards or regulations, the conflict shall be referred to the Engineer for resolution.

1.3 SUBMITTALS

A. Shop Drawings: Submit in accordance with Division 1 -General Requirements of these specifications.

1. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for the submitted equipment. The drawings shall further include dimensions from structural elements or architectural grid lines, operational clearances, locations of any utility service connection points, mounting requirements, and structural supports required for the submitted equipment.

B. Submittals shall include but not be limited to:

1. Component List - A breakdown of all components and options including switchgear.

2. Technical Data - Manufacturer produced generator set specification or data sheet identifying make and model of engine and generator, and including relevant component design and performance data.

a. Engine:

1) Type, aspiration, compression ratio, and combustion cycle

2) Bore, stroke, displacement, and number of cylinders

3) Engine lubricating oil capacity

4) Engine coolant capacity without radiator

5) Engine coolant capacity with radiator

6) Coolant pump external resistance (maximum)

7) Coolant pump flow at maximum resistance

b. Alternator:

1) Model

2) Frame

3) Insulation class

4) Number of leads

5) Weight, total

6) Weight, rotor

7) Air flow

c. At rated voltage:

1) Efficiency at 0.8 power factor for:

a) 50% load

b) 75% load

c) 100% load

2) Time constants; short circuit transient (T'D)

3) Time constants, armature short circuit (TA)

4) Reactance, subtransient - direct axis (X"D),

5) Reactance, transient - saturated (X'D)

6) Reactance, synchronous - direct axis (XD)

7) Reactance, negative sequence (X2)

8) Reactance, zero sequence (X0)

9) Fault current, 3 phase symmetrical

10) Decrement curve

d. Radiator:

1) Model

2) Type

3) Fan drive ratio

4) Coolant capacity, radiator

5) Coolant capacity, radiator and engine

6) Weight, dry

7) Weight, wet

e. System:

1) Dimensions:

a) length

b) width

c) height

d) Weight, dry

e) Weight, wet

2) Power rating at 0.8 power factor

3) kVA rating

4) Fuel consumption at standard conditions for:

a) 50 % load

b) 75 % load

c) 100% load

5) Combustion air inlet flow rate

6) Exhaust gas, flow rate, stack temperature

7) Exhaust system backpressure (maximum)

8) Heat rejection to:

a) coolant

b) aftercooler

c) exhaust

d) atmosphere from engine

e) atmosphere from generator

C. Auxiliary Equipment - Specification or data sheets, including switchgear, load bank, vibration isolators, and day tank.

D. Drawings - General dimensions drawings showing overall generator set measurements, mounting location, and interconnect points for load leads, fuel, exhaust, cooling and drain lines.

E. Wiring Diagrams - Wiring diagrams, schematics and control panel outline drawings published by the manufacturer in Joint Industrial Council (JIC) format for controls and switchgear showing interconnected points and logic diagrams for use by contractor and owner.

F. Warranty Statements - Warranty verification published by the manufacturer.

G. Service - Location and description of supplier's parts and service facility including parts inventory and number of qualified generator set service personnel.

H. Product Data:

1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.

2. All Product Data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories will be a cause for rejection.

3. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

B. Load Bank

1. The manufacturer shall submit for review technical data including features, performance, electrical characteristics, physical characteristics, ratings, accessories, and finishes.

2. Shop drawings shall include dimensional plans and mounting details sufficient to properly install the load bank. Load bus configuration and load connections termination area shall be clearly identified.

3. Electrical schematic drawings shall be provided to detail the operation of the load bank and the provided safety circuits. Over-current protection and control devices shall be identified and their ratings marked. An interconnection drawing shall be included for control wiring related to the load bank.

4. A complete parts list with part numbers, device identification, rating shall be included in the manuals. The original manufacturers name and part number shall be included in the parts listing.

5. Installation and operation manuals shall be provided with the equipment and shall include complete details for the installation, commissioning, operation, and maintenance of the load bank.

6. The manuals shall include the electrical schematic and interconnect drawings for the power and control wiring for the load bank and all control devices.

I. Operation and Maintenance Manual:

1. Provide a Complete parts list, operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:

a. Description of system and components.

b. Schematic diagrams of electrical, plumbing and compressed air systems.

c. Manufacturer's printed operating instructions.

d. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

e. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

2. Assemble and provide copies of manual in 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

1.4 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Manufacturers listed for each equipment item may bid without submittal for that item. Manufacturers not listed shall submit for approval in accordance with "Instructions to Bidders". Prior to installation, submittals for each equipment item by Mark Number shall be provided in accordance with Division 1 - General Requirements.

1.5 QUALITY ASSURANCE

A. The complete power generation system, including engine, generator, shall be the product of one manufacturer who has been regularly engaged in the production of complete generating systems for at least fifteen (15) years. All components shall have been designed to achieve optimum physical and performance compatibility and prototype tested to prove integrated design capability. The complete system shall have been factory fabricated, assembled, and production tested (transfer switches not included in the factory system test) as performed by the manufacturer. The engine must be designed and manufactured by the generator set manufacturer. Suppliers/Manufacturers using engines other than their own product and assembling it into a generator set will not be considered. The local supplying dealer must be a factory authorized facility allowing for troubleshooting access to all generator components and ECM’s. Suppliers that cannot troubleshoot and repair every component on the generator set will not be considered. The naming of a specific manufacture does not waive any requirements of this specification. Any exceptions or variations must be noted as described in paragraph 1.10, Equipment Alternatives

B. The Supplier of the Engine/Generator set shall be responsible for satisfactory total operation of the system and its certification. This Supplier shall have had experience with

three or more installations of systems of comparable size and complexity in regards to coordinating, engineering, testing and supervising. Each of these installations shall have been in successful operation for three or more years. Prior to review of submittals, the Engineer reserves the right to:

1. Have the Supplier submit a list of locations of similar installations.

2. Inspect any of these installations and operations of Engine/Generator package, and question the user concerning the installations without the presence of the Supplier.

C. Factory authorized representative shall be capable of providing emergency maintenance and repairs at the project site within four (4) hours maximum of notification.

D. A single Supplier shall be responsible for the furnishing of the Engine/Generator, Load Bank, Switchgear and SCR with auxiliary components as specified and as required. Supplier shall design Generator enclosure with capability to support the SCR reactor housing and all associated piping/accessories.

E. Noise level developed by the generator set shall be as herein specified.

F. Load Bank

1. The load bank shall be fully tested using a test specification written by the supplier. Tests shall include electrical functional testing, verifying conformance to assembly drawings and specifications. Each load step shall be cold resistance checked to verify proper calibration of resistive load steps and proper ohmic value.

2. The manufacturer shall maintain this data on file for inspection purposes by the purchaser. Tests using high potential equipment shall be performed to ensure isolation of the load circuits from the control circuits and to determine isolation of the load circuits from the load bank frame. Tests of all safety circuits shall be performed to verify conformance to the specification

3. All electrical circuits shall have a high potential insulation resistance test performed at twice rated voltage plus 1000 VAC to assure insulation integrity.

4. All quality control test equipment shall be regularly maintained and calibrated to traceable national standards.

5. The Company's Quality System shall be ISO9001 Certified.

6. The load bank shall be manufactured by a firm regularly engaged in the manufacture of load banks and who can demonstrate at least five (5) years experience with at least twenty five (5) installations of load banks similar or equal to the ones specified herein.

7. The manufacturer shall have a written Quality Control procedure available for review by the purchaser, which will document all phases of operations, engineering, and manufacturing.

G. Supplier shall submit certification that Engine/Generator, accessories, and components will withstand seismic forces defined in the IBC "International Building Code" CA Edition.

H. Manufacturer's Representative:

1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out and start up.

2. Training: Provide technical representative to train Owner's maintenance personnel in operation and maintenance of specified equipment.

I. Comply with ASME B15.1

J. Comply with NFPA 37

K. Comply with NFPA 70

L. Comply with UL2200 and provide UL2200 label. The generator system is intended to be factory UL listed. Custom generator enclosure to be IBC certified ASCE 7. Custom enclosure/generator assembly to be provided UL inspection at facility with load testing as required and provided UL inspection onsite after completion of installation/commissioning.

1.6 FIELD CONDITIONS

A. The operating environment of the power generating system shall be:

1. Altitude: 66 ft

2. Max Ambient Temperature: 105 F

3. Minimum Ambient Temperature: 25 F

4. Fuel Type: Pipeline Natural Gas

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery shall be FOB to the jobsite by the system manufacturer's authorized dealer. The genset, enclosure, genset and any components shall be shipped in pieces measuring no more than 13’H x 40’L, and have a weight of no more than 40 tons.

B. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid, dusty conditions.

C. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Mark Number of this specification.

D. The Engine/Generator Supplier shall be responsible for the shipment of the unit to the job site. Supplier shall be responsible for packaging and all precautions necessary for shipments to arrive at destinations in the condition shipped when handled by commercial carriers.

E. Installing Contractor shall be responsible for the receiving and unloading of the equipment at the job site. This responsibility includes proper protection for storage at the job site.

F. Supplier shall confirm shipping clearances and shall provide the status of shipments in transit upon request.

G. Supplier shall, 4 weeks prior to shipping, provide a complete list of material to be shipped. Included in this submittal shall be a list of loose ship material including the weight and sizing of such packages

1.8 LABELING

A. Manufacturer shall securely attach in a prominent location on each major item of equipment a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

B. H.E. Testing Agency Qualifications: An independent agency (hired/approved by owner), with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association (NETA) or is a nationally recognized testing laboratory (NRTL), and that is acceptable to authorities having jurisdiction.

C. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (U.L.), or other National Recognized Testing Laboratory (NRTL), in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

1.9 WARRANTY

A. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

B. The Manufacturer shall warrant that all materials and equipment furnished under this contract will be new and of good quality, free from defects in design, workmanship, and materials. Defects shall include, but not be limited to noisy, rough, or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

C. Each item of equipment, or part thereof, proving to be defective within the specified period of the warranty shall be replaced, free of defect, without cost to the Owner. Warranty shall include materials and labor necessary to correct defects.

D. The manufacturer's authorized dealer shall be capable of administering the manufacturer and dealer's warranty for all components supplied by the selling dealer (who may or may not be the same as the servicing dealer).

1. The manufacturer's and dealer's extended warranty shall in no event be for a period of less than five (5) years from date of initial start-up of the system and shall include repair parts, labor, reasonable travel expense necessary for repairs at the jobsite, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. Applicable deductible costs shall be specified in the manufacturer's warranty. Provide a

temporary generator set in the event a covered repair exceeds 96 hours. Submittals received without written warranties as specified will be rejected in their entirety.

2. The enclosure and all ancillary options shall have a two-year parts and labor warranty.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers, subject to compliance with requirements of this specification, are as follows:

1. Engine
   a. Caterpillar
   b. Cummins
   c. MTU
   d. Jenbacher
   e. Approved Equal
2. Governor:
   a. Caterpillar
   b. Woodward
3. Alternator:
   a. Caterpillar
   b. Kato
   c. Leroy Somers
   d. Marathon
4. Voltage regulator:
   a. Caterpillar
   b. Basler
   c. Marathon
5. Radiator:

a. Caterpillar

b. Cummins

c. MTU

6. Silencer:

a. Caterpillar

b. Harco

c. GT Exhaust

7. Battery charger:

a. Caterpillar

b. Sens

c. Lamarche

8. Circuit breakers:

a. Merlin Gerin

b. Square D

c. Siemens

d. ABB

9. Vibration Isolators:

a. Caterpillar Ace

b. Korfund

c. Mason

10. Enclosures:

a. Precision Power Source

b. Fiberbond

c. Robinson

d. Modutek

11. SCR

a. Safety Power

b. Miratech

2.2 PERFORMANCE

A. Engine exhaust emissions at full load shall meet the criteria listed in Part IV - Attachments prior to any emission control device.

B. The Engine/Generator set shall conform to the technical criteria listed in Part IV – Attachments.

C. Rating - Engine brake horsepower shall be sufficient to deliver full rated generator set kW/kVA when operated at rated rpm and equipped with all engine-mounted parasitic and external loads such as radiator fans and power generators.

D. Conditions - The rating shall be based on ISO 3046/1 standard conditions of 100 kPa and 27C (29.53 in Hg, 81F

E. Fuel – Natural Gas engines shall be able to deliver rated power when operating on pipeline natural gas having an LHV of 920 BTU/cu ft

F. Block Load Acceptance - Transient response shall conform to ISO 8528 requirements.

G. Exhaust Emissions - The proposed generator set shall be in compliance with San Diego County Air Pollution Control District (APCD) emission regulations for a spark ignited engine in a peak shaving/continuous application.

2.3 GAS ENGINE DRIVEN GENERATOR

A. The engine shall be equipped with air filters, restriction gauge, lubricating oil cooler, filters, and pressure gauge, water pump and temperature gauge, service hour meter, flywheel, and flywheel housing when applicable.

B. Structure/Metallurgy

1. The design of the basic engine shall provide for maximum structural integrity to extend service life. Materials used in the engine shall incorporate the highest level of proven metallurgical and manufacturing technology. Block shall be of one-piece design and cast of high tensile strength iron.

C. Lubrication System

1. The lubrication oil pump shall be a positive displacement type that is integral with the engine and gear driven from the engine gear train. The system shall incorporate full flow filtration with bypass valve to continue lubrication in the event of filter clogging.

2. The bypass valve must be integral with the engine filter base or receptacle. The filter shall incorporate a self-lubricating, free rotating seal and have a nonmetallic core sufficiently rigid to minimize movement or shifting of the filtration media.

D. Electronic Fuel Control Valve

1. The engine shall be equipped with an electronic engine fuel control valve. Fuel control valve shall mix the fuel with the intake combustion air. It shall meter incoming fuel and provide throttle control for engine operation. It shall require no more the .5 PSI at the inlet to the throttle control unit.

E. Fuel Strainer

1. A fuel strainer shall be provided as per the generator set MFG requirements to remove particles and debris from the incoming fuel supply line

F. Fuel Train

1. Provide the incoming fuel train as required per the MFG requirements for a natural gas fired engine generator set. Pressure losses through the fuel train shall be kept to a minimum. Provide fuel train per NFPA 37. Maximum pressure loss through the fuel train shall be 0.15 PSi

G. Fuel Lines

1. Flexible fuel lines between engine and fuel supply shall be installed to isolate vibration.

H. Engine Control

1. The engine control shall be an electronic type and shall control engine speed while optimizing both steady state and transient engine performance. The control will monitor all significant engine parameters, and adjust engine performance according to speed, altitude, temperature, aftercooler temperature, and engine condition. It shall incorporate revisable control software capable of reconfiguring engine operation to desired performance levels.

2. The engine control shall be configured to avoid interruption of power whenever possible. In the event of system faults, which do not require immediate shutdown, the engine shall be programmed to continue operation at power levels sufficient to remain within performance limits. Engine governing shall maintain steady state speed regulation of +/- 1%, and be adjustable. In the event of a DC power loss, the fuel system will remain closed.

I. Cooling System

1. The engine jacket water cooling system shall be a closed circuit design with provision for filling, expansion, and deaeration. The cooling pump shall be gear driven by the engine. Auxiliary coolant pumps required for heat exchangers or separate circuit aftercooling shall also be gear driven by the engine. The cooling system shall tolerate at least 172-kPa (25-PSI) static head. Coolant temperature shall be internally regulated to disconnect external cooling systems until operating temperature is achieved. Radiator shall be rated at 105 degrees F.

J. Radiator

1. Heat rejected to the engine jacket water shall be discharged to the atmosphere through a close-coupled radiator. The radiator shall be sized to cool the engine continuously while operating at full rated load and at specified site conditions.

K. Fan and Belt Guarding

1. The fan, fan drive, and fan belts shall be covered with 14 gauge punched steel mesh guarding for personnel protection. The guarding shall conform to IEC 34-5, ISO and OSHA standards.

L. Blower Fan

1. The radiator-cooling fan shall be a blower type driven from the engine. Air shall be drawn from the engine side and exhausted through the radiator core. It shall have an external static pressure capability of 0.75" H_20, not including the radiator core.

M. Inlet Air System

1. The engine air cleaner shall be engine mounted with dry element requiring replacement no more frequently than 250 operating hours or once each year.

N. Turbocharging

1. Turbochargers shall be of the radial turbine type driven by engine exhaust gases and direct - connected to a compressor supplying engine combustion air.

O. Crankcase Fumes Reclamation

1. Provide a crankcase fumes reclamation system on the engine. System shall collect crankcase emissions, filter out airborne lube oil, and return the crankcase fumes back to the engine air intake. Crankcase fumes shall not be allowed to vent directly into the atmosphere. Fumes collection system shall be as MFG by Racor or approved equal

P. Wiring and Conduit

1. Engine and generator control wiring shall be multi-strand annealed copper conductors encased by cross-linked polyethylene insulation resistant to heat, abrasion, oil, water, antifreeze, and diesel fuel. Wiring shall be suitable for continuous use at 120C (250F) with insulation not brittle at -50C (-60F). Each cable will be heat stamped throughout the entire length to identify the cable's origin and termination. Cables shall be enclosed in nylon flexible conduit, which is slotted to allow easy access and moisture to escape. Reusable bulkhead fittings will attach the conduit to generator set mounted junction boxes.

Q. Electrical Starting System

1. The engine starting system shall include 24V dual DC starting motors, starter relay, and automatic reset circuit breaker to protect against butt engagement. Batteries shall be maintenance free, lead acid types mounted near the starting

motor. A corrosion resistant or coated steel battery rack shall be located to avoid spillage from servicing of fuel and oil filters. Required cables will be furnished and sized to satisfy circuit requirements. The system shall be capable of starting a properly equipped engine within 60 seconds at ambient temperatures.

R. Jacket Water Heater

1. Jacket water heater shall be provided to maintain coolant temperature of 32C (90F) while the engine is idle. Heaters shall accept 120 or 240 VAC single phase power and include thermostatic controls. Hoses to and from the heater shall be industrial quality, which exhibit long life in operational environments. Manual shutoff valves shall be incorporated to isolate the heaters during servicing.

S. Batteries

1. Batteries for starting and control shall be selected and supplied by the generator set manufacturer. They shall be a heavy duty SLI lead acid type with thru-partition connectors, and housed in a hard rubber or polypropylene case with provision for venting.

2. Starting batteries shall be rated 24V DC Sizing shall consider specific application requirements of engine oil viscosity, ambient starting temperature, control voltage, overcharging and vibration.

3. Batteries shall be located as close to the starting motor as practical, away from spark sources, in a relatively cool ambient, and permit easy inspection and maintenance. Battery warranty shall be the responsibility of the generator set manufacturer.

T. Alternator

1. An engine-mounted belt driven battery-charging alternator shall be installed with an automatic voltage regulator. It shall be suitable for heavy-duty applications with a rating of 24V 35 amperes minimum.

2. The alternator(s) shall be rated for peak shaving/continuous service at 1000 ekW, 1250 kVA, 0.80 PF, 480 VAC, three phase, 3 wire, 60 Hz, 1800 rpm.

3. The alternator(s) shall be capable of withstanding a three-phase load of 300% rated current for 10 seconds, and sustaining 150% of continuous load current for 2 minutes with field set for normal rated load excitation.

4. It shall exhibit less than 5% waveform deviation at no load.

5. Structured – Close Coupled

a. The alternator shall be close coupled, drip proof and guarded, constructed to NEMA 1 and IP 22 standards, single bearing, salient pole, revolving field, synchronous type with amortisseur windings in the pole faces of the rotating field. The alternator terminal box shall provide generous space for entrance and installation of power cables.

6. Mechanical Design

   a. The alternator housing shall be one piece and mount directly to the engine flywheel housing without bolted adapters. Engine torque shall be transmitted through flexible steel plates to the alternator rotor. The alternator-ventilating fan shall mount to the engine flywheel and act as a pressure plate to secure the flexible plates.

7. Windings

   a. The windings shall consist of copper magnet wire coated with an underlay of polyester (amide)(imide) resins and a superimposed heavy coat of polyamideimide resins. All winding insulation materials shall be Class H in accordance with BS and IEEE standards. No materials shall be used which support fungus growth, and shall be impervious to oil, dirt, and fumes encountered in diesel and natural gas engine operating environments. Temperature rise shall be 80 degree C rise over 40 degree C ambient. Pitch shall be 2/3.

8. Operating Environment

   a. The alternator shall be designed to operate in a sheltered drip-proof environment.

9. Excitation

   a. The alternator exciter shall be brushless with the circuit consisting of a three-phase armature and a three-phase full wave bridge rectifier mounted on the rotor shaft. Surge suppressors shall be included to protect the rotating diodes from voltage spikes.

10. Exciter – PMG Type

    a. The permanent magnet excitation system shall derive excitation current from an external stator shaft mounted exciter. It shall enable the alternator to sustain 300% of rated current for ten seconds during a fault condition.

11. Voltage Regulator

    a. The voltage regulator shall be microprocessor based with adjustable operating and protection characteristics. The regulator shall be capable of sensing true RMS in three phases of alternator output voltage, or operating in single phase sensing mode. It shall exhibit the following operational characteristics:

       1) Alternator output voltage maintained within +/- 0.5% at steady state conditions.

       2) Alternator output voltage maintained within +/- 0.5% of rated value for any load variation between no load and full load.

3) Alternator output voltage drift no more than +/-0.5% of rated value at constant temperature.

4) Alternator output voltage drift no more than +/- 0.5% of rated value within a 40 change over ambient temperature range of -40øC to 70øC.

U. Mounting

1. The engine and generator shall be assembled to a common base by the engine-generator manufacturer. The generator set base shall be designed and built by the engine-generator manufacturer to resist deflection, maintain alignment, and minimize resonant linear vibration.

2. Isolator – Spring Type

a. Provide spring type vibration isolators to be mounted between the generator set base assembly and the site mounting surface. Isolators shall be spring type seismic zone 2 compliant. Isolators shall have a maximum deflection of 1” Isolators shall be Ace Mountings 822 series or approved equal

V. Controls, Protection, and Monitoring

1. The controls, protection, and monitoring systems of the generator set and its operation shall be the responsibility of the generator set manufacturer. All subsystem components, interfaces, and logic shall be compatible with engine mounted devices.

2. Cycle Cranking

a. A cycle crank timer shall provide five 10 second cranking periods separated by 10-second rest periods.

b. Engine Cooldown

1) A cool down timer shall provide an adjustable 0-30 minute engine-running period before shutdown after removal of load.

3. Controls – Generator Set Mounted

a. Provide a fully solid-state, microprocessor based, generator set control. The control panel shall be designed and built by the engine manufacturer. The control shall provide all operating, monitoring, and control functions for the generator set. The control panel shall be Caterpillar EMCP4 or approved equal.

b. Environmental

1) The generator set control shall be tested and certified to the following environmental conditions:\ –40°C to +70ºC Operating Range 100% humidity condensing, 30ºC to 60ºC IP22 protection

2) 5% salt spray, 48 hours, +38ºC, 36.8V system voltage

3) Sinusoidal vibration 4.3G's RMS, 24-1000Hz

4) Electromagnetic Capability (89/336/EEC, 91/368/EEC, 93/44/EEC, 93/68/EEC, BS EN 50081-2, 50082-2)

5) Shock: withstand 15G

c. Functional Requirements

1) The following functionality shall be integral to the control panel.

a) The control shall include a minimum 64 x 240 pixel, 28mm x 100mm, white backlight graphical display with text based alarm/event descriptions

b) The control shall include a minimum of 3-line data display

c) Audible horn for alarm and shutdown with horn silence switch

d) Standard ISO labeling

e) Multiple language capability

f) Remote start/stop control

g) Local run/off/auto control integral to system microprocessor

h) Cooldown timer

i) Speed adjust

j) Lamp test

k) Push button emergency stop button

l) Password protected system programming

d. Digital Monitoring Capability

1) The controls shall provide the following digital readouts for the engine and generator. All readings shall be indicated in either metric or English units

2) Engine

a) Engine oil pressure

b) Engine oil temperature

c) Engine coolant temperature

d) Engine RPM

e) Battery volts

f) Engine hours

3) Generator

a) Generator AC volts (Line to Line, Line to Neutral and Average)

b) Generator AC current (Avg and Per Phase)

c) Generator AC Frequency

d) Generator kW (Total and Per Phase)

e) Generator kVA (Total and Per Phase)

f) Generator kVAR (Total and Per Phase)

g) Power Factor (Avg and Per Phase)

h) Total kW-hr

i) Total kVAR-hr

j) % kW

k) % kVA

l) % kVAR

e. Alarms and Shutdowns

1) The control shall monitor and provide alarm indication and subsequent shutdown for the following conditions. All alarms and shutdowns are accompanied by a time, date, and engine hour stamp that are stored by the control panel for first and last occurrence:

2) Engine Alarm/Shutdown

a) Low oil pressure alarm/shutdown

b) High coolant temperature alarm/shutdown

c) Loss of coolant shutdown

d) Overspeed shutdown

e) Overcrank shutdown

f) Low coolant level alarm

g) Emergency stop depressed shutdown

h) Low coolant temperature alarm

i) Low battery voltage alarm

j) High battery voltage alarm

k) Control switch not in auto position alarm

l) Battery charger failure alarm

3) Generator Alarm/Shutdown

a) Generator over voltage

b) Generator under voltage

c) Generator over frequency

d) Generator under frequency

f. Maintenance

1) All engine, voltage regulator, control panel and accessory units shall be accessible through a single electronic service tool. The following maintenance functionality shall be integral to the generator set control

a) Engine running hours display

b) Service maintenance interval (running hours or calendar days)

c) Engine crank attempt counter

d) Engine successful starts counter

e) 20 events are stored in control panel memory

f) Programmable cycle timer that starts and runs the generator for a predetermined time. The timer shall use 14 user-programmable sequences that are repeated in a 7-

day cycle. Each sequence shall have the following programmable set points:

(1) Day of week

(2) Time of day to start

(3) Duration of cycle

g. Remote Communications

1) The control shall include Modbus RTU communications as standard via RS-485 half duplex with configurable baud rates from 2.4k to 57.6k.

h. Local and Remote Annunciation

1) Local Annunciator (NFPA 99/110, CSA 282)

2) Provide a local, control panel mounted, annunciator to meet the requirements of NFPA 110, Level 1.

a) Annunciators shall be networked directly to the generator set control

b) Local Annunciator shall include a lamp test pushbutton, alarm horn and alarm acknowledge pushbutton

c) Provide the following individual light indications for protection and diagnostics

(1) Overcrank

(2) Low coolant temperature

(3) High coolant temperature warning

(4) High coolant temperature shutdown

(5) Low oil pressure warning

(6) Low oil pressure shutdown

(7) Overspeed

(8) Low coolant level

(9) EPS supplying load

(10) Control switch not in auto

(11) High battery voltage

(12) Low battery voltage

(13) Battery charger AC failure

(14) Emergency stop

(15) Spare

(16) Spare

d) Provide a remote annunciator that shall provide annunciation of all points stated below and shall incorporate ring-back capability so that after silencing the initial alarm, any subsequent alarms will sound the horn

e) Ability to be located up to 4000 ft from the generator set

f) Provide the following individual light indications for protection and diagnostics

(1) Overcrank

(2) Low coolant temperature

(3) High coolant temperature warning

(4) High coolant temperature shutdown

(5) Low oil pressure warning

(6) Low oil pressure shutdown

(7) Overspeed

(8) Low coolant level

(9) EPS supplying load

(10) Control switch not in auto

(11) High battery voltage

(12) Low battery voltage

(13) Battery charger AC failure

(14) Emergency stop

(15) Spare

(16) Spare

W. Battery Charger

1. A battery charger shall be provided which shall accept 120 VAC single phase input to provide 24 VDC output. It shall be fused on the AC input and DC output; and incorporate current limiting circuitry to avoid the need for a crank disconnect relay. An AC voltage power switch shall be mounted on the face of the charger and shielded from accidental switching. The charger shall include an AC ammeter and voltmeter, a failure malfunction alarm switch, and be housed in a NEMA 1 enclosure suitable for wall mounting. It shall include alarm relays for remote annunciation of battery charger failure, low DC volts, and high DC volts, per NFPA 110

2.4 MAINLINE GENERATOR PROTECTION – OUTDOOR ENCLOSURE

A. Construction: The enclosure shall be vandal-resistant, rust-resistant and weather-protective housing and shall be of a 0.125” thick 3003 Aluminum formed construction. The enclosure is rated to a wind load of 125 MPH and 50lbs./sq ft roof load. Rain test equal to 4 inches/hour. The basic structure meets all seismic requirements of Zone 4 or equivalent. The design and construction shall be modular in that the panels shall not exceed 24” in width. All exterior components of the enclosure shall be assembled utilizing stainless steel bolts, nuts and lock washers. All seams shall be sealed to prevent leaks. The enclosure must be built to IBC standards and must be provided with proper certifications proving so. Enclosure must be designed to be ship disassembled with any one piece weighing no more than 40 tons and having a maximum dimension of 13’W x 74”L including any shipping skids, trailers etc. Include break down of the enclosure after testing.

B. Doors: Doors shall not exceed 36” in width. All doors on the enclosure shall be strategically located in areas as to allow ease of maintenance on the generator set and allow good access to and visibility of instruments, controls, engine gauges, etc. The doors shall be fitted with stainless steel bolt on, lift off hinges with pins of a diameter not less than .375”. Each door shall be fitted with flush-mounted, key lockable latches keyed alike. The latch hardware shall allow escape from within when locked externally. Door holdback hardware shall be provided to secure the door to the enclosure wall during installation and maintenance. All doors shall be Gasketed to prevent leaks. Provide five (5) sets of keys for each door lock.

C. Roof: The roof of the enclosure shall meet or exceed the minimum thickness requirements specified, but in addition, shall be strengthened by utilizing 3/16” thick aluminum trusses. The roof must be covered with a rubber membrane to prevent any water intrusion.

D. SCR Platform: A platform shall be provided around the SCR reactor housing providing working clearance for the reactor. Platform shall provide access to exhaust stack test ports in compliance with San Diego Air Pollution Control District requirements.

E. Ships ladder to be provided, allowing for easy access to SCR platform above the enclosure. Ships ladder to be mounted securely to outside edge of tank or enclosure and able to support a minimum of 350lbs.

F. Cooling: Under no circumstances shall the floor area or any of its parts be considered for cooling air intake or discharge requirements of the generator set or its associated equipment.

G. Working Clearance: The base and enclosure assembly shall allow room within the package to mount and maintain the specified battery charger, engine starting batteries, racks and cables, engine-generator control panel, and other items as specified or as shown on the drawings. Code required working clearances about the genset shall be provided.

H. Sound Attenuation: The entire enclosure except for the louvered openings shall have acoustic material installed on the interior roof and wall panels of a weight and thickness consistent with the specified level of noise reduction. The acoustic material shall be held in place by aluminum perorated metal sheeting to form a removable section easily inspected by maintenance personnel. The enclosure package shall be designed to achieve a 75 dB(A) sound level when measured at a distance of 5 feet from any point around the perimeter of the enclosure at 5 feet above grade based on free-field environment Paint: The enclosure shall be spray finish utilizing (2) coats of rust-inhibiting primer and finished with a minimum of two (2) coats of polyurethane. Final color of finish coat will be selected at shop drawing review.

I. Enclosure Power: The enclosure shall be equipped with a minimum 100-amp 480:120/208, 3 phase mini-power zone including a 45 kVA transformer to power the generator jacket water heaters, battery charger, lighting, receptacles, etc., as specified and as shown on the drawings. The placement of this equipment shall be shown on the submittal drawings. All internal conduit and wiring to the ancillary equipment shall be supplied within the package and shall be pre-wired by the enclosure manufacturer in accordance with all governing codes pursuant to this application. The Load Center is to be supplied complete with bolt-in circuit breakers, as required, to complete system. Enclosure electrical package shall include but not limited to the following:

1. (6) Vapor-proof LED lights
2. (2) Vapor-proof interior emergency LED 2-head lights with battery backup.
3. (2) 3-Way light switches
4. (3) GFCI receptacles
5. Ventilation fan(s) with thermostat
6. (4) Exterior LED lights with photocell and override local (2) switches
7. (6) Ceiling mounted heat detectors, (2) manual wall mounted pull stations, (2) wall mounted horn/strobe units
8. (3) Roof mounted vapor proof flashing beacons
9. (2) Emergency stop buttons, externally mounted with nameplates
10. (4) 5 lb CO2 fire extinguishers

J. Internal Wiring: All wiring (type THHN-2, 90°C.) within the enclosure shall be in conduits made from galvanized rigid metal material specifically manufactured for electrical use. All connections at the generator set shall be liquid tight flexible conduits, and all shall be provided and installed by the enclosure manufacturer.

K. Airflow

1. Intake/exhaust fans

a. Quantity as required for combustion, ventilating, and radiator cooling air

b. Mounted to the enclosure air intake and air exhaust

c. Variable frequency drive controlled

L. Enclosure Air Intake: Sound attenuated fixed louvers shall be utilized on the exterior of the enclosure. Air will then go through sound attenuated baffling then through motorized 120 VAC fail-safe dampers into the main enclosure compartment. All louvers shall be designed to help prevent the entrance of driving rain water, but shall have sufficient free area to allow for engine-generator cooling air requirements. Bird screen shall cover entire air intake opening

M. Enclosure Air Exhaust: Engine radiator shall exhaust through gravity dampers into an integral acoustical exhaust plenum. The exhaust plenum shall be incorporated into the design of the enclosure to maintain a square building type appearance. Bird screen shall cover entire air exhaust opening. Exhaust air shall exit thru the top of the container.

N. Insulation material is to be mineral wool held in place with an aluminum perforated metal liner

O. Enclosure Flooring: The floor of the enclosure shall be designed and constructed in such a manner as to prevent the entrance of rodents. This shall be accomplished with diamond plate. The floor must also be provided with fluid containment greater than the capacity of the cooling system. The enclosure floor must be capable of fully supporting any ancillary equipment specified which may be secured to it. The flooring must also accommodate the anticipated weight of maintenance personnel and their tools.

P. Weight: The weight of the entire unit consisting of generator set, enclosure and other specified items including all liquids (i.e., fuel oil and cooling solutions) shall be calculated by the enclosure manufacturer. The base of the unit shall be designed and manufactured as a heavy duty, structural steel construction with lifting provisions to support the calculated weight.

Q. Exhaust Silencer: Silencer must be provided to maintain the enclosure sound level. Exhaust system to include; one Stainless Steel wye-pipe flexible exhaust inlet, Insulated Silencer, mating flanges, gaskets, etc. as required. Silencer exit piping, thimbles, rain cap, etc. resulting in one complete exhaust system must be included and supplied by enclosure manufacturer. Exhaust system to be supported completely and only from roof or sides of enclosure, at no point shall the silencer weight be supported by the engine thus preventing potential damage to engine outlet turbo(s) or exhaust manifold, due to

excessive weight of components. All interior exhaust components to be covered in 2" thick calcium silicate blankets.

R. Rain Skirt: At the point where the exhaust pipe penetrates the roof of the enclosure, a suitable "rain skirt: and collar shall be provided by enclosure manufacturer. It shall be designed to prevent the entrance of rain yet allow for expansion and vibration of the exhaust piping without chafing or stress to the exhaust system.

S. Wiring and Connectors: All conduits, wire, cables, interconnections, etc., entering or exiting the generator enclosure shall be furnished and installed by the installing contractor. All wiring shall be in conduits sized in accordance with the NEC with San Diego Amendments. All power and control wiring shall be installed for a complete and operating system. All floor openings to accommodate underground conduits shall be as required based on contract drawings showing number and size of all power and communication conditions. Enclosure vendor shall make all required openings in the enclosure floor to accommodate all required power and communication conduits shown on drawings.

T. Color: Enclosure vendor shall provide a minimum of 10 colors for the owner / architect to select.

U. Provide two (2) welded ground connection lugs on each side of the enclosure at the engine base.

2.5 RADIATOR MOUNTED LOADBANK

A. The system shall be a UL listed, radiator style resistive load bank using the air discharge from the generator radiator for cooling.

B. Ratings

1. The total capacity of the load bank shall be rated (125) KW at (208) Volts, 3-Phase, 3-Wire, 60 Hertz, at unity Power Factor.

2. The load step resolution shall be a nominal 20% of the load bank rating.

3. The load bank shall be designed for continuous duty cycle operation with no limitations.

4. Radiator/Duct mounted load banks are designed as a supplemental load to the generator set, and shall be sized at 50-60% of generator nameplate KW rating (not 100%).

C. Material and Construction

1. The load bank shall be suitable for installation on the generator radiator core, or within the radiator exhaust ductwork.

2. Due to the high radiator exhaust from the generator, the load bank shall be constructed of heavy gauge aluminized steel per ASTM A463. Aluminized steel provides superior corrosion protection and extended service life, with a better

tolerance to high heat exposure compared to the more common Galvanized steel.

3. The main input load bus, load step relays, fuses and control relays shall be located within the load bank enclosure.

4. The load bank shall be sized to mount to the radiator core with a self-contained 2” flange on the top and bottom edges for mounting. Load banks with a depth of 13” shall have provisions for overhead lifting and duct adaptors.

5. The load bank shall be designed for installation and operation indoors. All exterior fasteners shall be stainless steel.

D. Resistive Load Elements

1. Load elements shall be Avtron Helidyne™, helically wound chromium alloy rated to operate at approximately ½ of maximum continuous rating of wire. Elements must be fully supported across the entire length within the air stream by segmented ceramic insulators on stainless steel rods. Element supports shall be designed to prevent a short circuit to adjacent elements or to ground.

2. The change in resistance due to temperature shall be minimized by maintaining conservative watt densities.

3. The overall tolerance of the load bank shall be –0% to +5% KW at rated voltage. A –5%, +5% rating allows the load bank to deliver less than rated KW and shall not be used. The load bank must deliver full rated KW at rated voltage.

4. Sealed wire type elements (which have the internal resistance wire totally enclosed) prevent internal cooling of the element wire and shall not be used.

E. Protective Devices

1. An over-temperature switch shall be provided to sense the load bank exhaust. The switch shall be electrically interlocked with the load application controls to prevent load from being applied in the event of an over temperature condition.

2. To provide for major fault protection, branch fuses shall be provided on all three phases of switched load steps above 50KW. Branch fuses shall be current limiting type with an interrupting rating of 200K A.I.C.

3. The exterior of the load bank shall have appropriate warning/caution statements on access panels.

F. Control Panel

1. The control panel shall be a local panel mounted on the load bank. The control panel shall contain the following manual controls:

a. Power ON/OFF switch

b. Master load ON/OFF switch.

c. Load step switches for ON/OFF application of individual load steps.

2. Control panel visual indicators shall be as follows:

a. Power ON indication light.

b. Over-temperature light.

3. A standard remote load dump circuit shall be provided as part of the load bank control circuit. Provisions shall be provided to remove the load bank off-line from the operation of a remote normally closed set of auxiliary contacts from a transfer switch or other device. In the event of the remote contact opening, all load is removed.

4. Remote 19” control panel housed in a NEMA 4 type wall mount enclosure shall be provided.

5. An Automatic Load Step Controller shall be provided for maintaining a minimum load on the generator set. The controller shall monitor the connected downstream loads and will automatically add or subtract load steps in response to building load changes as to maintain a minimum load level on the generator set. The controller includes an initial time-delay circuit, and automatic time delayed load step application circuit. A remote contact closure is required for activation and transfer of control. A separate current transformer shall be supplied loose for mounting and sensing of downstream loads.

6. (OPTIONAL) An integral control power transformer shall be provided to supply 120V, 1 phase, 60 Hz to the load banks control and safety circuitry. Transformer primary and secondary control circuits shall be fuse protected.

PART 3 - EXECUTION

3.1 PREDELIVERY TESTING

A. Each engine, generator, and generator set shall be subjected to production performance tests and quality controls to insure reliable operation. These tests and controls shall include but not be limited to:

1. Specific observances of engine blowby, slobber, combustion gas leaks, inlet air leaks, excessive vibration, and unusual noise.

2. Fuel system setting confirmation, which shall not be altered to rectify nonconformance to, established performance specifications.

3. Retest after any change affecting airflow through the engine, fuel injected into the engine, engine combustion, or any reassembly which potentially affects mechanical integrity.

B. Periodic extended tests to confirm baseline data.

C. Recording of:

1. Engine RPM
2. Frequency
3. Average voltage
4. Line to line voltages, all three phases
5. Average current
6. Line currents for all three phases
7. Observed power

D. Readings to be taken at 0.8 Power Factor

E. The generator set supplier shall provide test reports to the owner upon successful completion of the test.

F. Optional Witness Test

1. Load bank testing shall be done in the presence of the owner's engineer or his appointed representative. All travel and lodging expenses for attendees shall be included in this contract for the factory test. Testing shall be for a minimum of four (4) hours under full load.

G. All safety shutdown and pre alarm functions shall be tested to demonstrate their functionality.

H. Test transient response of genset by loading gensets in 20% load increments up to 100%

I. All transient load steps must be recorded on a chart recorder or light beam oscilloscope to verify generator set operation meets criteria.

J. Load testing shall be performed as follows:

1. In a period of four (4) hours with a loading of 100 percent of rated load at unity power factor. The following readings shall be taken at 15 minute intervals:

a. Voltage
b. Amperage (3 phase)
c. Frequency
d. Oil pressure
e. Water temperature
f. Ambient temperature

g. Kilowatts

K. The generator set supplier shall provide test reports to the owner upon successful completion of the test.

L. The bidder shall furnish all consumables necessary for testing. Any defects, which become evident during the test shall be corrected by the bidder at his own expense prior to shipment to the jobsite.

3.2 INSPECTION

A. Examine areas, equipment bases, and conditions, with installing Contractor present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. The installation shall be performed in accordance with shop drawings, specifications, and the manufacturer's instructions, and with recognized industry practices, to ensure proper performance in accordance with the specifications. Comply with applicable NEMA standards pertaining to installation of engine-generator sets and accessories and with NFPA 110.

B. Provide enclosure manufacturer’s site personnel to supervise reassembly of the enclosure as well as provide engine manufacturer's certified technicians to perform reassembly of the generator set on site to maintain integrity of the product and warranty.

C. Coordinate with the work of other trades including piping, breeching, post exhaust treatment and accessories as necessary to provide a complete operational system.

D. Include the installation of control and monitoring and power panels, battery charger, integral tank, batteries and racks and other appurtenances to the extent that such appurtenances are not factory installed and wired.

E. Include field inter wiring and power supply and control connections for load bank, batteries, battery chargers, pumps, heaters, float switches, solenoid valves, damper operators and other miscellaneous items as required in accordance with manufacturers wiring diagrams. Such wiring shall include (but not be limited to):

1. Wiring between battery and engine control panel and battery charger and power supplies thereto.

2. Power supply wiring and control wiring for engine jacket water heater.

3. Power supply wiring and control wiring for fuel pumps, integral fuel tank, float switches, valves and other fuel supply system components.

4. Power supply and control wiring for automatic louver damper operators.

5. Emergency stop break glass switch match type and number of cables and conductors to control and communications requirements of transfer switches as recommended by manufacturer.

F. Ground equipment.

3.4 FIELD QUALITY CONTROL

A. The complete installation shall be checked for procedural and operational compliance by a representative of the system manufacturer's authorized local dealer. The engine lubricating oil and antifreeze, as recommended by the system manufacturer, shall be provided by the generator set dealer. If different manufacturers furnish switchgear and generator sets, technical representatives of both manufacturers' authorized dealers shall verify the installation meets requirements. Any deficiencies shall be noted and corrected by the Contractor.

B. The system manufacturer's dealer representative shall be present to assist the Contractor during start-up, systems check, adjusting, and any site testing required after the installation is complete.

3.5 POST-INSTALLATION TESTING

A. Following installation, the following tests shall be performed by the system manufacturer's local dealer representative(s) in the presence of the owner's engineer or designated appointee:

B. Prestart Checks:

1. oil level

2. water level

3. day tank fuel level

4. battery connection and charge condition

5. air start supply pressure (if so equipped)

6. engine to control interconnects

7. engine generator intake/exhaust obstructions

8. engine room ventilation obstructions

9. removal of all packing materials

C. Operation

1. Load - Four hours operation at 100% of full load rating. After the first fifteen minute stabilization period at full load, the following shall be recorded at fifteen-minute intervals:

    a. Voltage and amperage (3 phase), frequency

    b. Fuel pressure, oil pressure and water temperature

    c. Exhaust gas temperature at engine exhaust outlet

    d. Ambient temperature

2. If equipped with appropriate instrumentation:

    a. Kilowatts

    b. Power Factor

    c. KVARS

    d. Generator Temperature

3. Proper operation of controls, engine shutdown, and safety devices shall be demonstrated.

D. The manufacturer's representative shall provide resistive load banks and field engineer for the test. Building load shall not be used.

E. Upon satisfactory completion of the load bank test, a pull the plug building test shall be performed utilizing building load and all equipment associated with the emergency generator set system.

F. Should these tests indicate that the equipment does not meet the specified performance requirements, National Electric Code and Local codes, the cost of all corrective measures shall be borne by the manufacturer's representative.

3.6 TRAINING

A. The system manufacturer's authorized dealer shall provide a complete training for the owner's engineering and maintenance personnel. Training shall include both classroom and hands-on instruction. Topics covered shall include control operation, schematics, wiring diagrams, meters, indicators, warning lights, shutdown system and routine maintenance.

B. Provide 2 days of on-site training (one day- 8 hours during regular working hours and one day- 8 hours during off hours) to instruct the owner's personnel in the proper operation and maintenance of the equipment. All training shall be recorded by professional videographer and shall provide electronic copies of the training to owner. Review operation and maintenance manuals, parts manuals, and emergency service procedures.

3.7 SERVICE MANUALS AND PARTS BOOKS

A. The system manufacturer's authorized local dealer shall furnish one copy each of the manuals and books listed below for each unit under this contract:

1. Operating Instructions - with description and illustration of all switchgear controls and indicators and engine and generator controls.

2. Parts Books - which illustrate and list all assemblies, subassemblies and components, except standard fastening hardware (nuts, bolts, washers, etc.).

3. Preventative Maintenance Instructions - on the complete system that cover daily, weekly, monthly, biannual, and annual maintenance requirements and include a complete lubrication chart.

4. Routine Test Procedures - for all electronic and electrical circuits and for the main AC generator.

5. Troubleshooting Chart - covering the complete generator set showing description of trouble, probable cause, and suggested remedy.

6. Recommended Spare Parts List - showing all consumables anticipated to be required during routine maintenance and test.

7. Wiring Diagrams and Schematics - showing function of all electrical components.

B. All manuals and books described above shall be contained in rigid plastic pouches.

3.8 TESTING

A. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with all specified features in the presence of the Engineer using acceptance procedures provided by the manufacturer.

3.9 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing or installation debris from job site.

D. Notify Engineer for acceptance inspection.

PART 4 – ATTACHMENTS

4.1 Data Sheets for Generator System

ATTACHMENT NO. 1 - ENGINE/GENERATOR PERFORMANCE DATA SHEET

E N G I N E

Engine Continuous Capacity kW	1,000
Electrical efficiency	*
Manufacturer / Model No.	*
Type	Reciprocating Gas Engine
Lubrication	Oil
Exhaust (flue) gas temperature at 100% load ° F	*
Exhaust (flue) gas temperature at 75% load ° F	
Exhaust (flue) gas temperature at 50% load ° F	
Exhaust (flue) gas temperature at 30% load ° F	
Exhaust gas flow (dry) lb/hr / SCFM	*
Engine Starter type:	Electric Battery *
Engine Jacket Cooling Btu/hr- In-Out temp.° F	*
Engine Lube Oil Cooling Btu / hr- In-Out temp.° F	*
Percentage Propylene Glycol Mixture fluid %	*

G E N E R A T O R

Generator Continuous Capacity/Nominal Power	1000 kW /1000kW
Manufacturer / Model No.	* / *
Type	Permanent Magnet
Lubrication	*
Power factor:	0.8 PF
Voltage:	480V
Amps:	* amps
Frequency:	60 hz
Poles	*
Phase	3 phase
RPM:	*
Connection:	*
Pitch:	*
Insulation class	“H”
Excitation Requirements	
Efficiency At Full Load	*
Reactances (% at KVA rating)	*
Direct axis synchronous reactance;	*
Direct axis transient reactance:	*
Direct axis sub-transient reactance:	*
Short circuit current values:	*
Three phase:	*
Line to Line:	*
Line to Neutral:	*
Electrical data	*
Auxiliary power requirements	*
Space heaters (Watts & Volts):	*
Cooling fan(Watts & Volts):	*

Total Weights:		*
Shipping / Erection	Lbs	*
Operating / Flooded	Lbs	*
Overall Dimensions		*

Note: Supplier to Confirm all listed information and to furnish information marked with *

ATTACHMENT NO. 2 – EMISSIONS AND FUEL

EMISSION REQUIREMENTS ON DISCHARGE OF THE GENERATOR

ALL CONCENTRATIONS BELOW CORRECTED TO 3% OXYGEN ON A DRY BASIS	TECHNICAL DATA	
	gr/BHP-Hr	PPM
NOx:	1.0	82
CO:	2.0	270
VOC:	0.7	60
Minimum efficiency at 100% capacity at 15 percent excess air		

FUEL – NATURAL GAS

Fuel Pressure Required at the Engine: Psig	0.5-5
Natural Gas Firing Rate at Engine: SCFM	*
Fuel Oil Firing Rate: GPH (MAX/MIN)	Not Applicable
Natural Gas heat value (HHV) Min/Max Btu/scf	990/1150
Turn Down	30%
Jacket water heat rejection Btu/Hr	*
Oil cooler heat rejection Btu/Hr	*
Heat rejection to atmosphere Btu/Hr	*
Location: ( ) Indoors (x) Outdoors	

ATTACHMENT NO. 3 – ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT

DESCRIPTION	INFORMATION	DESCRIPTION	INFORMATION
Power	480V, 3 ph., 3 wire, 60 Hz	**Lighting:**	By Supplier as defined in Specification.
Area Classification Per NEC & FM Supplier shall confirm Rating of equipment	Class: General Purpose Division: Group: Temp Rating	**Heat Tracing**	NA
Motors	480V, 3 ph, 60 Hz, TEFC, severe duty, energy efficient, type per motor data sheet	**Electr. Equipment Nameplates**	White lamicoid with black lettering. Screwed in place
Grounding	Skid - Ground Lugs on frame by Supplier Motors – Separate ground conductor with power supply	**Control System**	By Supplier as defined in Specification.

Control Power	Derived by Supplier from engine batteries	**Convenience Receptacles:**	By Supplier as defined in Specification.
Raceway and Fittings	Rigid galvanized steel unless otherwise required	**Wiring**	Flame retardant, UL VW-1
Motor Controllers	By Supplier	**Control Terminations**	Spade
Branch Feeders	By Supplier	**Wire numbers**	Yes
Equipment Enclosures and Control Stations	NEMA 12, unless otherwise required	**Certifications:**	UL listed components
		Documentation:	Power requirements/ load summary, single line diagram, schematics, panel layouts, interconnect wiring diagrams, bills of materials, raceway

END OF SECTION

MTS – Imperial Avenue Division Zero Emission Bus Overhead Charging – Phase I

SECTION 26 37 13

MICROGRID ENERGY MANAGEMENT SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, configuration and installation for low voltage Microgrid Energy Management System (also identified as MEMS, Microgrid EMS, Energy Control Center, ECC, Microgrid PCS, Microgrid Power Control System, Distributed Energy Resources Power Control System or DER PCS) as required for the complete performance of the Work, as shown on the Drawings and as specified herein.

2. The low voltage Microgrid Energy Management System shall be provided by a qualified MEMS system supplier. The Contractor shall ultimately be responsible for the MEMS and shall supplement the system supplier's Work as necessary to provide a complete and operable system. The Contractor shall coordinate the equipment and systems provided by others that interface with the MEMS to ensure necessary interconnections and compatibility are provided for the required functionality of the MEMS:

3. MEMS system shall control the following equipment and as indicated in the drawings. System requirements outlined in this specification may need to be revised based on the final work package selected by the Owner as described below. The resources that need to control are as follows:

   a. The breakers for the ten (10) DC electric vehicle supply equipment (EVSE) at Substation B and four (4) future electric vehicle supply equipment (EVSE). A separate charger management system (CMS) would be required to control and receive data from the individual EVSEs.

   b. A permanent stationary generator connected to Substation A. MEMS shall include all equipment & installation labor necessary to monitor & control stationary generator. Contractor shall coordinate with generator supplier as necessary.

   c. Two (2) 1 MWh/500 kW battery energy storage system (BESS) and its respective breakers connected to the Substation B low voltage switchboard. MEMS shall include all equipment & installation labor necessary to monitor & control the battery energy storage system. Contractor shall coordinate with battery energy storage system as necessary.

   d. The breakers to the three solar photovoltaic systems and their respective inverters connected to Substation B. MEMS shall include all equipment & installation labor necessary to monitor & control the solar PV system.

   e. The utility feed breaker in the medium voltage switchgear.

B. Related Sections: Related sections include but shall not be limited to the following

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1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2. Applicable general requirements for electrical Work specified within Division 26 Specification Sections apply to this Section.

3. Refer to the following Specifications for additional requirements

    a. Section 26 24 13.11 Switchboards

    b. Section 26 11 16 Secondary Unit Substation

    c. Section 26 24 16.33 Panelboards

    d. Section 26 12 16 Substation Transformers – Dry Type

    e. Section 26 13 13 Metal Enclosed MV Switchgear

    f. Section 26 31 01 Battery Electrical Supply System (ALT-1)

    g. Section 26 31 00 Photovoltaic System (ALT-2)

    h. Section 26 32 13 Gas Engine Driven Generator Sets (ALT-3)

1.2 REFERENCES

A. General Publications: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified:

1. Institute of Electrical and Electronics Engineers (IEEE)

    a. IEEE 1547, “IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces

    b. IEEE 2030.7, “Standard for the Specification of Microgrid Controllers”

    c. IEEE 2030.8, “Standard for the Testing of Microgrid Controllers”

2. International Organization for Standardization (ISO):

    a. ISO 9001, “Quality Management Systems – Requirements”

3. National Fire Protection Agency (NFPA):

    a. NFPA 70, “National Electrical Code”

    b. NFPA 70B, “Electrical Equipment Maintenance

    c. NFPA 70E, “Standard for Electrical Safety in the Workplace

4. Underwriters Laboratories, Inc. (UL):
    a. UL67, “Standard for panelboards”
    b. UL 98, "Standard for Enclosed and Dead Front Switches
    c. UL 489, "Standard for Molded Case Circuit Breakers and Circuit Breaker Enclosures."
    d. UL 891, "Standard for Dead Front Switchboards
    e. UL 943, "Standard for Ground Fault Circuit Interrupters
    f. UL 1283, “Standard for Safety for Electro Magnetic Interference Filters
    g. UL 1449, "Standard for Surge Protective Devices
    h. UL 1741, “Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources
    i. UL 1741 SA (Supplement A), “Advanced Inverter Testing
5. International Electrotechnical Commission (IEC):
    a. IEC 61850, “Power Utility Automation”

1.3 DEFINITIONS

A. Unless specifically defined within the Contract Documents, the words or acronyms contained within this specification shall be as defined within, or by the references listed within this specification, the Contract Documents, or, if not listed by either, by common industry practice.

1. BESS: Battery Energy Storage System
2. DER: Distributed Energy Resource (e.g. generators, PV arrays, BESS, etc.)
3. ECC: Energy Control Center
4. HMI: Human Machine Interface
5. MEMS: Microgrid Energy Management System
6. PV: Photovoltaic (e.g. solar electric)

1.4 SUBMITTALS

A. General: Submittals shall be in accordance with the requirements specified herein.

1. Submit sufficient information to determine compliance with the Contract Documents. Identify submittal data with the specific equipment tags and/or service descriptions to

which they pertain. Submittal data shall be clearly marked to identify the specific model numbers, options, and features of equipment and work proposed.

2. Deviations from the Contract Documents shall be indicated within the submittal. Each deviation shall reference the corresponding drawing or specification number, show the Contract Document requirement text and/or illustration, and shall be accompanied by a detailed written justification for the deviation.

3. Submit required product data and shop drawings specific to each product and accessory proposed. [In addition, include the following information

   a. System Architecture Diagram

   b. MEMS Sequence of Operations

   c. Unwitnessed Factory Acceptance Test report submitted prior to shipment.

B. Operation & Maintenance (O&M) manuals shall be provided in accordance with the minimum requirements specified in Section 01 78 23 Operation and Maintenance Data, Section 26 00 10 Electrical Requirements and additional requirements specified herein

1. Submit required Operations & Maintenance data specific to each product and accessory proposed.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of specified products of types and sizes required.

1. The manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system that is regularly reviewed and audited by a third-party registrar. Manufacturing, inspection, and testing procedures shall be developed and controlled under the guidelines of the quality assurance system.

2. The manufacturer or their representative shall have service, repair, and technical support services available 24 hours 7 days a week basis.

B. Installer Qualifications: Installer shall be a firm that shall have a minimum of 5 years of successful installation experience with projects utilizing equipment similar in type and scope to that required for this Project and shall be approved by the manufacturer's representative.

C. All work performed and all materials used shall be in accordance with the National Electrical Code, and with applicable local regulations and ordinances. Process controllers, assemblies, materials, and equipment shall be listed and labeled by Underwriter's Laboratories or by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

1.6 DELIVERY, STORAGE AND HANDLING

A. Prior to delivery to the Project site, ensure that suitable storage space is available to store materials in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres. Materials shall be protected during

delivery and storage and shall not exceed the manufacturer stated storage requirements. As a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. In addition, protect electronics from all forms of electrical and magnetic energy that could reasonably cause damage.

B. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified within the Contract Documents.

C. Inspect and report any concealed damage or violation of delivery storage, and handling requirements to the Engineer.

1.7 WARRANTY

A. General: Refer to Section 01 77 00 - Closeout Procedures

B. The manufacturer shall warrant products against defects in material and workmanship for 24 months from the date of commissioning or 36 months from the date of shipment, whichever comes first, provided that the manufacturer performs functional testing, commissioning and first parameter adjusting of equipment. During the warranty period the manufacturer shall repair or replace defective products. This warranty shall be in addition to any provided by the Contractor. The warranty shall exclude normal wear and tear under normal usage and any damage caused by abuse, modification, or improper maintenance by entities other than the manufacturer or its approved representative.

C. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1.8 SPECIAL TOOLS AND SPARE PARTS

A. The Contractor shall provide a recommended spare parts list with the following information provided as a minimum:

1. Contact information for the closest parts stocking location to the Owner.

2. Critical spare parts shall be identified as those parts being associated with long lead times and/or those being critical to the unit's operation.

3. Maintenance spares shall be identified as being those parts required to regularly perform scheduled maintenance on the furnished equipment. These spares shall include, but shall not be limited to, consumable spares that are required to be exchanged during scheduled maintenance periods.

B. Spare parts shall be provided for each type and size of unit installed. At a minimum, the following shall be provided:

1. Provide the minimum spare parts recommended by the manufacturer.

2. Provide [1] set of each type of power and control fuse installed within equipment

C. Any manufacturer specific special tool, not normally found in an electrician's toolbox, required to remove and install recommended or furnished spare parts shall be furnished. At a minimum the following shall be provided:

1. If available from manufacturer, provide PC-based configuration software tool and a minimum of one communication interface cable for each type of cable required to connect a PC-based computer to the devices specified herein for configuration and programming.

2. Electronic configuration files, in a media format acceptable by the Owner (e.g. CD, USB stick, etc.), updated to an as-installed and commissioned state.

3. Provide a minimum of one compatible communication interface and programming device and required connection cable for each device specified herein for configuration and programming.

D. Spare parts shall be properly marked and packaged for long term storage. Printed circuit boards shall be provided in separate anti-static containers.

PART 2 PRODUCTS

2.1 PRODUCT MANUFACTURERS

A. Example Product Manufacturers: Products and manufacturers specified are to establish a standard of quality for design, function, materials, and appearance. Products shall be modified as necessary by the manufacturer for compliance with requirements. The listed manufacturers are provided for example only and are not intended to represent all qualified manufactures. Contractor may select an alternate manufacturer provided the product(s) comply with all design requirements.

- Eaton (basis for design)
- ABB
- Schneider Electric

2.2 GENERAL REQUIRMENTS

A. LV Microgrid Energy Management System (MEMS) shall consist of one or more of integrated power distribution equipment (e.g. unit substations, power panels, switchgear, switchboards) items with the required HMI interface(s), microgrid controller(s), communications interfaces, relays, communications converters, communications switches, electrically operated circuit breakers, etc. to perform the required functionality, such as the control and operation of DERs per the sequence of operations, as specified in Section 1.17.

B. The integrated power distribution equipment bus shall be rated as shown on the Drawings and as described in related specification sections.

C. MEMS integrated power distribution equipment shall be constructed in accordance with UL891.

D. The enclosure rating of the MEMS integrated power distribution equipment shall be NEMA 3R. The equipment shall have separate sections for power and controls with a minimum of one for power distribution (e.g. breakers) and one for control hardware, HMI, and auxiliaries (e.g. 24 Vdc power supplies).

E. All main circuit breakers utilized within the MEMS for control shall be electrically operated and capable of being opened and closed by commands over the MEMS Ethernet network. Branch circuit breakers used to supply battery electric bus charging circuits shall at a minimum be capable of being shunt-tripped by the MEMS with manual reset. The circuit breakers should also allow for manual operation.

2.3 All medium-voltage circuit breakers and low voltage main circuit breakers as shown on the Drawings or required for MEMS specified functionality shall have electronic trip units capable of reporting real power (P), reactive power (Q), voltage, frequency, and current over the MEMS Ethernet network. Service Entrance Requirements

A. When the MEMS is serving as the utility service entrance, the system shall include the following:

1. The MEMS shall provide utility pull section(s) within the integrated power distribution equipment. Refer to section 26 13 13 Medium Voltage Switchgear for details.

2. The MEMS shall provide utility metering and current transformers (CT's) within the integrated power distribution equipment. Equipment drawings & specifications shall be approved by San Diego Gas & Electric, and installation shall be coordinated with San Diego Gas & Electric.

3. The MEMS shall include protective relaying to comply with local utility requirements for the parallel operation of distributed energy resources with the electric utility distribution system.

2.4 SYSTEM REQUIREMENTS

A. Communications: The MEMS shall provide Ethernet connections and accept a mixture of standard SCADA Protocols, such as DNP3, Modbus, or IEC 61850 interface for communications to the DERs, circuit breakers, meters, etc. as needed for monitoring and control. The Ethernet network shall be a secure private network capable of being integrated into the existing Building Management System or Charge Management System by the Owner at a later date. Connections between unit substations shall be via multimode fiber for DERs in Substation A and copper for the DERs in Substation B. The type of connectors will be determined by the final equipment selected and design.

B. Monitoring: The MEMS shall include an HMI display, indicator lights and an AUTO-MANUAL selector switch for operator interface of the system. These interfaces shall provide the following:

1. Status indicators

2. One-line diagram showing circuit breaker arrangement, service and status

3. Power, reactive power, voltage, frequency, and current measured by each breaker or meter

4. Status of each load breaker

5. Key information available from DERs, such as power output and status

6. Pertinent alarms, such as breakers tripped for overcurrent or loss of utility feed power

7. Pertinent events, such as breakers opened or closed by commands from the touchscreen or manually, to be stored as a Sequence of Events (SOE)

8. Trends of key measurements, such as power measured by a breaker vs time, minimum of 1 month trend window required.

9. Secured data export capabilities of all stored data

C. Utility Requirements: The MEMS shall be able to comply with a utility requirement to have zero export power and minimum import power. To achieve this compliance, the system shall send commands to decrease the power output from DERs, curtailing output of the PV inverters, and/or send commands to the power flowing into energy storage devices to follow the real-time loads of the individual battery electric vehicle chargers.

D. Resiliency: In the event of a sustained utility grid power outage, the MEMS shall follow the Sequence of Events as detailed in Section 1.17. At any point in time, the MEMs should have the capability to be manually overridden at specific sections of the system.

1. Substation A and B should have clear signage and separate physical buttons for operators to stop the MEMs from controlling specific separate sections of the grid. For example, if manual override is initiated at Substation B, Substation A should not be affected and continue to be controlled by the MEMs and vice versa.

2. After the button is pushed, the operators should have the ability to manually configure the onsite system. When coming back online, the MEMs shall wait for 1 min before resuming normal operations.

2.5 Economic Optimization of Distributed Energy Resources

A. The MEMS shall include the capability to utilize a service integrated for dispatch of DERs for economic optimization according to local utility requirements (e.g. to maximize Return on Investment). The System shall be capable of running multiple use cases simultaneously. The following services shall include:

1. Remote Monitoring, Forecasting, and Data Storage: monitoring power, energy, and other KPI’s for each DER using a web-based interface

2. Demand Charge Reduction (aka Peak Shaving): control DERs (consume/produce/store energy) to reduce peak consumption and resulting charges from utility

3. Self-Consumption: control energy storage to maximize energy consumed and charged directly from solar sources

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4. Off Grid Preparation (aka Storm Hardening): control DERs to prepare for likely power outage events (e.g. due to storms)

2.6 Remote Notification of Alarms

A. The MEMS shall offer at least one of the following options for remote notification of alarms (e.g. breaker tripped due to overcurrent):

1. Email: The MEMS shall send an email to designated recipients in the event of an alarm.

2. SMS: The MEMS shall send an SMS to designated recipients in the event of an alarm.

3. Push Notifications: The MEMS shall use a push notification on a mobile app in the event of an alarm.

2.7 Multiple Anchor Resources While Islanding

A. When a MEMS has multiple DERs capable of serving as an anchor resource (e.g. generator and BESS capable of grid-forming mode), the system shall be capable of utilizing a preferred anchor resource over secondary anchor resource(s) within specified parameters.

1. The MEMS shall recognize when use of the primary anchor resource has gone outside the specified parameters (e.g. State-of-Charge below x%), and the system shall switch to a secondary anchor resource. The system will adjust load if necessary.

2. The MEMS shall recognize when the preferred anchor resource can again be utilized (e.g. State-of-Charge above y%), and the system shall switch back to the preferred anchor resource. The system will adjust load if necessary.

2.8 Sequence of Operations

The MEMs shall have five modes: automatic, manual (utility feed), manual (stationary generator), manual (mobile generator), and manual (no microgrid energy management system). The name of the breakers is detailed as below.

POWER SOURCE

- GEN-M BKR – MOBILE GENERATOR BREAKER ON SUBSTATION B
- GEN-S BKR – STATIONARY GENERATOR BREAKER (GEN-S) ON SUBSTATION A
- PV1 BKR – PV INVERTER #1 ON SUBSTATION B
- PV2 BKR – PV INVERTER #2 ON SUBSTATION B
- PV3 BKR – PV INVERTER #3 ON SUBSTATION B
- BESS-A BKR – BATTERY ENERGY STORAGE SYSTEM (BESS) ON SUBSTATION B
- BESS-B BKR – BATTERY ENERGY STORAGE SYSTEM (BESS) ON SUBSTATION B

- UTILITY BKR – UTILITY FEED BREAKER IN MV SECTION AM2 ON SUBSTATION A
- SWGR BL1 – SUBSTATION B MAIN BREAKER AFTER THE SECONDARY TRANSFORMER
- SWGR AL1 – SUBSTATION A MAIN BREAKER AFTER THE SECONDARY TRANSFORMER

ALL BEB CHARGERS' BREAKERS

- CC-1 BKR – BEB CHARGER CC-1 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-2 BKR – BEB CHARGER CC-2 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-3 BKR – BEB CHARGER CC-3 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-4 BKR – BEB CHARGER CC-4 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-5 BKR – BEB CHARGER CC-5 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-6 BKR – BEB CHARGER CC-6 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-7 BKR – BEB CHARGER CC-7 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-8 BKR – BEB CHARGER CC-8 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-9 BKR – BEB CHARGER CC-9 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-10 BKR – BEB CHARGER CC-10 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-11 (F) BKR – BEB CHARGER CC-11 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-12 (F) BKR – BEB CHARGER CC-12 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-13 (F) BKR – BEB CHARGER CC-13 BREAKER ON NORTHSIDE OF SUBSTATION B
- CC-14 (F) BKR – BEB CHARGER CC-14 BREAKER ON NORTHSIDE OF SUBSTATION B

Scenario	GEN-M	GEN-S	PV1	PV2	PV3	BESS-A	BESS-B	UTILITY BKR	BEBS
AUTOMATIC	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED
MANUAL - UTILITY	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED
MANUAL – STATIONARY GENERATOR	OPEN	CLOSED	OPEN	OPEN	OPEN	CLOSED	CLOSED	OPEN	OPEN*
MANUAL – MOBILE GENERATOR	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN*
MANUAL – NO MEMS	**	**	**	**	**	**	**	**	**

* BEB charger breakers shall be automatically opened to limit connected load to the capacity of the generator. After automatic opening the MEMs shall allow for manual control of BEBs breakers.

**in manual – the MEM is not engaged at all. In this mode, the system shall not attempt to automatically control any circuit breakers or generation sources. All breaker operations shall be controlled by facilities staff.

Assumptions:

- Microgrid energy management system will operate as the charge management system in this draft of the sequence of operations.
- No closed transitions or sensitive loads accounted for in this draft
- If the stationary generator is out of service, avoid manual mode– stationary generator
- If the BESS are out of service, the BESS breakers should be opened and locked out and the PV inverters would need to operate in load curtailing mode
- If PV generation is out of service, the PV breakers should be opened and locked out.
- Stationary generator includes integrated load banks which will be automatically engaged by the generator controls system to meet minimum loading requirements.
- This sequence of operation focuses on resiliency usage. However, the automatic modes include some peak shaving operations. The specific programming would depend on future modeling and load profile results which are not discussed in detail in this document.

The MEMs shall have five modes: automatic, manual (utility feed), manual (stationary generator), manual (mobile generator), manual (no MEMs), normal status

A. Automatic Mode:

Scenario	GEN-M	GEN-S	PV1	PV2	PV3	BESS-A	BESS-B	UTILITY BKR	BEBS
AUTOMATIC	OPEN	OPEN*	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED

* Gen-s breaker may be closed when stationary generator is in operation but will otherwise be open to allow for synchronization process.

1. All on-site generation shall be limited to on-site usage and shall not be exported to the grid. Mems shall provide signals to PV inverters to limit power production based on active loads and state of charge of BESSES.

2. Stationary BESSES shall be charged by PV system when available or by utility power during economically viable modes. BESSES shall be discharged when economically viable (i.e. During "on-peak" utility periods, or to provide peak shaving service during high-demand periods).

3. Stationary generator may be energized and paralleled with utility feed to provide peak shaving service when economically viable. Mems shall confirm generator synchronization with grid prior to closing in the stationary generator breaker (GEN-S).

During prolonged utility outage, in automatic mode, the MEMs

1. If the MEMs detect a prolonged utility outage, all BEBs breakers shall be opened. Mems shall begin to execute an open transition to on-site generation sources.

2. If stationary generator is not energized, it shall be started and stabilized.

3. If stationary generator is energized and paralleled for peak shaving, the generator breaker (GEN-S) shall be opened, and generator shall be stabilized.

4. The utility feed breaker (utility) and PV generation (PV1, PV2, PV3) and BESSES (BESS-A & BESS-AB) breakers shall be opened.

5. Following generator stabilization, the generator breaker (GEN-S) shall be closed, energizing the bus.

6. PV generation and BESS shall be synchronized to the stationary generator. Following synchronization associated circuit breakers (PV1, PV2, PV3, BESS-A, & BESS-B) shall be closed.

7. Facilities staff shall manually close BEB charger breakers and activate charge sessions. A limited number of BEB chargers can be supported by the stationary generator, facilities operators shall monitor generator loading while conducting operations to maintain safe conditions. Mems shall automatically open BEB charger breakers if generator loading exceeds safe operations.

8. BESS shall be utilized to support BEB charger loads. Once discharged, BESS charging shall be low priority and shall only occur if excess capacity is available from stationary generator or PV generations.

B. Manual (Utility Feed only) Mode

Scenario	GEN-M	GEN-S	PV1	PV2	PV3	BESS-A	BESS-B	UTILITY	BEBS
MANUAL - UTILITY	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED

1. PV generation and stationary BESS systems shall be controlled to deactivate power usage. associated breakers shall be opened to prevent accidental energization.

2. All generator breakers shall be held in the open position.

3. Only the utility feed breaker (UTILITY) is closed.

C. Manual (Stationary Generator) Mode

Scenario	GEN-M	GEN-S	PV1	PV2	PV3	BESS-A	BESS-B	UTILITY	BEBS
MANUAL – STATIONARY GENERATOR	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN*

* Beb charger breakers shall be automatically opened to limit connected load to the capacity of the generator. After automatic opening the MEMs shall allow for manual control of BEBs breakers.

1. If stationary generator is not energized, it shall be started and stabilized.

2. If stationary generator is energized and paralleled for peak shaving, the generator breaker (GEN-S) shall be opened, and generator shall be stabilized.

3. All BEBs breakers shall be automatically opened to limit connected load to the capacity of the generator. Mems shall begin to execute an open transition to on-site generation sources.

4. Utility feed breaker (utility) shall be opened and shall remain open until system is returned to automatic mode.

5. Following generator stabilization, the generator breaker (GEN-S) shall be closed, energizing the bus.

6. PV generation and BESS shall be synchronized to the stationary generator. Following synchronization associated circuit breakers (PV1, PV2, PV3, BESS-A & BESS-B) shall be closed.

7. Facilities staff shall manually close BEB charger breakers and activate charge sessions. A limited number of BEB chargers can be supported by the stationary generator, facilities operators shall monitor generator loading while conducting operations to maintain safe conditions. Mems shall automatically open BEB charger breakers if generator loading exceeds safe operations.

8. BESS shall be utilized to support BEB charger loads. Once discharged, BESS charging shall be low priority and shall only occur if excess capacity is available from stationary generator or PV generations.

D. Manual (Mobile Generation – Substation B) Mode

Scenario	GEN-M	GEN-S	PV1	PV2	PV3	BESS-A	BESS-B	UTILITY	BEBS
MANUAL – MOBILE GENERATOR	CLOSED*	OPEN	OPEN**	OPEN**	OPEN**	OPEN	OPEN	OPEN	OPEN***

*Mobile generator breaker shall not be controlled by MEMs but shall be closed in by facilities staff following mobile generator connection and energization.

** MEMs shall automatically open PV1, PV2, PV3 breakers, however facility staff may choose to close these breakers following generator stabilization.

*** BEB charger breakers shall be automatically opened to limit connected load to the capacity of the generator. After automatic opening the MEMs shall allow for manual control of BEBs breakers.

1. The main breaker of substation B (BL1) will be opened and shall remain open until the system is returned to automatic mode.

2. All BEB charger breakers (BEBs) shall be opened.

3. PV generation breakers (PV1, PV2, PV3) shall be opened.

4. The MEMs shall take no action on the mobile generator connection breaker but will monitor the status. Manual action will be required to connect the mobile generator, energize mobile generator, and then close in the mobile generator connection breaker. Wait for mobile generators stabilization prior to engaging loads

5. Mems shall control PV generation to synchronize to the mobile generator. Manual engagement of PV generation shall be at the facilities' prerogative.

6. Facilities staff shall manually close BEB charger breakers and activate charge sessions a limited number of BEB chargers can be supported by the stationary generator, facilities operators shall monitor generator loading while conducting operations to maintain safe conditions.

E. Full Manual, No MEMS

Scenario	GEN-M	GEN-S	PV1	PV2	PV3	BESS-A	BESS-B	UTILITY	BEBS
MANUAL – MOBILE GENERATOR	CLOSED*	OPEN	OPEN**	OPEN**	OPEN**	OPEN	OPEN	OPEN	OPEN***

1. The system shall not attempt to automatically control any circuit breakers or generation sources. all breaker operations shall be controlled by facilities staff.

2. Return to Automatic mode from Manual

3. Ensure all loads are open and disconnected.

4. Open the stationary generator breaker (GEN-S) and the mobile generator quick connect breaker (GEN-M). Start the stationary generator cooldown process.

5. PV generation and BESS shall be deactivated and circuit breakers (PV1, PV2, PV3, BESS-A, and BESS-B) shall be opened during this transition.

6. Close the utility feed breaker (utility) re-energizing the system.

7. PV generation and BESS systems shall be synchronized to utility source and PV1, PV2, PV3, BESS-A, and BESS-B circuit breakers shall be closed in.

8. All BEB charger breakers (BEBs) shall be automatically closed. Charging sessions will be started manually.

PART 3 EXECUTION

3.1 GENERAL

A. In addition to the requirements specified herein, execution shall be in accordance with the requirements of specifications Section [26 00 10], Section [26 08 00] and Drawings.

B. Examine equipment exterior and interior prior to installation. Report any damage and do not install any equipment that is structurally, moisture, or mildew damaged.

C. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

D. Pre-Installation Conference: Prior to commencing the installation, an onsite pre-installation conference shall review the material selections, installation procedures, and coordination with other trades. Attendees shall include, but shall not be limited to, the Contractor, the Installer, manufacturer's representatives, and any trade that requires coordination with the work. Date and time of the pre-installation conference shall be acceptable to the Owner and the Engineer

E. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

F. Install equipment in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings.

G. Provide final protection and maintain conditions in a manner acceptable to the manufacturer that shall help ensure that the equipment is without damage at time of Substantial Completion.

3.2 FACTORY ACCEPTANCE TESTING

A. The manufacturer shall perform a witnessed factory acceptance test prior to shipment. A test report shall be generated documenting the tests performed, assumptions, corrective actions and results. The test shall include the manufactures standard test procedures but shall include the following as a minimum:

1. Inspection and proper energization of components

2. Operational

a. Transition from utility grid to islanded operation and return to utility grid operation

3.3 FIELD QUALITY CONTROL

A. Functional testing, commissioning, and first parameter adjusting shall be carried out by a factory-trained manufacturer's field service representative. This manufacturer's field service technician shall provide all material, equipment, labor and technical supervision to perform inspection, testing and adjustments to ensure equipment is installed, adjusted, and tested in

accordance with the manufacturer's recommendations and is ready for operation. The manufacturer's field service technician shall replace damaged or malfunctioning equipment and report to the Engineer any discrepancies or issues with the installation.

B. The manufacturer's representative shall, upon satisfactory completion of inspection and testing, attach a label to all serviced devices indicating the date serviced and testing company responsible.

3.4 FIELD TESTING AND COMMISSIONING

A. Functional testing, commissioning, and first parameter adjusting shall be carried out by a factory-trained manufacturer's field service representative. This manufacturer's field service technician shall provide all material, equipment, labor and technical supervision to perform inspection, testing and adjustments to ensure equipment is installed, adjusted, and tested in accordance with the manufacturer's recommendations and is ready for operation. The manufacturer's field service technician shall replace damaged or malfunctioning equipment and report to the Engineer any discrepancies or issues with the installation.

B. Operational Readiness Testing

1. The Contractor shall inspect and test furnished equipment and associated systems for conformance to the contract documents, including equipment manufacture's recommendations, and readiness for operation. The test shall include the following as a minimum:

a. Visually inspect for physical damage and proper installation

b. Perform tests in accordance with manufacturer's instructions

c. Perform tests to ensure compliance with Contract Documents

d. Perform tests that equipment is ready for operation

e. Touch-up paint all chips and scratches with manufacturer-supplied paint and transfer remaining paint to Owner

2. Contractor shall submit an operational readiness test report documenting all test results, including all assumptions, conditions, allowances and corrections made during the test. The report shall provide a listing of all modifications and adjustments made onsite to include any settings / parameters not identified as factory defaults within the equipment's O&M documentation. The test report shall include a signed statement from the Contractor, installer(s) and the factory-trained manufacturer's representative(s) certifying that the furnished equipment and associated system have been installed, configured, and tested in accordance with the manufacturer's recommendations, completely conforms to the requirements of the Contract Documents and is ready for operation.

C. Functional Demonstration Testing

1. Prior to scheduling functional demonstration testing the Contractor shall submit a signed statement from the Contractor, installer(s) and the factory-trained manufacturer's representative(s) certifying that the furnished equipment and associated system have

been installed, configured, and tested in accordance with the manufacturer's recommendations, completely conforms to the requirements of the Contract Documents and is ready for operation.

2. The Contractor shall completely demonstrate the functionality and performance of the equipment and associated systems in the presence of Owner and Engineer, observing and documenting complete compliance with the Contract Documents.

3. The Contractor shall submit a written report documenting successful completion of functional demonstrating testing including all assumptions, conditions, allowances and corrections made during the test.

3.5 TRAINING

A. O&M Training: Onsite training specific to the equipment furnished shall be provided to the Owner's staff by a factory trained manufacturer's representative. Training duration shall be sufficiently adequate to cover the operation and maintenance of the equipment and shall consist of not less than [1] repeated session(s) with [4] hours of onsite classroom and hands-on instruction for a minimum of [4] attendees per session, or as agreed upon by the Owner in writing.

1. The instructor shall provide sufficient time and detail in each session to cover the following as a minimum:

   a. Theory of operation

   b. Major components of equipment

   c. Operation of equipment

   d. Configurations of equipment

   e. Maintenance, troubleshooting and repair

   f. Replacement of component level parts

2. The submitted O&M manuals shall be used for training.

3.6 SUPPORT

A. The OEM microgrid energy management system should offer long-term support and troubleshooting during the lifetime of the management system.

END OF SECTION

SECTION 26 41 13

LIGHTNING PROTECTION SYSTEM FOR STRUCTURES

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall provide labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install complete lightning protection system for standby generator.

2. This shall be included as part of Add Alternate 1.

B. Related Sections:

1. 26 05 26 Grounding And Bonding for Electrical Systems

1.2 MEASUREMENT AND PAYMENT

A. This item is to be bid as lump sum as part of Add Alternate 1.

1.3 REFERENCES

A. NFPA 780 – Standard for the Installation of Lightning Protection Systems (Current Edition)

1.4 SUBMITTALS

A. Product Data: Manufacturer's descriptive and technical literature or catalog cuts.

B. Shop Drawings:

1. Layout of the lightning protection system, specifically for the building(s), structures or equipment included in the contract drawings.

2. Installation details of the products to be used in the installation.

C. Manufacturer's Instructions: Installation instructions shall be provided for lightning protection components that require field assembly or fabrication.

D. Qualification data for firms or persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include data on listing or certification by a Nationally Recognized Testing Laboratory (NRTL).

E. Certification, signed by standby generator contractor, that structural adhesive and installation method for air terminals and conductors is approved by manufacturers of the lightning protection components and components of the standby generator and/or generator enclosure.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Installing contractor shall provide building owner with an operation and maintenance manual.

B. Warranty Documentation: The completed installation shall carry a one-year guarantee against defects in material or installation.

1. Exclusions: Routine preventative maintenance, accidental or intentional damage shall not be included as part of the warranty service.

C. Record Documentation: Installing contractor shall provide building owner a copy of the pre-installation site report, post-installation site report and (3) full-size plots of accurate as-built shop drawings.

1.6 EXTRA STOCK MATERIALS

A. Provide extra stock materials to building owner in a single, durably packed container labeled with “26 41 13 – Lightning Protection for Structures”, installing contractor contact information, date and complete listing of contents.

1. (3) Air Terminal Assemblies

2. (3) Secondary sized bonding lugs

3. (3) Main sized bonding lugs or bonding plates

4. (5) Cable-to-Cable splice connectors

5. (25’) Main sized conductor

6. (10) Cable fasteners/holder with related hardware

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer shall maintain current lightning protection material listings from a Nationally Recognized Testing Laboratory (NRTL).

2. Installer Qualifications: the system shall be installed by a firm actively engaged in the installation of Underwriters Laboratories Inc. Master Labeled Lightning Protection Systems. The persons performing the work of this section and their supervisor shall be personally experienced in lightning protection systems.

B. The system shall be physically inspected by a Nationally Recognized Testing Laboratory (NRTL), such as LPI-IP, to the current edition of NFPA 780. The certification shall be provided to the Owner at completion of the project.

PART 2 PRODUCTS

2.1 AIR TERMINALS

A. Basis of Design: Subject to compliance with requirements, provide Harger Lightning and Grounding safety tip air terminals or equivalent.

B. Substitution Limitations: Project conditions may dictate the use of an air terminal not shown, installing contractor shall coordinate with lightning protection manufacturer to determine proper materials.

C. Product Options:

1. Length: 10” minimum when installed around the perimeter or along the ridge of a building and 24” minimum when installed in mid-roof areas.

2. Point Type: Gently tapered air terminals shall be used in all areas. Exception, mid-roof mounted air terminals shall be safety tipped to prevent personnel injury.

3. Material Type: Where applicable, copper air terminals shall be used. Exception, copper materials shall not be mounted on aluminum, Galvalume ®, galvanized steel, zinc or directly onto other ferrous metal surfaces. In these instances, aluminum air terminals shall be used.

2.2 AIR TERMINAL BASES

A. Basis of Design: Subject to compliance with requirements, provide Harger Lightning and Grounding air terminal bases or equivalent.

B. Substitution Limitations: Project conditions may dictate the use of an air terminal base not shown. Installing contractor shall coordinate with lightning protection manufacturer to determine proper materials.

2.3 CONDUCTORS

A. Basis of Design: Subject to compliance with requirements, provide Harger Lightning and Grounding conductors or equivalent.

B. Material type: Where applicable, bare copper conductors shall be used. Exception, copper materials shall not be mounted on aluminum, Galvalume ®, galvanized steel, zinc or directly onto other ferrous metal surfaces. In these instances, aluminum conductors shall be used.

2.4 CONDUCTOR FASTENERS

A. Basis of Design: Subject to compliance with requirements, provide Harger Lightning and Grounding conductor fasteners or equivalent.

B. Material type: Where applicable, bare copper fasteners shall be used. Exception, copper materials shall not be mounted on aluminum, Galvalume ®, galvanized steel, zinc or directly onto other ferrous metal surfaces. In these instances, aluminum fasteners shall be used.

2.5 ABOVE GRADE CONNECTORS

A. Basis of Design: Subject to compliance with requirements, provide Harger Lightning and Grounding connectors or equivalent.

B. Material type: Where applicable, bare copper connectors shall be used. Exception, copper materials shall not be mounted on aluminum, Galvalume ®, galvanized steel, zinc or directly onto other ferrous metal surfaces. In these instances, aluminum connectors shall be used.

2.6 BONDING LUGS AND PLATES

A. Basis of Design: Subject to compliance with requirements, provide Harger Lightning and Grounding bonding lugs and plates or equivalent.

B. Material type: Where applicable, bare copper bonding connections shall be used. Exception, copper bonding materials shall not be mounted on aluminum, Galvalume ®, galvanized steel, zinc or directly onto other ferrous metal surfaces. In these instances, aluminum or bi-metallic bonding connections shall be used.

2.7 THRU-ROOFS / THRU-WALLS

A. Basis of Design: Subject to compliance with requirements, provide Harger Lightning and Grounding thru-walls or thru-roofs or equivalent.

2.8 GROUNDING ELECTRODES

A. Basis of Design: Subject to compliance with requirements, provide Harger Lightning and Grounding grounding electrodes or equivalent as specified in section 26 05 26 Grounding and Bonding for Electrical Systems.

B. Substitution Limitations: Soil conditions may dictate the use of a grounding electrode not shown. Installing contractor shall coordinate with lightning protection manufacturer to determine proper materials.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install lightning protection system as indicated on approved shop drawing, according to manufacturer's written instructions.

B. Installation shall comply with all aspects of NFPA 780.

C. Conductors shall be concealed from public view where possible.

3.2 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture, unless moisture is permanently excluded from the junction of such materials.

B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors, such as tin.

3.3 FIELD QUALITY CONTROL

A. The system shall be physically inspected by a Nationally Recognized Testing Laboratory (NRTL), such as LPI-IP, to the current edition of NFPA 780. The certification shall be provided to the building owner at the completion of the project.

END OF SECTION

SECTION 26 43 13

SURGE PROTECTION DEVICES

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. The Surge Protection Device (SPD) covered under this section includes all service entrance type SPD suitable for use as Type 1 or Type 2 devices that are applied to the line or load side of the utility feed.

2. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install surge protection devices with size and trip rating as shown or specified.

B. Coordination:

1. Review installation procedures under other Sections and coordinate installation of items to be installed with or before surge protection devices.

C. Related Sections:

1. Section 26 05 05, General Provisions for Electrical Systems.

2. Section 26 05 53, Identification for Electrical Systems.

3. Section 26 13 00, Medium-Voltage Switchgear.

4. Section 26 23 00, Low-Voltage Switchgear.

5. Section 26 24 13, Switchboards.

6. Section 26 24 16, Panelboards.

1.2 MEASUREMENT AND PAYMENT

1. This item is to be included in lump sum cost for Unit Substations.

1.3 REFERENCES

A. Standards referenced in this Section are:

1. UL 1449, 4th Edition – Standard for Surge Protection Devices.

2. UL 1283, 7th Edition – Standard for Electromagnetic Interference Filters.

3. UL 96A, 13th Edition – Standard for Installation Requirements for Lightning Protection Systems.

4. ANSI/IEEE C62.41 – Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

5. ANSI/IEEE C62.45 – Guide for Surge Testing for equipment connected to Low-Voltage AC Power Circuits.

6. IEEE C62.62 – Standard Test Specification for Surge Protection Devices for Low-Voltage AC Power Circuits.

7. IEEE 1100 Emerald Book

8. NFPA 70 Article 285, National Electrical Code.

9. NFPA 70E, Electrical Safety in the Workplace

1.4 DEFINITIONS

A. Definitions referenced in this section are:

1. I-nominal: Nominal discharge current.

2. MCOV: Maximum continuous operating voltage.

3. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

4. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

5. OCPD: Overcurrent protective device.

6. SCCR: Short-circuit current rating.

7. SPD: Surge protective device.

8. VPR: Voltage protection rating.

1.5 SUBMITTALS

A. Action Submittals. Submit the following:

1. Product Data:

a. Surge Protection Devices - Product Data

1) Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2) Include maximum conductor length for all external SPDs.

3) Include manufacturer’s suggested OCPD size and rating.

B. Informational Submittals. Submit the following:

1. Test and Evaluation Reports

a. Surge Protection Devices – Test and Evaluation Reports

b. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

2. Manufacturers' Instructions

a. Surge Protection Devices - Manufacturers' Instructions

1) Submit instructions for each type.

3. Source Quality Control Submittals (NOT USED)

4. Field Quality Control Submittals

a. Surge Protection Devices - Field Quality Control

1) Results of Field Quality Control Reports.

C. Closeout Submittals. Submit the following:

1. Operation and Maintenance Data

a. Surge Protection Devices - Operation and Maintenance Data

1) Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, and description of operation.

2. Warranty Documentation

a. Surge Protection Devices - Warranty Documentation

1) Submit manufacturer's warranty per the requirements of this Section.

D. Maintenance Material Submittals. (NOT USED)

1.6 QUALITY ASSURANCE

A. SPDs shall bear the UL label.

B. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.

C. Testing Agency Qualifications: Independent testing agency shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or shall be full member company in InterNational Electrical Testing Association (NETA).

D. Manufacturer:

1. Manufacturer shall have not less than five years of experience producing substantially similar equipment to that required and, upon request, shall submit documentation of not less than five installations in satisfactory operation for not less than five years in the United States.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by the following or equivalent:

1. External SPDs:

a. ASCO Power Technologies

b. Current Technologies

2. Internal SPDs:

a. Eaton.

b. Siemens

c. Square D.

2.2 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. MCOV of the SPD shall be the nominal system voltage.

2.3 SERVICE ENTRANCE, SEPARATELY DERIVED SYSTEM AND TRANSFER SWITCH SUPPRESSOR

A. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 1.

B. SPDs with the following features and accessories:

1. Integral disconnect switch.

2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

3. Indicator light display for power and protection status.

4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

5. Surge counter.

C. Comply with UL 1283.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than [480 kA]. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with [480Y/277 V] three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: [1200 V for 480Y/277 V].

2. Line to Ground: [1200 V for 480Y/277 V].

3. Line to Line: [2000 V for 480Y/277 V].

F. Protection modes and UL 1449 VPR for grounded wye circuits with [208Y/120 V], three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: [700 V for 208Y/120 V].

2. Line to Ground: [V for 208Y/120 V].

3. Line to Line: [1000 V for 208Y/120 V].

G. SCCR: Equal or exceed [100 kA].

H. I-Nominal Rating: 20 kA.

2.4 PANEL SUPPRESSORS

A. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 2.

B. SPDs with the following features and accessories:

1. Integral disconnect switch.

2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

3. Indicator light display for power and protection status.

4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

5. Surge counter.

C. Comply with UL 1283.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than (480 kA). The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with [480Y/277 V] three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: [1200 V for 480Y/277 V].

2. Line to Ground: [1200 V for 480Y/277 V].

3. Line to Line: [2000 V for 480Y/277 V].

F. Protection modes and UL 1449 VPR for grounded wye circuits with [208Y/120 V], three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: [700 V for 208Y/120 V].

2. Line to Ground: [1200 V for 208Y/120 V].

3. Line to Line: [1000 V for 208Y/120 V].

G. SCCR: Equal or exceed 100 kA.

H. I-nominal Rating: 20 kA.

2.5 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 12.

2.6 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads complying with Section 26 05 19, Low-Voltage Electrical Power Conductors and Cables.

1. External SPDs:

a. Contractor shall not exceed manufacturer’s recommended maximum length of cabling.

b. Contractor shall consult with Engineer for all cable installations longer than manufacturer's recommended maximum length.

B. Class 2 Control Cables: Multi-conductor cable with copper conductors not smaller than No. 18 AWG, complying with Section 26 05 19, Low-Voltage Electrical Power Conductors and Cables.

C. Class 1 Control Cables: Multi-conductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 26 05 19, Low-Voltage Electrical Power Conductors and Cables.

PART 3 EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads.

1. Do not splice and extend SPD leads unless specifically permitted by manufacturer.

2. Do not exceed manufacturer's recommended lead length.

3. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:

1. Power Wiring: Comply with wiring methods in Section 26 05 19, Low-Voltage Electrical Power Conductors and Cables.

2. Controls: Comply with wiring methods in Section 26 05 19, Low-Voltage Electrical Power Conductors and Cables.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.

2. Inspect anchorage, alignment, grounding, and clearances.

3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Train Owner’s maintenance personnel to operate and maintain SPDs.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install lighting fixtures and associated controls.

2. Provide luminaires and accessories in accordance with the Contract Documents.

3. Lamps shall be of the same manufacturer.

4. Drivers and power supplies shall be of the same manufacturer for each fixture type.

5. Equipment shall be certified for use in the State of the project and shall meet the State Energy Code and local energy ordinances.

B. Section Includes:

1. Fixtures And Fixture Components

2. Fixture Mounting & Support Components

3. Lighting Control Devices

4. Emergency Lighting

C. Coordination:

1. Coordinate location of fixtures with piping, ductwork, openings, and other systems and equipment and locate clear of interferences.

D. Related Sections:

1. Section 26 05 05, General Provisions for Electrical Systems.

2. Section 26 05 53, Identification for Electrical Systems.

1.2 MEASUREMENT AND PAYMENT

1. This item is to be included in lump sum cost for Exterior Lighting.

1.3 REFERENCES

A. Standards referenced in this Section are:

1. ANSI C2, Safety Code

2. ANSI C78, Electric Lamps
3. ANSI C78.51, Electric Lamps - LED
4. ANSI C82.4, Ballasts for High Intensity Discharge
5. ANSI C82.16, LED Drivers
6. ASTM A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
7. ASTM A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
8. ASTM B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
9. NEC Article 410, Luminaires, Lampholders, and Lamps.
10. California Electrical Code
11. California Energy Commission Title 24, Part 6
12. National Fire Protection Association (NFPA) 70.
13. NEMA SSL 1, Electronic Drivers for LED Devices, Arrays, or Systems.
14. UL 773, Plug-In Locking Type Photocontrols for Use with Area Lighting
15. UL 844, Luminaires for Use in Hazardous (Classified) Locations.
16. UL 1029, Safety of High-Intensity- Discharge Lamp Ballasts.
17. UL 1572, High Intensity Discharge Lighting Fixtures
18. UL 8750, Standard for LED Equipment for Use in Lighting Products
19. UL 8752, Standard for OLED Panels
20. UL 8753, Standard for Field-Replaceable LED Light Engines

1.4 DEFINITIONS

A. Fixture: Complete lighting device. Fixtures include lamp or lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply.

B. Lighting Unit: Fixture or assembly of fixtures with common support, including bracket plus mounting and support accessories.

C. Luminaire: Fixture.

1.5 SUBMITTALS

A. Action Submittals. Submit the following:

1. Product Data

a. Exterior Lighting – Product Data

1) For proposed fixtures, lamps, ballasts, supports, and accessories. Arrange Product Data for fixtures in order of fixture designation.

2) Include data on features, support, accessories, finishes, and following:

- Outline drawings indicating dimensions and principal features of fixtures and support.

- Electrical Ratings and Photometric Data: Certified results of laboratory tests for fixtures and lamps meeting requirements of California Energy Code and information submitted by Owner to AHJ on form NRCC-LTO-E.

b. Lighting Control

1) Provide lighting control scheme based on lighting control system described in drawings.

2) Include data on control devices in Section 2.4.

2. Shop Drawings

a. Nonstandard Fixtures and Support Shop Drawings

1) Indicating dimensions, weights, method of field assembly, components, and accessories.

b. Wiring Diagrams

1) Detailing wiring for control system showing both factory-installed and field-installed wiring for specific system of this Project, and differentiating between factory-installed and field-installed wiring.

c. Anchor-Bolt Templates

1) Keyed to specific poles and certified by manufacturer.

B. Informational Submittals. Submit the following:

1. Field Quality Control Submittals

a. Exterior Lighting – Field Quality Control Reports

1) Results of required field quality control tests and inspections.

2) Reports indicating and interpreting test results.

C. Seismic restraint calculations.

D. Closeout Submittals. Submit the following:

1. Operation and Maintenance Data

a. Exterior Lighting – Operation and Maintenance Data

1) Maintenance data for products to include operation and maintenance information.

E. Maintenance Material Submittals. Submit the following:

1. Extra Stock Materials

a. Exterior Lighting - Extra Material

1) Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

- Lamps: 10 lamps for every 100 of each type and rating installed. Furnish at least one of each type.
- Glass and Plastic Lenses, Covers, and Other Optical Parts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
- Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
- Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

1.6 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Items provided under this section shall be listed or labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).

1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.

2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.

C. Regulatory Requirements:

1. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.

2. NEC Article 410, Luminaires, Lamp holders, and Lamps.

3. California Electrical Code

D. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange for door opening to disconnect ballast.

E. Exposed Hardware Material: Stainless steel.

F. Reflecting Surfaces: Minimum reflectance as follows, except as otherwise indicated:

1. White Surfaces: 85%

2. Specular Surfaces: 83%

3. Diffusing Specular Surfaces: 75%

G. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

H. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor mounting in fixture doors.

I. Photoelectric Relays: Conform to UL 773.

1. Contact Relays: Single throw, arranged to fail in ON position and factory set to turn light unit on at 1.5 to 3 foot-candles (16 to 32 lux) and off at 4.5 to 10 foot-candles (48 to 108 lux) with 15 sec minimum time delay.

2. Relay Mounting: In fixture housing.

3. Photocell shield deflector to minimize nuisance activation.

J. Light Emitting Diodes (LED)

1. Driver shall be accessible for easy replacement.

2. Weatherproof fixture housing shall be sealed completely against moisture and environment contaminants.

3. 4000K temperature, Color rendering index (CRI) greater than 70.

4. LED driver shall have power factor greater than 90% and THD less than 20%.

5. CSA Certified to US standards for 40°C ambient.

K. LED Fixtures:

1. Conform to UL 8750 and UL 8752.

2. LED fixtures shall be modular and allow for separate replacement of lamps and drivers. User serviceable LED lamps and drivers shall be replaceable from the room side.

3. Dimmable LED fixtures shall have either a 0-10 volt, three wire dimming driver or a two-step (50%, 100%) dimming driver.

L. LED Drivers: Electronic type, labeled as compliant with RFI requirements of FCC Title 47, Part 15, Level “A” sound rating, minimum of 0.8 power factor, and THD less than 20%.

1. Conform to UL 8753.

2. Certification by Electrical Testing Laboratory (ETL).

3. Dimming Drivers shall be 0-10 volt dimming with low end dimming to 10%.

4. Dimming drivers shall be strobe and flicker-free across the full dimming range.

5. Voltage: 120-277 volt unless listed on fixture schedule.

6. Conform to IEEE C62.41, Category A, for resistance to voltage surges for normal and common modes.

M. Outdoor Fixtures: Provide each fixture to be installed outdoors with cut-off lens to reduce the fixture’s light pollution emissions.

2.3 FIXTURE MOUNTING & SUPPORT COMPONENTS

A. Wind-load strength of total support assembly, including support, arms, appurtenances, base, and anchorage, is adequate to carry itself plus fixtures indicated at indicated heights above grade without failure, permanent deflection, and be able to withstand seismic event.

B. Mountings, Fastenings, and Appurtenances: Corrosion-resistant items compatible with support components. Use materials that will not cause galvanic action at contact points. Use mountings that correctly position luminaire to provide indicated light distribution.

C. Trapeze: Used to mount linear fixture. Can be anchored to steel structure with seismic wire bracing, and support cables.

D. Metal Support Brackets: Used to mount floodlights. Designed to match support metal. Provide cantilever brackets without underbrace, in sizes and styles indicated, with straight tubular end section to accommodate fixture.

E. Supply pole luminaires with davit arms, brackets, pole hand-hole covers, base components, and all other accessories complete by specified manufacturer who will be responsible for proper fitting of all elements.

F. Manufacturer will supply pole luminaire assembly to withstand a minimum of 100-mile-per hour winds with a 1.3 gust factor without permanent deflection.

G. Manufacturer shall be responsible for the structural integrity of complete pole luminaire. Contractor shall provide below grade concrete base as needed for each bollard or pole mount type light fixture.

2.4 LIGHTING CONTROL DEVICES

A. Relay Panels

1. Product: nLight Relay Panel ARP INTENC16 NLT w/ 16-single pole relays or equal.

2. Relay and dimming panel shall be available with 4, 8, 12, 16, 24, 32, 40, or 48 individual relays per panel, with an equal number of individual 0-10V dimming outputs.

3. Optional Field Configurable Relays (FCR) used shall have the following required properties:

   a. Configurable in the field to operate with single, double, or triple pole relay groupings

   b. Configurable in the field to operate with normally closed or normally open behavior

   c. Provides visual status of current state and manual override control of each relay

   d. Listed for the following minimum ratings

      1) 40A@120-480VAC ballast

      2) 16A@120-277VAC electronic

      3) 20A@120-277VAC tungsten

      4) 20A@48VDC resistive

      5) 2HP@ 120VAC

      6) 3HP@ 240-277VAC

      7) 65kA SCCR @ 480VAC

4. 0-10 dimming outputs shall support a minimum of 100kA sink current per output.

5. Relay and dimming outputs shall be individually programmable to support all standard sequence of operations as defined in this specification.

6. Panel shall be UL924 listed for control of emergency lighting circuits

7. Panel shall power itself from an integrated 120-277VAC supply.

8. Panel shall provide a configurable low-voltage sensor input with the following properties:

   a. Configurable to support any of the following input types:

      1) Indoor photocell

      2) Outdoor photocell

      3) Occupancy sensor

      4) Contact closure

b. Low voltage sensor input shall provide +24VDC power for the sensor so that additional auxiliary power supplies are not required

c. Sensor input supports all standard sequence of operations as defined in this specification.

9. Panel shall provide a contact closure input for each group of 8-relays that acts as a panel override to activate the normally configured state of all relays (i.e. normally open or normally closed) in the panel. This input is intended to provide an interface to alarm systems, fire panels, or BMS system to override the panel.

10. Panel shall supply current limited low voltage power to other networked devices connected via low voltage network cable.

11. Panels shall be available with NEMA 3R rated enclosure with the following mounting and cover options:

a. Surface mounted for all panel sizes

b. Flush mounted for up to 16 relay panel sizes

c. Screw-fastened for up to 16 relay panel sizes

d. Hinged cover with keyed lock for all panel sizes

12. Surface-mounted screw cover options for 8 and 16 relay panel sizes shall be plenum rated

13. Panel shall be rated form 0-50C for 8 and 16 enclosure sizes, and 0-45C for 32 and 48 enclosure sizes.

B. Digital Electronic Time Clock

1. Product: Sensor switch DTC or equal

2. DTC shall control and program a linear bus of lighting devices and supply all time functions without connection to a system controller.

a. Programming of the linear bus of lighting devices shall not require additional hardware, including computers, specialized dongles, or other connection devices.

b. Programming of the linear bus shall be exclusively done through the touch screen interface.

3. DTC shall be capable of up to 32 schedules. Each schedule shall consist of one set of On and Off times per day for each day of the week and for each of two holiday lists. The schedules shall apply to any individual relay or group of relays.

4. DTC shall be run from non-volatile memory so that all system programming is retained indefinitely.

5. DTC shall be optionally mounted inside of a relay panel.

6. DTC shall have a capacitive 3.5” full color touch screen.

C. Wired Networked Wall Switches

1. Product Series: nPODM or equal

2. Devices shall recess into single gang switch box and fit a standard GFI opening.

3. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.

4. All switches shall have the ability to detect when it is not receiving valid communciation and blink its LED in a pattern to visually indicate a potential wiring issue. Devices with mechanical push buttons shall provide tactile and LED user feedback

5. Devices with mechanical push buttons shall be made available with custom button labeling.

6. Wall switches and dimmers shall support the following device options:

a. Number of control zones: 1, 2, or 4

b. Control types supported:

1) On/Off

2) On/Off/Dimming

3) On/Off/Dimming/Correlated Color Temperature Control for specific luminaire types

c. Control types supported:

1) Ivory, white, light almond, gray, black, red

2.5 EMERGENCY LIGHTING

A. General

1. Provide emergency lighting as required by referenced standards and indicated on the Contract Documents. The main function of emergency lighting is to direct building occupants safely out of the building in the event of an emergency.

2. Connect emergency lighting to the emergency power distribution systems.

3. Provide integral battery ballast power for emergency lighting where an emergency power distribution system does not exist. Provide all long-life batteries. High temperature, maintenance free, nickel-cadmium batteries are acceptable, however, lead-calcium type are not.

4. All battery ballasts shall be capable of providing full illumination in emergency mode.

B. Exit Signs

1. Exit signs shall have cast-aluminum housings and stencil edge-lit faces. Letters shall be red and 8" high. Light source shall be light emitting diodes (LED). Exit signs shall employ a diffuser lens for even illumination of letters. Products that exhibit "dots" or "hot spots" shall not be acceptable. Exit signs shall have internal sealed lead calcium maintenance free battery rated for 90 minutes.

C. LED Battery Systems

1. Emergency battery power supply suitable for installation remote from or in the driver compartment of the LED luminaire. Unit shall be capable of providing normal fixture operation in a switched fixture. Include "TEST" switch and "AC ON" indicator light capable of installation in the luminaire or remote from the luminaire. Power supply shall have self-test diagnostic feature.

2. Emergency battery power supply shall be capable of operating the LED fixtures specified.

3. Provide LED battery with the following:

a. Rated input and output voltage and wattages.

b. Temperature rating.

c. Illumination time (minimum 90 minutes).

d. Suitable for indoor and damp locations and for sealed and gasketed features.

4. LED battery shall meet all associated UL ratings, including UL924.

2.6 FINISHES

A. Metal Parts: Manufacturer's standard finish, except as otherwise indicated, applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and similar defects.

B. Other Parts: Manufacturer's standard finish, except as otherwise indicated.

PART 3 – EXECUTION

3.1 TEMPORARY LIGHTING

A. New lighting fixtures **SHALL NOT** be used for temporary lighting.

3.2 INSTALLATION

A. General:

1. Fixture mounting heights and locations indicated on the Drawings are approximate and are subject to revision in the field where necessary to clear conflicts and obstructions.

2. Mounting Heights: Mounting heights or elevations are to bottom of fixture or to centerline of device.

3. Install fixtures in accordance with Laws and Regulations, the Contract Documents, and manufacturer instructions and recommendations.

4. Provide mounting and support fittings and accessories including but not limited to anchors, screws, conduit stems, aircraft cable, trapeze, universal framing channels as required to support light fixtures from structure as appropriate for environmental, weather, and seismic conditions of the installed location

5. Mount fixtures so that sufficient access is available for ready and safe maintenance.

6. Securely fasten equipment to walls or other surfaces on which equipment is mounted.

B. Suspended Fixtures:

1. Pendant-mount using manufacturer's recommended diameter conduit stems, hangers, cables, etc.

2. Ground to outlet box.

3. Attach mounting to building structure with expansion anchors, beam clamps, or other appropriate fitting.

4. Fixtures shall not be dependent on the outlet box cover screws for support.

C. Surface Mounted Fixtures:

1. Attach to appropriate outlet box.

2. Attach to surface using fasteners and sealing washers when mounting fixture in damp or wet locations.

D. Boxes and Fixtures:

1. For units mounted against masonry or concrete walls, provide suitable 1/4-inch spacers to prevent mounting back of box directly against wall.

2. Bolt units rigidly to building with expansion anchors, toggle bolts, hangers, or Unistrut.

3. Do not install boxes with open conduit holes.

4. Cable each circuit and identify with tag.

E. Set units plumb, square, level, and secure according to manufacturer's written instructions and approved submittals.

F. Concrete Foundations: Construct according to Section 03 30 00.

1. Comply with details and manufacturer's recommendations for reinforcing, anchor bolts, nuts, and washers. Verify anchor-bolt templates by comparing with actual support bases furnished.

2. Finish: Trowel and rub smooth parts exposed to view.

G. Fixture Attachment: Fasten to indicated structural supports.

H. Fixture Attachment with Adjustable Features or Aiming: Attach fixtures and supports to allow aiming for indicated light distribution.

I. Lamp fixtures with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.

3.3 GROUNDING

A. Ground fixtures and metal support according to Section 26 05 26.

1. Metallic Support: Install 10 ft (3 m) driven ground rod at each support.

2. Nonmetallic Support: Ground metallic components of lighting unit and foundations. Connect fixtures to grounding system with No. 6 AWG conductor.

3.4 FIELD QUALITY CONTROL

A. Inspect each installed unit for damage. Replace damaged fixtures and components.

B. Tests and Observations:

1. Give advance notice of dates and times for field tests.

2. Provide instruments to make and record test results.

3. Verify normal operation of lighting units after installing fixtures and energizing circuits with normal power source. Include following:

a. Photometric Tests: Measure light intensities at night at locations where specific illumination performance is indicated. Use photometers with calibration referenced to National Institute of Standards and Technology (NIST) standards.

b. Check for intensity of illumination.

c. Check for uniformity of illumination.

d. Check for excessively noisy ballasts.

e. Prepare written report of tests indicating actual illumination results.

4. Replace or repair damaged and malfunctioning units, make necessary adjustments, and retest. Repeat procedure until units operate properly.

3.5 ADJUSTING AND CLEANING

1. Clean units after installation. Use methods and materials recommended by manufacturer.

2. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

SECTION 28 33 00

FUEL GAS DETECTION AND ALARM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

B. Equipment and all necessary accessories as designated in this section for a multiple-station gas system which shall include the following.

1. Standalone Detectors.

2. Multi-Zone Control Panels.

3. Remote Sensors/Transmitters.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

1.3 STANDARD AND REGULATORY REQUIREMENTS

A. All materials, design, fabrication, assembly and test procedures shall be in accordance with the requirements of all applicable codes, standards or regulations having jurisdiction over the work.

B. Reference to any code, standard or regulation shall mean the latest published editions, including addenda, supplements and revisions thereto, which are in effect when the purchase order is awarded.

C. In the event of conflict between codes, standards or regulations, the conflict shall be referred to the Engineer for resolution.

D. The organizations having jurisdiction include, but are not limited to, the following:

1. AGA American Gas Association

2. ANSI American National Standards Institute

3. ASME American Society of Mechanical Engineers

4. FCC Federal Communications Commission

5. NEMA National Electrical Manufacturers Association

6. NFPA National Fire Protection Association.

7. OSHA Regulations of the Occupations Safety and Health Administration.

8. RoHS Restriction of Hazardous Substances Directive

9. UL Underwriter's Laboratories Inc.

10. The state, county or municipal laws and regulations governing the location where the equipment is to be installed.

E. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic and fire codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

1.4 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.5 SUBMITTALS

A. Design Data: Include details of materials, construction, and finish. Include relationship with adjacent construction.

B. Manufacturers Installation Instructions: Submit installation instructions for material and equipment.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

D. Shop Drawings - Submit in accordance with Division 1 -General Requirements of these specifications.

1. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for the submitted equipment. The drawings shall further include dimensions from structural elements or architectural grid lines, operational clearances, locations of any utility service connection points, mounting requirements, and structural supports required for the submitted equipment.

2. Provide product data for each equipment indicated and include the following:

a. Manufacturer's data sheets on each product to be used.

b. Preparation instructions and recommendations.

c. Storage and handling requirements and recommendations.

d. Typical installation methods.

e. Product dimensions including required clearances.

f. Drawings showing physical dimensions, mounting requirements and terminations.

g. General arrangement or component drawing.

h. Panel layout drawing.

i. Wiring Diagram.

3. All Product Data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories will be a cause for rejection.

4. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

E. Startup service reports.

1. Certificate: Contractor’s start-up and demonstration affidavit

F. Operation and Maintenance Manual:

1. Provide a Complete parts list, operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:

a. Commissioning instructions.

b. Calibration Instructions/schedule frequency

c. Trouble shooting guide and instructions.

d. Vendor data or “cut sheets” on major components.

e. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

f. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

2. Assemble and provide copies of manual in 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

1.6 WARRANTY

A. The Manufacturer shall warrant that all materials and equipment furnished under this contract will be new and of good quality, free from defects in design, workmanship, and materials.

B. Each item of equipment, or part thereof, proving to be defective within the specified period of the warranty shall be replaced, free of defect, without cost to the Owner.

C. The warranty period shall be the Manufacturer's standard warranty period, but not less than a minimum of twelve (12) months after startup, or 18 months after delivery of the equipment at the site (whichever comes first).

D. Warranty shall include materials and labor necessary to correct defects.

E. Defects shall include, but not be limited to noisy, rough, or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

F. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

1.8 COORDINATION

A. Coordinate with electrical and controls contractor all device locations, power and wiring requirements and any special wiring requirements.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers, subject to compliance with requirements of this specification, are as follows:

1. American Gas Safety.

2. Emerson.

3. Honeywell.

4. MSA.

5. Sensidyne.

6. Siemens.

2.2 GENERAL

A. Provide a system with electrically supervised detection and noncoded alarm of combustible gas within natural gas generator enclosure, conforming to the applicable requirements of NFPA 70 and NFPA 72.

2.3 CONTROLLER

A. The Gas Detection Controller shall have the following features:

1. Multi-Channel Gas Controller shall be microprocessor based with 7-inch LCD touchscreen display 800 X 480 resolution and capacitive multi-touch TN panel for easy screen navigation.

2. The controller shall be capable of operating over a temperature range of 32 to 125 degrees F, capable of monitoring multiple detectors.

3. The controller shall be housed in a weatherproof cabinet suitable for wall] mounting in a Class I, Division 1, Group D location] with solid-state plug-in-type relays and solid-state rectifiers

4. The system uses an RS-485 communication protocol that accommodates 128 channels through four digital ports. In addition, there are 128 analog inputs from any 4-20 mA device and equally 128 4-20 mA outputs.

5. The system can accommodate up to 128 binary inputs and 128 binary outputs.

6. Communications:

a. Modbus RS485

b. BACnet IP

7. The system communicates wirelessly for programming and downloading of data through smartphone or tablet device.

8. Input/output boxes can be installed at any location on the RS-485 network for ease of installation of additional sensors.

9. A touch screen graphic display is used for programming.

10. All relevant gas detection data, such as relay status, historical data, location and addresses of sensors are displayed by scrolling through multiple screens.

11. The controller has a scheduler that can be programmed to activate relays and deactivate relays several times a day based on a frequency of day, weekday or weekend only.

12. An auto-configure program searches for connected devices.

13. The unit can accept any 4-20 mA signal, which is ideal for additional monitoring such as temperature humidity and other parameters that may be of interest.

14. Controllers can be connected together to a centralized system that will display gas detection concentrations of an entire facility. Remote monitors are an optional item that can be used to observe the concentration of gases prior to entering the space.

2.4 SENSORS/TRANSMITTERS

A. Provide the quantity and type of gas detection sensors as shown on the drawings

B. Natural Gas/Methane sensor(s) shall have a catalytic bead sensing element, with a typical life of three (3) years.

1. Pre-calibrated sensors can be purchased and installed by the user thereby reducing calibration costs and minimizing downtime.

C. Transmitter electronics

1. Microprocessor based.

2. Housed in a NEMA 4X enclosure

3. The controller shall have an alphanumeric LCD display for gas concentration and unit configuration, five LED's for communication and relay status, and three function keys for operation/configuration.

4. Programming and calibration is nonproprietary and is accessed through a user selectable password that protects system integrity

5. The sensors can be installed as stand-alone, digitally networked with controller through a standard RS-485, Modbus communication port.

6. A user configured 4-20 mA, 2-10 VDC, or 1-5 VDC analog output that is fully assignable over a chosen range is standard.

7. Three user programmable relays

a. The relays can be configured to energize at a preselected concentration or based on a time-weighted average concentration.

8. 80 dB buzzer.

D. The natural gas sensors shall be powered by a 24VAC class 2 power supply. Class 2 power supply will be provided by the gas monitoring equipment supplier and installed by the electrician or controls contractor.

2.5 ACCESSORIES

A. External Audible Alarm:

1. Basis of Design: Vibratone Horns, Model 350; as manufactured by Federal Signal.
2. Operating Temperature: Minus 65 to 150 degrees F (minus 54 to 66 degrees C).
3. Weight: 1.4 pounds (0.6 kg).
4. Size (WxHxD): 4.06 x 4.06 x 2.19 inches (103 x 103 x 55.6 mm).
5. Model 350-024-30:
    a. Power Requirements: 24 VAC, 0.90 A, 50/60 Hz.
    b. Decibels: 100 at 10 feet (110 at 1 M).
6. Model 350-120-30:
    a. Power Requirements: 120 VAC, 0.18 A, 50/60 Hz.
    b. Decibels: 100 at 10 feet (110 at 1 M).

B. External Strobe:

1. Operating Temperature: Minus 31 to 150 degrees F (minus 35 to 66 degrees C).
2. Weight: 0.1 pounds (0.06 kg).
3. Size (WxHxD): 3.94 x 3.95 x 1.6 inches (100 x 100 x 40.6 mm).
4. Flash Rate: 80 per minute.
5. Candela Peak: 108,000.
6. Mounting: Surface.
7. Model VALS-024:
    a. Power Requirements: 24 VAC, 0.08 A.
8. Model VALS-120:
    a. Power Requirements: 120 VAC, 0.06 A, 50/60 Hz.

C. Fuse:

1. Basis of Design: Radial Lead Fuse, 374 Series, TR5 Fuse, Time Lag; as manufactured by Littelfuse.

2. Compliance: UL 248.

3. Halogen free and lead-free.

4. Reduced PCB space requirements.

5. Low internal resistance.

D. Modbus:

1. Basis of Design: Modbus TRNS Gen 2 as manufactured by Brasch Environmental Technologies, LLC

a. Communicates across a two-wire RS-485 bus using the Modbus RTU protocol.

b. Addressable with up to 128 unique addresses

c. Supports Function Code (FC) 04

d. Provides gas sensor readings and error codes

e. Data on This Bus: Readable by a remote device capable of interfacing with this protocol. The remote device is the client and the TRNS is the server.

1) Baud Rate: 9600

2) Data: 8 bits

3) Stop: 1 bit

4) Parity: None

5) Flow Control: None

f. DIP Switch: 7-position. Used to set the device address.

g. Programmed and configured at the factory; field adjustable.

h. Address is assigned using a binary counting system.

2.6 SYSTEM SEQUENCE OF OPERATION

A. Natural gas alarm shall be set at 20% (low) and 50% (high) LEL within the 0 - 100% LEL measuring range.

B. When natural gas concentration from the sensors exceeds the low alarm setpoint, the audible alarms shall sound, the light indicator associated with that alarm will be activated

at the Multi-Channel Gas Controller, the alarm will be transmitted to the Remote Alarm Panel and BMS system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until mounting surfaces have been properly constructed and prepared. If mounting surface preparation is the responsibility of another installer, notify Owner in writing of unsatisfactory preparation before proceeding.

B. Before installation, Contractor shall verify actual locations, and note any conditions affecting installation, routine maintenance, and operation.

1. Final locations indicated on Drawings are approximate. Determine exact locations before roughing-in for electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.

B. Equipment Mounting: Mount all sensors at or as close as possible to the recommended heights.

1. Sensor Mounting Heights

a. Natural Gas Sensor HT = 2’ – 0” below ceiling.

C. Install in locations that will allow access for calibration and testing.

D. The Contractor shall wire the sensors to their respective channels inside the controller with shielded cables specified by the equipment manufacturer to certify length and maximum loop resistance as required.

E. Ensure that the installation of combustible-gas detection and alarm systems complies with ICC IFGC, NFPA 70 and applicable requirements of NFPA 72.

3.3 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01

3.4 TESTING

A. General: Test system either in its entirety or in sections after system is installed or cleaned.

B. Conduct performance tests in accordance with ANSI/ISA 60079-29-1.

C. Test operation of the entire system in operational and alarm modes. Activate each detector by a gas calibration bottle representing the adjusted Lower Flammable Limit (LFL). Test the malfunction feature for each control unit.

3.5 CLEANING

A. Clean products in accordance with the manufacturer's recommendations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 TRAINING

A. Provide on-site operator training services to be performed by a factory trained field experienced professional.

B. Train Owner's maintenance and operations personnel on how to adjust, operate, and maintain the gas detection system.

END OF SECTION

SECTION 31 20 00

EXCAVATION

PART 1 - GENERAL

1.1 Excavation shall include the removal of existing material to the elevations required for over excavation per geotechnical recommendations; removal, disposal or stockpiling of material excavated as required; subgrade preparation; re-use of excavated material; placement and compaction of re-used material or imported engineered fill to the required elevations shown in the plans and in accordance with the Caltrans Standard Specifications, APWA Standard Specifications for Public Works Construction, 2018 Edition and these Special Provisions.

1.2 SECTION INCLUDES

A. Excavation

B. 1-Sack Cement Slurry Backfill

C. Engineered Fill

D. Buried Man-made Objects

E. Dust Control

F. Surplus Material

G. Hazardous Materials in Excavation

H. De-watering

I. Utility Trenches

1.3 RELATED SECTIONS

A. Not Used

1.4 REFERENCE STANDARDS

A. Caltrans Standard Specifications, 2018 Edition

1. Section 5.120, “Coordination with Other Entities”

2. Section 14-11, “Hazardous Waste and Contamination”

3. Section 18, “Dust Palliatives”

4. Section 19, “Earthwork”

B. APWA Standard Specifications for Public Works Construction (Greenbook), 2018 Edition

1.5 SUBMITTALS

A. Engineered Fill Product Data: Submit source, gradation, R-value, sand equivalent, and durability for the proposed fill material.

B. Engineered Fill Certified Test Results: At least seven calendar days in advance of desired date of ENGINEER'S approval, submit certified test results performed by an independent testing laboratory certifying that the proposed base material complies with the specifications. Test results shall not be more than 30 days old. Test results shall indicate type of aggregate, gradation, R-value, sand equivalent, and durability.

C. Documentation: Submit delivery tickets from each load of fill delivered to the Worksite which include, as a minimum the supplier, material and its composition, and material weight.

D. Health and Safety Plan: Contractor shall prepare a site specific Health And Safety Plan (HASP) that complies with the HAZWOPER requirements for excavation and other work related to excavating, handling or otherwise coming into contact with hazardous materials in excavation (impacted soil). Non-HAZWOPER trained personnel shall not excavate, handle or otherwise come in contact with impacted soil. Contractor shall designate, mark, and enforce an exclusion zone to prevent unauthorized contact with impacted soils. Contractor shall also supply, construct, and maintain a decontamination area for personnel and equipment at the perimeter of the exclusion zone.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Engineered Fill

Onsite excavated material may be used as engineered fill provided it is free of oversized rock, organic materials and deleterious debris. Oversized material is defined as material exceeding 8 inches in diameter. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

B. 1-Sack Cement Slurry Backfill: a self-compacting, cementitious flowable material requiring no vibration or tamping to achieve consolidation, may be used. The Contractor must submit a mix design in writing to the Engineer for approval. The design shall provide:

1. A minimum 28 day strength of 50 psi and a maximum 28 day strength not to exceed 150 psi.

2. Consistency shall be flowable (6 to 8 IN slump)

Onsite excavated material may be used as engineered fill provided it is free of oversized rock, organic materials and deleterious debris. Oversized material is defined as material exceeding 8 inches in diameter. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

C. Unsuitable Material

Onsite excavated material that is soft or yielding is considered unsuitable and may not be used as engineered fill and must be disposed of offsite as surplus material.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Pavement and Trench Areas: The existing asphalt pavement, including base, sections are assumed to be 20” thick, or as shown on the contract drawings. Contractor to verify and match existing pavement section.

B. Upon removal of the existing asphalt pavement areas, contractor shall have MTS contracted geotechnical engineer test soils for constituents of concern prior to excavation. Stockpiles shall not be allowed on-site.

3.2 PLACEMENT OF ENGINEERED FILL

A. Engineered fill shall be placed in uniform, loose lifts of approximately 8 inches and then compacted to prior to the placement of subsequent lifts. Engineered fill shall be moisture conditioned to at least 4 percent above optimum moisture content. Onsite excavated material shall be compacted to a minimum of 90 percent relative compaction based on ASTM D 1557. Material placed in the upper 12 inches of pavement subgrade shall be scarified then moisture conditioned to a moisture content of 3% above optimum content and compacted to a minimum 95 percent relative compaction.

3.3 BURIED MAN-MADE OBJECTS

A. Buried man-made objects discovered during excavation and not previously known or otherwise identified in the plans shall be removed and disposed of according to Section 19-1.03D, “Buried Man-made Objects”, of the Caltrans Standard Specifications and these Special Provisions. The CONTRACTOR shall immediately inform the ENGINEER of the discovery of any buried man-made objects. Depressions left by removed buried man-made objects shall be backfilled with engineered fill.

3.4 DUST CONTROL

A. The Contractor Watering for dust control shall comply with Section 18, “Dust Palliatives”, of the Caltrans Standard Specifications.

3.5 SURPLUS MATERIAL

A. Surplus excavated material not designated or determined to contain hazardous waste shall become the property of the Contractor and shall be disposed of offsite in conformance with Caltrans Standard Specifications, except that MTS shall be absolved from responsibility instead of the Department. Surplus material shall not be disposed of in any MTS or public street right of way.

3.6 HAZARDOUS WASTE IN EXCAVATION

A. There is the possibility that there is undocumented hazardous material onsite. If the Contractor encounters hazardous waste in excavation, as defined by Section 25117 of the Health and

Safety Code, the Contractor shall immediately so notify the Engineer in writing. The Engineer shall notify the City of San Diego Solid Waste Local Enforcement Agency (LEA) and MTS during earthwork. Excavation in the immediate area of the suspected hazardous material shall be suspended until the Engineer authorizes it to be resumed. If such suspension delays the current controlling operation, the Contractor will be granted an extension of time as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications.

If such suspension delays the current controlling operation more than 2 working days, the delay will be considered a right-of-way delay and the Contractor will be compensated for each such delay as provided in Section 8-1.08, "Right of Way Delays," of the Standard Specifications.

MTS reserves the right to use other forces for exploratory work to identify and determine the extent of such material and for removing hazardous material from such area.

B. Should TPH- and pesticide-impacted soil or other contaminants be encountered during excavation, the Contractor excavation work shall be modified as follows:

1. Comply with requirements outlined in the Soil Management Plan.

2. Comply with San Diego County Department of Environmental Health (SDCDEH) requirements and guidance (e.g., guidance for sampling subsequent to UST and associated piping removal and oil/water separator system removal).

3. Comply with the SDCDEH Site Assessment and Mitigation (SAM) Program Manual, dated September 2, 2010 or any later revision. Specifically refer to Section 5-XI – waste characterization and soil reuse.

4. Comply with California Code of Regulations, Title 22, Division 4.5, “Environmental Health Standards for the Management of Hazardous Waste” regarding identification of hazardous waste.

5. During excavation, segregate impacted from non-impacted soil. This may be done on a bucket-by-bucket load basis. Contractor shall also take various monitoring instrument readings and samples. Contractor will evaluate which bucket load or scraped run is impacted or not impacted based on visual observations, odor, and photoionization detector (PID) readings, except for those areas predetermined as pesticide impacted.

6. Should potentially impacted soil be discovered, the Resident Engineer shall be contacted immediately.

7. Place impacted and non-impacted soil in separate stockpiles on-site. In some cases a third soil stockpile may be needed for “questionable” soils.

8. Maintain soil stockpiles as required. Contractor shall collect soil samples for environmental analytical testing and waste characterization.

9. Cover all stockpiles daily with Visqueen or similar plastic sheeting with a minimum thickness of 10-millimeters. The sheeting will be anchored with sand bags to minimize rain or water used for dust control from contacting the waste and collecting in the stockpile areas. The temporary stockpiles shall be constructed to a maximum height of 7

feet with flat tops to facilitate sampling, if necessary. All stockpiles shall be kept covered when not actively being worked on. When the stockpiles are actively worked on, light misting will be used to minimize generation of dust. Load stockpiles for disposal as requested by the ENGINEER.

C. Contractor shall hire an environmental consultant to be onsite during all soil management activities. The environmental consultant's onsite personnel shall be trained and have at least 3 years of experience in the use and calibration of appropriate instrumentation used in the testing and classification of soil that is potentially impacted by TPH and pesticides. All testing results and reports shall be delivered to the Engineer as soon as they are available.

D. Contractor shall have the Soil stockpiles remain in-place until soil sampling and waste characterization has been completed to allow for proper disposal. It is anticipated that excavated impacted soil will need to be stockpiled for a period not to exceed 30 days. Stockpiling of excavated soil at the Site shall be coordinated with the Engineer. Should the potentially non-impacted stockpile be found to be free of contamination, the soil shall be re-used or disposed of offsite, as required by the Contractor.

E. Regulatory Requirements for Permitting for Dust and Emissions Controls: Contractor shall comply with the requirements outlined in the construction drawings for dust control as well as erosion control. Regarding the impacted soil stockpile shall be continuously covered with plastic sheeting. Plastic sheeting shall consist of Visqueen or similar plastic sheeting (minimum 10-mil thickness). Sand bags, staking or other means shall be applied to maintain plastic sheeting cover from possible winds. Impacted soil stockpiles shall also be placed on plastic sheeting.

F. Regulatory Requirements For Construction Contractor and Personnel: Excavation and handling of impacted soils shall be performed by an appropriately licensed California construction contractor with Hazardous Substance Removal Certification (California Code of Regulations [CCR], Division 9, Title 16, Article 3. Classification). In addition, all personnel working on sites exposed to hazardous substances, health hazards, or safety hazards and their supervisors shall be trained and covered under the Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements (Code of Federal Regulations [CFR] Standard 29 Part 1910.120) including current 8-hour HAZWOPER refresher training. Contractor shall comply with all elements of the HAZWOPER requirements including:

1. Training;

2. Training Refreshers;

3. Medical Surveillance; and

4. Safety and Health Program Implementation.

G. Regulatory Requirements For Soil Profiling, Transportation And Disposal:

1. Soil Profiling: Prior to removal from Site, the impacted soil and other potential hazardous or regulated waste must be profiled. Sample and analytical test data from Site investigations may be used for profiling; preferably data for the impacted oil stockpile should be used. The hired environmental consultant shall assist with waste profiling;

however, the waste generator is responsible for profiling the waste and determining the following:

a. Hazardous waste determination

b. The proper documentation (e.g. hazardous waste manifest or bill-of-lading)

c. The proper disposal (or treatment) facility.

d. Waste manifest or bill-of-lading shall be signed by the waste generator, transporter, and disposal facility.

2. Soil Transportation: Hazardous waste shall only be transported by a Department of Transportation (DOT) licensed hazardous waste hauler. Hazardous waste and petroleum-impacted (nonhazardous) waste shall utilize shipping documents acceptable to the receiving facility and in compliance with state and federal requirements. Each load must be accompanied by a signed hazardous waste manifest or bill-of-lading. Each load must be completely covered with a secured tarp.

3. Upon exiting the Contractor's exclusion zone at the Site, all soil shall be removed from the exterior of the truck and truck tires by means such as, but not limited to, brushing/sweeping to prevent spreading of impacted soil beyond the construction excavation exclusion zone and on to streets.

4. Soil disposal: Impacted soil shall be transported only to the generator's approved disposal facilities soil profiles shall be approved prior to shipment. Trucks shall be released only under the following conditions:

a. Loads leaving the Site are logged by the Contractor (i.e. truck number/name, date and time);

b. Facility is approved in advance by the waste generator;

c. Each load transported to facility is accompanied by a hazardous waste manifest or bill-of-lading;

d. Each load is weighed and tared; and

e. Each load is documented by the Contractor.

5. Contractor's documentation shall include the following:

a. Copies of all disposal facility-signed hazardous waste manifests or bill-of-lading;

b. Log of each load;

c. Log of each load's weight and tare weight; and

d. Certificate from disposal facility documenting acceptance/treatment for total quantity of impacted soil and other wastes disposed.

6. Impacted soil shall be disposed at a facility authorized to receive contaminate soil.

H. Dust Control and Air Monitoring Compliance. The Contractor shall take action to prevent, reduce, or mitigate contaminated dust emissions through use of best management practices (BMPs). Dust suppression shall be performed by the Contractor, as required, by spraying with a light mist of water. Watering for dust suppression shall comply with Section 17, “Watering”, of the Caltrans Standard Specifications. It should be noted that there are no specific air monitoring requirements in San Diego County for sites where TPH- or pesticide-impacted soil is the main constituent of concern. For soil that is to be temporarily stockpiled, the Contractor shall contain and cover the soil using 10-mil Visqueen or similar plastic sheeting for dust suppression purposes.

I. Water Pollution Control Plan (WPCP). The Contractor shall follow the WPCP for all on-site and disposal activities. See also MTS Stormwater Standards and Section 5.26 Temporary Stormwater Pollution Control.

J. Contractor must secure and maintain graded/excavated areas in the event of a storm. BMPs shall be used to prevent soil (impacted or otherwise) from washing into storm drains, being tracked, or washing off Site. BMPs should also protect open excavations to the extent practical, to prevent flooding and the subsequent need for over-excavation.

K. For soil that is to be temporarily stockpiled, the Contractor shall contain and cover the soil using 10-mil Visqueen or similar plastic sheeting, to the extent necessary to prevent soil transport by storm water from the stockpile. The Contractor shall use erosion control bags around the stockpile perimeters if rain is forecast or if rain occurs.

L. Spills of Soil or Other Materials. Contractor shall maintain appropriate required BMPs to prevent and mitigate potential spills of potentially hazardous materials. If a spill of potentially hazardous material occur, the Contractor shall take all appropriate steps required to clean up the spill in a timely manner. Contractor will also immediately notify the RWQCB (as required), local Fire Department, and MTS of the spill. Contact Information follows:

a. MTS
Mr. Eli Belknap
Manager of Capital Projects
100 16th St.
San Diego, CA 92101
Tel: (619) 595-7039
Eli.Belknap@sdmts.com

b. Fire-Rescue Department– San Diego
Emergency: 911
Non-Emergency: (619) 533-4300
sdfd@sandiego.gov

M. Tracking and Reporting of Impacted Soil.

1. Photographs of Construction Excavations: Contractor shall photograph obvious features within the construction area that are associated with contamination and with the construction activities. Photographs shall be taken, as necessary, to assist in

documenting pre-existing environmental conditions encountered during construction grading and excavation.

2. Photographs shall be numbered and a brief description compiled for each photograph, including location (i.e. location number), orientation (i.e. facing east, on the west end of the excavation area), date, and description of feature. In addition, general photographs of Site activities shall also be taken to document construction progress and environmental procedures.

3. Field documentation Organization: Contractor shall compile field documentation related to environmental conditions. Field reporting shall be performed by completing standard forms that will be compiled as the job progresses. This documentation shall be organized into several files as follows:

   a. Map(s) of the Site showing the location and dimensions of each excavation;

   b. Estimated quantities of soil temporarily stockpiled on-Site;

   c. Estimated quantities of soil removed from Site and transported to a disposal facility (based on field notes);

   d. Actual quantities of soil removed from the Site and transported to a disposal facility (based on weight tickets);

   e. Photographs organized by Site area that document relevant features, such as apparent preferential pathways or observed indications of contamination;

   f. Copies of bills of lading and manifests for soil removed and transported to an off-Site treatment or disposal facility; and

   g. Miscellaneous correspondence.

3.7 UTILITY TRENCH EXCAVATIONS

A. Trenches and excavations shall be designed and constructed in accordance with OSHA and other applicable government safety codes and regulations. Excavations deeper than 5 feet shall be shored or laid back on a slope no steeper than 1.5:1 (H:V). For trench excavations, Contractor shall meet OSHA requirements regarding personnel safety with the appropriate use of shoring or laying back of slopes. If seepage is encountered, the Contractor shall immediately inform the Engineer. The Engineer or his designee shall evaluate the seepage and determine if de-watering is required. Contractor shall keep vibrations away from the immediate excavation area. The Contractor shall setback all stockpiled materials from the trench a distance of at least one half the excavation depth. Shoring and/or bracing may be required. The material excavated from the trench may not be re-used as backfill and must be treated and disposed of as contaminated waste pending sampling and testing in accordance with Article 3.5. of these Special Provisions.

B. The project site contains existing utilities that are shallow. Contractor shall pothole and inform the Engineer of the location of all existing utilities at crossings prior to excavation. The Contractor shall determine alternative duct bank configurations at each crossing where conflicts exist and obtain approval from Engineer prior to excavation.

C. Not all utilities are shown on the project plan sheets. It is the responsibility of the contractor to provide utility locating to ensure no additional utilities are on the project.

3.8 DE-WATERING

A. De-watering is not anticipated on this project. If groundwater or water drainage from excavated soils is encountered during construction, the Contractor shall immediately inform the Engineer, sample and control the runoff in a manner that is consistent with the Water Pollution Control Plan (WPCP). De-watering shall be considered Force Account Work if required and shall conform Section 9-1.04, “Force Account”, of the Caltrans Standard Specifications.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Excavation shall be measured by the cubic yard based on the dimensions of material in place, as shown within the construction plans and these Special Provisions. Includes excavation of trench and any miscellaneous excavation. It shall NOT include the concrete and asphalt material removed as part of Demolition.

B. 1-Sack Cement Slurry shall be measured by the cubic yard and completed in accordance with the Contract Documents and as measured by the Engineer.

C. Loading, Hauling, and Disposing Clean Fill Export (no manifest) shall be measured by the cubic yard and completed in accordance with the Contract Documents and as measured by the Engineer, removed from the site and delivered to a location approved by the Owner. Does not include excavation of the material.

D. Loading, Hauling, and Disposing Non-Hazardous waste (manifest required) will be measured by the cubic yard and completed in accordance with the Contract Documents and as measured by the Engineer or Owner's representative. The quantities as contained on the Bid Form, Schedule of Quantities and Prices, or approved schedule of values, as applicable, as derived from the Plans will be used as the basis for this measurement. Does not include excavation of the material.

E. Loading, Hauling, and Disposing CAL Hazardous Waste (manifest required) will be measured by the cubic yard and completed in accordance with the Contract Documents and as measured by the Engineer or Owner's representative. The quantities as contained on the Bid Form, Schedule of Quantities and Prices, or approved schedule of values, as applicable, as derived from the Plans will be used as the basis for this measurement. Does not include excavation of the material.

4.2 PAYMENT

A. Excavation shall be paid by the cubic yard based on the dimensions within the construction plans. Full compensation for Excavation shall include furnishing the labor and materials, equipment, tools and incidentals involved in excavation, subgrade preparation, placement of engineered fill, stockpiling and re-use of suitable excavated material and disposal of surplus material. Includes excavation of trench and any miscellaneous excavation. Pavement removed as part of Demolition shall NOT be included in the payment made for Excavation.

B. 1-Sack Cement Slurry furnished and completed in accordance with the Contract Documents will be paid for at the Contract Price, as listed on the Bid Form or Schedule of Quantities and Prices, as applicable. This price shall include full compensation for furnishing all labor, materials, tools, equipment, supplies, supervision, and incidentals, to furnish and place 1-sack cement slurry, as shown on the Plans, and as specified in these Specifications, and as directed by the Engineer.

C. Loading, Hauling, and Disposing Clean Fill Export (no manifest) furnished and completed in accordance with the Contract Documents will be paid for at the Contract Price, as listed on the Bid Form or Schedule of Quantities and Prices, as applicable. This price shall include full compensation for furnishing all labor, materials, tools, equipment, supplies, supervision, and incidentals, and doing all work for loading, hauling and disposing of clean material, as shown on the Plans, and as specified in these Special Provisions, and as directed by the Engineer. Does not include excavation of the material.

D. ADD ALT: Loading, Hauling, and Disposing Non-Hazardous Waste (manifest required) furnished and completed in accordance with the Contract Documents will be paid for at the Contract Price, as listed on the Bid Form or Schedule of Quantities and Prices, as applicable. This price shall include full compensation for furnishing all labor, materials, tools, equipment, supplies, supervision, and incidentals, as shown on the Plans, as specified in these Special Provisions, and as directed by the Engineer. Work shall include obtaining any necessary permits, any required state, federal, municipality or disposal facility testing and analysis, stockpiling, handling, sample storage, and disposal at a legal facility, reuse, documentation, and relevant disposal fees. Does not include excavation of the material.

E. ADD ALT: Loading, Hauling, and Disposing CAL Hazardous Waste (manifest required) furnished and completed in accordance with the Contract Documents will be paid for at the Contract Price, as listed on the Bid Form or Schedule of Quantities and Prices, as applicable. This price shall include full compensation for furnishing all labor, materials, tools, equipment, supplies, supervision, and incidentals, as shown on the Plans, as specified in these Special Provisions, and as directed by the Engineer. Work shall include obtaining any necessary permits, any required state, federal, municipality or disposal facility testing and analysis, stockpiling, handling, sample storage, and disposal at a legal facility, reuse, documentation, and relevant disposal fees. Does not include excavation of the material.

F. Full compensation for workers to attend OSHA accepted HAZWOPPER 40 Hour Training and possess a certificate showing proof of acceptable training as described in this section shall be included in various items of work involved and no additional compensation will be allowed therefor.

G. The cost to engage an Environmental Consultant to test for Hazardous Materials in Excavation and the cost for all testing and reporting services performed by the Environmental Consultant shall be considered incidental to the contract price paid per cubic foot of Excavation. No separate payment shall be made therefor.

END OF SECTION

SECTION 31 23 33

GAS LINE TRENCHING, BACKFILL, AND RESURFACING

PART 1 - GENERAL

1.1 SCOPE

A. This specification covers requirements for excavation, backfill, base (bedding), shading material and resurfacing for trenches intended for buried gas utilities.

1.2 SECTION INCLUDES

A. Excavation

B. Buried Man-Made Objects

C. Dust Control

D. Surplus Material

E. Hazardous Waste in Excavation

F. Utility Trench Excavation

G. De-watering

H. Resurfacing

1.3 RELATED SECTIONS

A. 31 20 00 EXCAVATION

1.4 REFERENCE STANDARDS

A. Caltrans Standard Specifications, 2018 Edition

B. APWA Standard Specifications for Public Works Construction (Greenbook), 2018 Edition

C. SDG&E Service Standards & Guide, 2023 Edition

D. SDG&E Underground Construction Standards, 2019 Edition

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's information, material source, gradation, R-value, sand equivalent, and durability for the shading and base (bedding) material.

B. It is the responsibility of the contractor to provide material whose constituents meet all applicable requirements of this specification. The Supplier must be capable of supplying a consistent material. Subsequent to Supplier approval, the Supplier shall make no changes to the material without satisfying the following conditions:

- Prior written notice to the engineer and SDG&E of intent to change material.
- Written notification from the engineer and SDG&E approving the change.

1.6 DEFINITIONS

A. Sand: Natural, manufactured, or recycled granular material, or a combination thereof, free of deleterious amounts of contaminants defined in this specification.

B. Manufactured Sand: Material made by crushing existing native natural material.

C. Recycled Sand: Material made by crushing concrete, asphalt-concrete, or concrete and asphalt mixture.

D. Supplier: Manufacturer, vendor, contractor, or developer who supplies trench bedding, shading, and material for use in installing gas utilities.

E. Base (bedding): A layer of select materials, normally screened sand, placed at trench bottom for the purpose of providing uniform support of the buried utility and protection from substructures, trench irregularities, rock projections or other features that could cause damage to the utility.

F. Shading: A layer of select material, normally screened sand, to surround the utility after installation for the purpose of protecting it from damage by the backfill material.

G. ASTM: American Society for Testing and Materials

PART 2 - PRODUCTS

2.1 MATERIALS

A. Base (bedding) and shading material intended for buried gas utilities consist of natural sand, equivalent native natural material, manufactured sand, or recycled sand, or a combination thereof, and shall meet SDG&E Underground Standard specifications UG3370 and UG3371 and the requirements of this specification.

B. Base (bedding) and shading material shall be free of hazardous material. Oblong rocks (cobbles) or angular pieces of rock that resemble arrowheads, as described in ASTM D2488, shall not be included in the base or shading material. Beach sand shall not be used under any circumstance.

C. The manufactured sand, recycled sand, or a combination thereof, submitted for testing shall meet the specifications provided in Table 1.

Table 1 – Sand Requirements

Property	Test Method	Requirements
Sand Equivalent	California Test 217 or ASTM D2419	≥ 20
Durability Index	California Test 229	≥ 35
pH Value	California Test 643	Case-by-case evaluation by the Company, with a minimum value of 6.0
Electrical Resistivity (ohm- cm)	California Test 643	Case-by-case evaluation by the Company, with a minimum value of 4,500 ohm-cm
Organic Impurities	ASTM C40	Shall not be darker than the Plate #3 when compared to standard Gardner Color Series
Sieve Size	ASTM C136 Size (inch)	Total percentage of material passing by weight (%)
	½ (0.500)	100
	#4 (0.187)	91 - 100
	#8 (0.0937)	72 - 100
	#16 (0.0469)	50 -100
	#30 (0.0232)	30 - 90
	#50 (0.0117)	12 - 46
	#100 (0.0059)	1 - 26
	#200 (0.0029)	0 - 16
Compaction Test	ASTM D1557	Relative compaction of 95% or greater

PART 3 - EXECUTION

3.1 EXCAVATION

A. The contractor shall obtain all permits and traffic control approvals prior to construction within the public right of way at K Street. The trench location shown on the plans is approximate and shall be coordinate by the contractor with SDG&E from the gas meter station to the point of connection. All base material, shading and backfill must be approved by the Engineer and SDG&E prior to placement and acceptance of material. The contractor shall obtain all traffic control approvals and permits required to complete the work prior to the start of construction. State law requires the contractor to contact DigAlert at least 2 working days prior to excavation.

3.2 BURIED MAN-MADE OBJECTS

A. Buried man-made objects discovered during excavation and not previously known or otherwise identified in the plans shall be removed and disposed of according to Section 19-1.03D, “Buried Man-made Objects”, of the Caltrans Standard Specifications and these Special Provisions. The CONTRACTOR shall immediately inform the ENGINEER of the discovery of any buried man-made objects. Depressions left by removed buried man-made objects shall be backfilled with engineered fill.

3.3 DUST CONTROL

A. The Contractor Watering for dust control shall comply with Section 18, “Dust Palliatives”, of the Caltrans Standard Specifications.

3.4 SURPLUS MATERIAL

A. Surplus excavated material not designated or determined to contain hazardous waste shall become the property of the Contractor and shall be disposed of offsite in conformance with Caltrans Standard Specifications, except that MTS shall be absolved from responsibility instead of the Department. Surplus material shall not be disposed of in any MTS or public right of way.

3.5 HAZARDOUS WASTE IN EXCAVATION

A. There is the possibility that there is undocumented hazardous material. If the Contractor encounters hazardous waste in excavation, as defined by Section 25117 of the Health and Safety Code, the Contractor shall immediately so notify the Engineer in writing. The Engineer shall notify the City of San Diego Solid Waste Local Enforcement Agency (LEA) and MTS during earthwork. Excavation in the immediate area of the suspected hazardous material shall be suspended until the Engineer authorizes it to be resumed. If such suspension delays the current controlling operation, the Contractor will be granted an extension of time as provided in Section 8-1.07, "Liquidated Damages,” of the Standard Specifications.

3.6 UTILITY TRENCH EXCAVATIONS

A. Trenches and excavations shall be designed and constructed in accordance with OSHA and other applicable government safety codes and regulations. Excavations deeper than 5 feet shall be shored or laid back on a slope no steeper than 1.5:1 (H:V). For trench excavations, Contractor shall meet OSHA requirements regarding personnel safety with the appropriate use of shoring or laying back of slopes. If seepage is encountered, the Contractor shall immediately inform the Engineer. The Engineer or his designee shall evaluate the seepage and determine if de-watering is required. Contractor shall keep vibrations away from the immediate excavation area. The Contractor shall setback all stockpiled materials from the trench a distance of at least one half the excavation depth. Shoring and/or bracing may be required.

3.7 DE-WATERING

A. De-watering is not anticipated on this project. If groundwater or water drainage from excavated soils is encountered during construction, the Contractor shall immediately inform the Engineer, sample, and control the runoff in a manner that is consistent with the Water Pollution Control

Plan (WPCP). De-watering shall be considered Force Account Work if required and shall conform Section 9-1.04, “Force Account”, of the Caltrans Standard Specifications.

3.8 RESURFACING

A. Gas line trenching and resurfacing through K Street is within the public right of way and is subject to City of San Diego requirements and standard drawings. SDG&E shall approve the trench, tie-in excavation, base shading and backfill material prior to installing the gas service and energizing the system. The SDG&E inspector must approve installation of shading material prior to backfill and resurfacing the trench. The contractor shall replace all sidewalk, curb and gutter, asphalt, and striping to restore the existing condition as shown in the plans and to the satisfaction of the City representative.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Gas Line Trenching, Backfill, and Resurfacing is part of Add-Alternate 3 and shall be measured by the linear foot of trench construction, as shown within the construction plans and these Special Provisions. Gas Line Trenching, Backfill, and Resurfacing shall include all pavement and concrete removal, saw cutting, backfill, base/bedding, shading material, and resurfacing of the trench. SDG&E shall inspect/approve the trench and install the gas service line and energize the system prior to backfill and resurfacing.

4.2 PAYMENT

A. Gas Line Trenching, Backfill, and Resurfacing shall be paid by the linear foot based on the dimensions within the construction plans. Final alignment and exact point of connection to be coordinate with SDG&E prior to the start of construction. Full compensation for Gas Line Trenching, Backfill, and Resurfacing shall include furnishing the labor and materials, equipment, tools and incidentals involved in demolition, excavation, subgrade preparation, placement of backfill, stockpiling and re-use of suitable excavated material, disposal of surplus material, traffic control, encroachment permits, and resurfacing of the trench.

END OF SECTION

SECTION 31 63 29

DRILLED CONCRETE PIERS AND SHAFTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dry-installed drilled piers.

B. Related Specification Sections:

1. Section 033000 Cast-in-Place Concrete

2. Section 032000 Concrete Reinforcing

1.2 UNIT PRICES

A. Drilled Piers: Actual net volume of drilled piers in place and approved. Actual length, shaft diameter, and bell diameter if applicable, may vary, to coincide with elevations where satisfactory bearing strata are encountered. These dimensions may also vary with actual bearing value of bearing strata determined by an independent testing and inspecting agency. Adjustments are made on net variation of total quantities, based on design dimensions for shafts and bells.

1. Base bids on indicated number of drilled piers and, for each pier, the design length from top elevation to bottom of shaft, extended through the bell, if applicable, and the diameter of shaft and bell.

2. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete fill, testing and inspecting, and other items for complete drilled-pier installation.

B. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed outside dimensions of drilled piers cast against rock. Unit prices for rock excavation include replacement with approved materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture.

C. Shop Drawings: For concrete reinforcement.

1.5 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Material test reports.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Record drawings.

1.7 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report will be prepared for this Project and will be available for information only. Piers as currently shown on the Drawings are designed based on minimum criteria as per the 2015 California Building Code.

B. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.

1. Record and maintain information pertinent to each drilled pier and indicate on record Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Drilled-Pier Standard: ACI 336.1 except as modified in this Section.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Wire: ASTM A82/A82M, galvanized.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C150/C150M, Type I/II. Supplement with the following:

a. Fly Ash: ASTM C618, Class F.

B. Normal-Weight Aggregate: ASTM C33/C33M, graded, 1-1/2-inch (37-mm-) nominal maximum coarse-aggregate size.

1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C94/C94M and potable.

D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.

2. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.

3. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.

4. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

2.4 STEEL CASINGS

A. Steel Pipe Casings: ASTM A283/A283M, Grade C, or ASTM A36/A36M, carbon-steel plate, with joints full-penetration welded according to AWS D1.1/D1.1M.

2.5 CONCRETE MIXTURES AND MIXING

A. Refer to Section 033000.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Unclassified Excavation: Excavate to bearing elevations regardless of character of surface and subsurface conditions encountered.

1. Standard excavation includes excavation accomplished with conventional augers fitted with soil or rock teeth, drilling buckets, or underreaming tools attached to drilling equipment of size, power, torque, and downthrust necessary for the Work.

B. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.

C. Notify and allow testing and inspecting agency to test and inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by owner's representative.

1. Do not excavate shafts deeper than elevations indicated unless approved by owner's representative.

2. Payment for additional authorized excavation is according to Contract provisions for changes in the Work.

D. Temporary Casings: Install watertight steel casings of sufficient length and thickness to prevent water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls.

1. Remove temporary casings, maintained in plumb position, during concrete placement and before initial set of concrete, or leave temporary casings in place.

E. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.

3.2 INSTALLATION

A. Install steel casings of minimum wall thickness indicated and of diameter not less than diameter of drilled pier.

B. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

C. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by a qualified testing agency.

D. Place concrete to fall vertically down the center of drilled pier without striking sides of shaft or steel reinforcement.

E. Coordinate withdrawal of temporary casings with concrete placement to maintain at least a 60-inch (1500-mm) head of concrete above bottom of casing. Vibrate top 60 inches (1500 mm) of concrete after withdrawal of temporary casing.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Drilled-Pier Tests and Inspections: For each drilled pier, before concrete placement.

1. Soil Testing: Bottom elevations, bearing capacities, and lengths of drilled piers indicated have been estimated from available soil data. Actual elevations and drilled-pier lengths and bearing capacities are determined by testing and inspecting agency. Final evaluations and approval of data are determined by owner’s representative.

C. Concrete Tests and Inspections: ACI 301 (ACI 301M).

3.4 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aggregate Base Material

B. Installation Standards

C. Spreading of Material

D. Compacting

E. Field Quality Control

1.2 RELATED SECTIONS

Not Used

1.3 REFERENCE STANDARDS

A. Caltrans Standard Specifications, 2018 Edition

1. Section 26, "Aggregate Bases”

1.4 SUBMITTALS

A. Product Data: Submit source, gradation, R-value, sand equivalent, and durability for the proposed material.

B. Certified Test Results: At least seven calendar days in advance of desired date of ENGINEER'S approval, submit certified test results performed by an independent testing laboratory certifying that the proposed base material complies with the specifications. Test results shall not be more than 30 days old. Test results shall indicate type of aggregate, gradation, R-value, sand equivalent, and durability.

C. Documentation: Submit delivery tickets from each load delivered to the Worksite which include, as a minimum the supplier, material and its composition, and material weight.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE MATERIAL

A. Aggregate base shall be in Class 2, 3/4 in accordance with Section 26, Aggregate Bases, Caltrans Standard Specifications.

2.2 SOURCE QUALITY CONTROL

A. Once the material has been approved, change source of supply only after obtaining approval of the new source material.

B. Approval of a source of supply does not relieve the Contractor from the obligation to furnish material which conforms to the specified requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect in accordance with the Contractor's Quality Management Plan and document in writing acceptance of the prepared subgrade before proceeding with the placement of aggregate course.

B. The subgrade to receive aggregate course, immediately prior to spreading, shall conform to the compaction and elevation tolerances indicated for the material involved and shall be free of standing water and loose or extraneous material.

3.2 INSTALLATION STANDARDS

A. Aggregate base course shall be spread over the prepared subgrade in accordance with Section 26 of the Caltrans Standard Specifications.

B. Aggregate base course shall be compacted to a minimum of 95 percent relative compaction as obtained by the ASTM D 1557 test procedure.

C. Aggregate course shall have minimum uniform thickness after compaction of dimensions indicated on the Plans. Where not indicated, compacted thickness shall be 6 inches. Grade tolerances shall be in accordance with Section 26 of the Caltrans Standard Specifications.

3.3 FIELD QUALITY CONTROL

A. Field testing shall be performed in accordance with the test methods specified in Caltrans Standard Specifications Section 26. Tests shall be performed by Contractor -hired independent testing laboratory.

B. Perform sampling and tests of the aggregate base materials for grading, sand equivalent, resistance (R-value) and durability to determine compliance with specified requirements. Samples shall be taken from material as delivered to the site. Tests shall represent no more than 500 cubic yards of base course material or one day's production, whichever is the lesser amount.

C. Perform field tests to determine compliance with requirements for compaction and moisture content of aggregate bases. Testing frequency shall be not less than one test for every 2,000 square feet of aggregate base material, per layer or lift.

D. Measure thickness of the aggregate bases. Perform a minimum of one test for each unit of 2000 square yards of aggregate bases installed at a location selected by the ENGINEER. For units of aggregate bases less than 2000 square yards, perform a minimum of one test. In that

unit where the aggregate subbase or base is deficient by more than 0.05 foot in thickness, the deficiency shall be corrected to meet the required grade and thickness using a method approved by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Aggregate Base to be measured by the cubic yard in accordance with the Standard Specifications and these Special Provisions. The quantity is determined from the dimensions shown in the Construction Plans and Details.

4.2 PAYMENT

A. Aggregate Base to be paid by the cubic yard in accordance with the Standard Specifications and these Special Provisions.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Asphalt Materials

B. Aggregate materials.

C. Asphalt paving base course and wearing course

D. Asphalt paving overlay for existing paving

E. Field quality control.

1.2 REFERENCE STANDARDS

A. APWA Standard Specifications for Public Works Construction (Greenbook), 2018 Edition

B. Caltrans Standard Specifications, 2018 Edition

1. Section 39, “Asphalt Concrete”

1.3 SUBMITTALS

A. Product Data:

1. Submit product information for asphalt and aggregate materials.

Submit mix design with laboratory test results supporting design.

B. Certified Test Results: At least seven calendar days in advance of desired date of ENGINEER'S approval, the CONTRACTOR shall submit certified test results performed by an independent testing laboratory certifying that each batch of the proposed asphalt binder material complies with the specifications. Test results shall not be more than 12 months old.

PART 2 - PRODUCTS

2.1 TRENCH RESURFACING

A. Trench resurfacing for asphalt paving areas shall be per Detail 5 per Civil Details.

2.2 ASPHALT PAVING

A. Asphalt Concrete paving depth and horizontal dimensions as shown on construction plans.

2.3 SOURCE QUALITY CONTROL

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the City of San Diego for asphalt paving work.

PART 3 - EXECUTION

3.1 EQUIPMENT

A. Spreading and Compacting Equipment

1. Spreading and compacting equipment shall conform to Section 39-2.01C(2), "Spreading and Compacting Equipment" of the Caltrans Standard Specifications.

3.2 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Asphalt Concrete will be measured by the ton of asphalt actually placed and verified by the ENGINEER by the certified weight tickets. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

4.2 PAYMENT

A. The contract unit price paid per ton of Asphalt Concrete actually placed and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in installing Asphalt Concrete complete in place, including testing, job mix formula preparation and approval process, tack coat, and asphalt cold joint adhesive (as required) as shown on the construction drawings and as specified in these Special Provisions.

END OF SECTION

SECTION 32 13 13

VEHICULAR CONCRETE PAVING

PART 1 – GENERAL

1.1 SECION INCLUDES

A. Vehicular Concrete Paving

1.2 REFERENCE STANDARDS

A. APWA Standard Specifications for Public Works Construction (Greenbook), 2018 Edition

B. Caltrans Standard Specifications, 2018 Edition

1.3 SUBMITTALS

A. Provide mix designs for each class of concrete used in accordance with Section 201-1 of the Standard Specifications for Public Works Construction.

B. Contractor shall provide a jointing plan to be approved by the Engineer.

C. Mock-Ups: Provide sample panels not less than 20 square feet in size on the project site showing the proposed texture, finish, and workmanship. Upon approval, each panel shall become the standard of comparison for all concrete indicated to receive that finish.

Sample panels shall be approved before proceeding with the respective work. Sample panels, if approved, may be left in place as part of the completed construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cement, Aggregate, Water and Admixtures: Conform to Section 201-1 Portland Cement Concrete, Subsection 201-1.2 Materials of the Standard Specifications for Public Works Construction.

B. Reinforcing Bars and Mesh: Conform to Section 201-2 of the Standard Specifications for Public Works Construction.

C. Expansion Joint Filler and Joint Sealants: Conform to Section 201-3 of the Standard Specifications for Public Works Construction.

D. Concrete Curing Materials: Conform to Section 201-4 of the Standard Specifications for Public Works Construction.

E. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement. Use flexible spring steel forms or laminated boards to form radius bends.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Scarify and recompact earth subgrade in conformance with geotechnical recommendations and as shown, on plans.

3.2 CONCRETE PLACEMENT

B. Construct all pavement, including placement or construction of concrete, forms and joints, curing, repairing, backfilling, cleanup, etc., in conformance with Section 303-5 of the Standard Specifications for Public Works Construction.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Concrete paving will be measured by the cubic yard of concrete placed. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage.

4.2 PAYMENT

B. The contract unit price paid per CY of concrete shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in installing Concrete Paving, as shown on the construction drawings and as specified in these Special Provisions.

END OF SECTION

SECTION 32 17 23

PARKING STRIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, materials, tools, equipment, incidentals, layout, removal of existing striping, and markings and for doing all work involved in placing the striping, and markings as called on the Plans and in these Special Provisions.

1.2 RELATED SECTIONS

NOT USED

1.3 REFERENCE STANDARDS

A. Caltrans Standard Specifications, 2018 Edition

1. Section 84, “Markings”

B. California Manual on Uniform Traffic Control Devices, 2014 (Revision 6)

1.4 SUBMITTALS

A. Product Data:

1. Submit name of manufacturer.

2. Submit dimensions.

3. Submit item identification number.

B. Certificate of Compliance: At least seven calendar days in advance of desired date of ENGINEER'S approval, the CONTRACTOR shall submit a certificate of compliance for all pavement markings material.

PART 2 - PRODUCTS

2.1 TRAFFIC STRIPES AND PAVEMENT MARKINGS

A. Traffic Stripes and Pavement Markings and Curb Paint shall conform to Section 84, “Markings”, Caltrans Standard Specifications, the California Manual on Uniformed Traffic Control Devices and these Special Provisions.

PART 3 - EXECUTION

3.1 INSTALLATION AND REMOVALS

A. Installation and Removals of traffic stripes and pavement markings shall conform to Section 84, “Markings”, Caltrans Standard Specifications.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

A. The contract unit price paid per EA for Install Lane Number shall also include full compensation to supply all labor, materials, tools, equipment, incidentals, layout, removal of existing striping, legends, and markings and for doing all work involved in placing the striping, legends and markings as called on the Plans and in these Special Provisions.

B. The contract unit price paid per LF for Install Yellow Stripe With Contrast shall also include full compensation to supply all labor, materials, tools, equipment, incidentals, layout, removal of existing striping, legends, and markings and for doing all work involved in placing the striping, legends and markings as called on the Plans and in these Special Provisions.

C. The contract unit price paid per LF for Install 4" Red Stripe shall also include full compensation to supply all labor, materials, tools, equipment, incidentals, layout, removal of existing striping, legends, and markings and for doing all work involved in placing the striping, legends and markings as called on the Plans and in these Special Provisions.

END OF SECTION

SECTION 32 31 13

BOLLARDS AND BOLLARD COVERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Steel pipe bollards for equipment and structure protection.

B. Bollard covers: Protective pipe sleeves for steel pipe bollards.

1.2 RELATED SECTIONS

A. Not used.

1.3 REFERENCE STANDARDS

A. Not used.

1.4 SUBMITTALS

A. Product Data: Submit to the Engineer per Section 3.9, "Submittals" under General Conditions, the manufacturer's or supplier's certification that the materials delivered to the site are in compliance with the Specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bollards shall be 6" diameter and 4’-0” tall standard galvanized pipe and concrete filled bollard per Civil Details of the plans.

B. Bollard Covers shall be yellow high-density polyethylene with a dome top.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Bollards are to be set in holes which shall have been formed or drilled as shown on the plans or as directed by the Engineer. After the bollards have been set in place and properly supported to hold them in line and grade, the remaining space shall be filled with concrete as specified in the project plans.

B. After bollards are placed, install yellow high-density polyethylene bollard covers as specified in the project plans and per the manufacturer’s recommendations.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Bollards and Bollard Covers shall be measured by each bollard with cover and installed.

4.2 PAYMENT

A. The contract price for Bollard and Bollard Cover shall include the full compensation for furnishing all labor, materials, tools, equipment, and incidentals, for acquiring and installing the bollards complete in place, touch-ups, and yellow bollard cover, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

END OF SECTION

SECTION 44 13 73

CATALYTIC REDUCTION EQUIPMENT

PART 1 - GENERAL

The General Provisions of the Contract, including General and Special Conditions and the requirements of Division 1, apply to the Work in this Section.

1.1 WORK INCLUDED

A. The installation of the catalytic reduction system shall include the following:

1. Horizontal catalyst/oxidation reactor vessel, including catalyst.
2. Mixer assembly with injection tubes.
3. Urea storage tank, with valving and instrumentation.
4. Metering/Injection system complete with metering pump, dosing box, and atomizing air compressor.
5. Engine exhaust gas continuous sampling system.
6. Flexible connections, as required.
7. Urea injection control and instrumentation system.
8. PLC controls with indicators, alarms, and shutdown annunciators.
9. All necessary trim, pipe, valves instruments and fittings within the boundaries of equipment furnished by Suppliers (interconnecting tubing is by others).
10. Bolts, nuts, and gaskets at system flanged interfaces.
11. Electrical wiring, conduit and all electrical components within the boundaries of manufacturer's scope of supply.
12. Prime and finish painting of equipment, components and structure, auxiliary equipment and piping, and other exposed steel surfaces.
13. Shop testing.
14. Startup and two-year operational spare parts.
15. Special tools required for erection, operation, or maintenance.
16. Foundations, structural steel, anchor bolts, washers, and nuts.
17. Insulation and painting.
18. On-site technical support and supervision during installation and start-up.

19. Operator Training.

B. The SCR system shall be installed outdoors in the exhaust duct of one (1), natural gas fueled, engine/generator set (refer to specification 263213). The SCR system shall reduce the exhaust emissions to the level as listed in Attachment No. 2. The scope of equipment supplied shall be as specified herein, and in the Equipment Data Sheets on which the operating conditions and special requirements are listed.

C. In the event the Engine exhaust temperature exceeds 975 deg F (including all exhaust temperature tolerances) thus causing ammonia slip above CA limits at any load point, an additional oxidizing catalyst or a pre-cooler shall be provided to cool the exhaust prior to the SCR catalyst and to limit the ammonia slip to the level acceptable by EPA. The SCR catalyst shall be able to handle the elevated flue gas temperatures during the engine low load operations.

1.2 QUALITY ASSURANCE

A. The Supplier shall be responsible for satisfactory total operation of the SCR and its certification. This supplier shall have had experience with three (3) or more installations of SCRs of comparable size and complexity in regards to coordinating, engineering, testing and supervising. Each of these installations shall have been in successful operation for three (3) or more years. Prior to review of submittals, the Engineer reserves the right to:

1. Have the Supplier submit a list of locations of similar installations.

2. Inspect any of these installations and operations of the SCR system, and question the user concerning the installations without the presence of the Supplier.

B. Factory authorized representative shall be capable of providing emergency maintenance and repairs at the project site within four (4) hours maximum of notification.

C. Supplier shall be responsible for coordination of all sub-suppliers, and for overall guarantees relating to the mechanical and electrical compatibility of equipment, including the proper functioning of instrumentation, control and the interaction of the overall system.

D. Manufacturer's quality plan shall be available for review and shall specify how Manufacturer shall ensure that:

1. All engineering, design, drafting, calculations, specifications, and other related work performed by Supplier, his sub-suppliers, or his subcontractors is ensured of being accurate, technically correct, and in compliance with all specifications, codes, standards, and other technical requirements of the specification.

2. All applicable Standards and Engineering specifications, documents, and other requirements are communicated to and complied with by sub-suppliers and subcontractors.

3. All materials can be verified as to origin and conformance to requirements.

4. Fabrication is in accordance with approved drawings and procedures. Non-conforming work is subject to corrective action or replacement.

5. Non-conforming items are not shipped without Owner's authorization.

6. Verification equipment is correctly calibrated and adjusted.

E. Experience: Equipment shall be produced by a manufacturer of established reputation with a minimum of five years experience supplying specified equipment.

F. Manufacturer's Representative:

1. Installation: Provide a qualified manufacturer's representative at site to supervise work related to equipment installation, check out and start up.

2. Training: Provide technical representative to train Owner's maintenance personnel in operation and maintenance of specified equipment.

1.3 STANDARD AND REGULATORY REQUIREMENTS

A. All materials, design, fabrication, assembly and test procedures shall be in accordance with the requirements of all applicable codes, standards or regulations having jurisdiction over the work.

B. Reference to any code, standard or regulation shall mean the latest published editions, including addenda, supplements and revisions thereto, which are in effect when the purchase order is awarded.

C. In the event of conflict between codes, standards or regulations, the conflict shall be referred to the Engineer for resolution.

D. The organizations having jurisdiction include, but are not limited to, the following:

1. ANSI American National Standards Institute

2. ASME American Society of Mechanical Engineers

3. EPA Federal, State and Local Environmental Protection Agencies

4. IBC International Building Code, California Edition

5. ISA Instrument Society of America.

6. NEC National Electrical Code.

7. NEMA National Electric Manufacturer's Association.

8. NFPA National Fire Protection Association.

9. OSHA Regulations of the Occupations Safety and Health Administration.

10. UL Underwriter's Laboratories Inc.

11. The state, county or municipal laws and regulations governing the location where the equipment is to be installed.

E. Equipment indicated within this specification section shall comply with all applicable national, state and local codes and regulations, including seismic and fire codes and regulations. Additional, more specific compliance requirements may be listed under individual equipment headings.

1.4 SUBMITTALS

A. Refer to Drawing Q9.06 Shop Equipment Schedule for submittal requirements listed in the "Submittals" column of the equipment list. In the event of conflict between Drawing Q9.06 Shop Equipment Schedule and the following expanded submittal descriptions, Drawing Q9.06 Shop Equipment Schedule is to govern.

B. Product Data:

1. Submit Product Data in accordance with Division 1 - General Requirements of these specifications.

2. All Product Data submittals shall identify proposed project specific items marked by arrow, circle, underline, reproducible highlight, or other markings clearly discernable by the reviewer, to show which specific items, parts and accessories are being submitted for the project product data review. Non-marked or generic product data submittals with no marks indicating specific items, parts and accessories will be a cause for rejection.

3. Restrict submitted material to pertinent data. For instance, do not include manufacturer's complete catalog when pertinent information is contained on a single page.

C. Operation and Maintenance Manual:

1. Provide a Complete parts list, operating instructions, and maintenance manual covering equipment at time of installation including, but not limited to:

a. Description of system and components.

b. Schematic diagrams of electrical, plumbing and compressed air systems.

c. Manufacturer's printed operating instructions.

d. Printed listing of periodic preventive maintenance items and recommended frequency required to validate warranties. Failure to provide maintenance information will indicate that preventive maintenance is not a condition for validation of warranties.

e. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts stockage quantity and local parts and service source.

2. Assemble and provide copies of manual in 8-1/2 by 11 inch format. Foldout diagrams and illustrations are acceptable. Manual to be reproducible by dry copy method. Provide copies per provisions of Division 1 - General Requirements.

D. Shop Drawings: Submit in accordance with Division 1 -General Requirements of these specifications. Refer to Drawing Q9.06 Shop Equipment Schedule for the equipment mark numbers requiring shop drawings.

1. Submitted shop drawings shall be project specific and shall include a minimum 1/8 inch to 1 foot scaled (or larger standard architectural imperial scale), dimensioned, graphical representation of the size, orientation, and location for the submitted equipment. The drawings shall further include dimensions from structural elements or architectural grid lines, operational clearances, locations of any utility service connection points, mounting requirements, and structural supports required for the submitted equipment.

1.5 SPARE PARTS

A. With his proposal, the Supplier shall identify all spare parts, including source, cost and identification of the manufacturer and associated model number, critical to initial startup that are recommended for the Engineer/Owner to have on-hand to minimize unplanned construction delays or equipment downtime, as well as a standard priced spare parts list for replacement of components as needed. The Supplier shall recommend spare parts expected for replacement during startup and two (2) years of operation.

1.6 PRODUCT SUBSTITUTIONS

A. Follow requirements specified in Division 1 - General Requirements.

B. Additional costs resulting from substitution of products other than those specified, including drawing changes and construction, will be at the expense of the Contractor.

C. Substitution Approval: Manufacturers listed for each equipment item may bid without submittal for that item. Manufacturers not listed shall submit for approval in accordance with "Instructions to Bidders". Prior to installation, submittals for each equipment item by Mark Number shall be provided in accordance with Division 1 - General Requirements.

1.7 WARRANTY

A. The Manufacturer shall warrant that all materials and equipment furnished under this contract will be new and of good quality, free from defects in design, workmanship, and materials.

B. Each item of equipment, or part thereof, proving to be defective within the specified period of the warranty shall be replaced, free of defect, without cost to the Owner.

C. The warranty period shall be the Manufacturer's standard warranty period, but not less than a minimum of twelve (12) months after startup, or 18 months after delivery of the equipment at the site (whichever comes first).

D. Warranty shall include materials and labor necessary to correct defects.

E. Defects shall include, but not be limited to noisy, rough, or substandard operation; loose, damaged, and missing parts; and abnormal deterioration of finish.

F. Submit warranties in accordance with Division 1 - General Requirements of these specifications.

G. All parts shall be readily available locally in the United States.

1.8 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer's containers, appropriately packaged and/or crated for protection during domestic shipment and storage in humid, dusty conditions.

B. Indelibly label all containers, including those contained in others, on outside with item description(s) per title and Mark Number of this specification.

C. Provide equipment and materials specified complete in one shipment for each equipment item. Split or partial shipments are not permissible.

1.9 LABELING

A. Manufacturer shall securely attach in a prominent location on each major item of equipment a non-corrosive nameplate showing manufacturer's name, address, model number, serial number, and pertinent utility or operating data.

B. All electrical equipment and materials shall be new and shall be listed by Underwriter's Laboratories, Inc. (U.L.), or other National Recognized Testing Laboratory (NRTL), in categories for which standards have been set by that agency and labeled as such in the manufacturer's plant.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers, subject to compliance with requirements of this specification, are as follows:

1. Safety Power Inc.

2. Miratech Corp.

3. Steuler

4. Johnson Matthey

2.2 GENERAL

A. Asbestos or asbestos filled materials shall not be used for any component.

B. The SCR system shall be guaranteed to achieve reduction of emissions to levels below the maximum site emissions from a minor stationary source located in a Severe Non-Attainment area as defined by Title V of the Federal Clean Air Act of 1990, as well as the emissions reduction criteria stipulated by the San Diego Air Permit and Control District.

C. Urea is the only reducing agent that will be accepted for use in the SCR system.

D. Supplier shall ensure the total back pressure imparted on the engine exhaust by the SCR System, and other in-line exhaust components shall be less than the engine manufacturer recommends

2.3 SELECTIVE CATALYTIC REDUCTION SYSTEM

A. SCR Reactor Vessel

1. The SCR catalyst reactor housing shall be fabricated from non-scaling heat resistant stainless steel, of rigid reinforced construction. The SCR catalyst reactor housing shall be equipped with ANSI flanges at both ends. The SCR housing and all components in contact with engine exhaust shall be suitable for continuous operation at the maximum engine exhaust temperature without scaling, deformation or any other physical damage for the life of the system.

2. The SCR reactor housing shall be equipped with insulation supports. Insulation shall be supplied and installed by others.

3. The SCR reactor housing shall be designed to be mounted horizontally in the engine exhaust gas duct and be supported from overhead. The SCR supporting steel shall be provided by Supplier.

4. The reactor housing shall be equipped with sample gas ports, maintenance and inspection doors for easy access and catalyst bed loading and unloading, instrumentation connections and other connections as deemed necessary by the Supplier.

5. The SCR vessel catalyst core shall consist of an adequate number of layers of catalyst material, with room for one (1) additional layer of material in the reactor housing. Each layer of catalyst material shall be of a modular design. Catalyst modules shall be of size and weight to facilitate manual loading.

6. The catalyst shall be type as recommended by the SCR manufacturer and shall be designed for operation at the maximum and minimum exhaust temperatures achievable by the engine.

B. Catalyst

1. General

a. Shall be extruded, ceramic blocks with square monolithic channels (honeycomb type). The catalyst material shall be mixed into the substrate prior to extrusion. The catalyst material composition shall be tungsten, vanadium, titanium and other base metals. The catalyst shall have a proven track record in similar applications.

b. Shall operate and perform properly without the use of a guard bed or filter which may become masked, coated and clogged and require frequent cleaning and/or change-out due to compounds and particulates such as soot or ash.

c. Shall be shop assembled with a high temperature fiberglass gasket material. The modules should be approximately 6 inches x 6 inches in cross section and 6, 12 or 18 inches in depth for ease of field installation and removal from the reactor housing.

d. Shall be designed to minimize the SO2 to SO3 conversion rate.

e. Shall be of sufficient mass such that the natural frequency in or around the engine is far above the resonant frequency of the engine firing so it will not resonate.

2. SCR Catalyst

a. Shall have a minimum active surface area of 270 sq ft/cu ft.

b. Shall have an operating range of 572°F to 986°F

3. Ammonia Reduction Catalyst

a. Shall have a minimum active surface area of 270 sq ft/cu ft

b. Shall have an operating range of 572°F to 986°F

c. Shall reduce the concentration of residual ammonia in the exhaust gas without creation of NOx

4. Oxidation Catalyst

a. Shall have an operating range of 572°F to 986°F

b. May be located within the SCR Converter Housing or in a separate housing upstream of the injection lance.

C. Catalytic System Accessories

1. The SCR system shall include a static exhaust gas mixer to be mounted upstream of the SCR catalyst reactor housing. The mixer shall insure full and complete mixing of the atomized injected reducing agent with the engine exhaust gas under all engine load conditions. The static mixer shall be fabricated from non-scaling heat resistant stainless steel. The static mixer shall be equipped with a stainless steel injection lance, through which the atomized reducing agent is introduced into the exhaust stream. The static mixer shall be equipped with ANSI flanges at both ends.

2. The static mixer shall be equipped with insulation supports. Insulation shall be supplied and installed by others.

3. The SCR system shall be supplied with a reducing agent storage, injection and control system which shall included but not necessarily limited to the follow: Urea storage tank, metering/injection pump, dosing box, atomizing air compressor, and all appurtenances required to form a complete and operable system. The capacity shall by as recommended by the SCR supplier.

4. Injection Lance

   a. The reducing agent injection lance constructed of 304 Stainless Steel shall be installed on the engine exhaust upstream from the reactor housing at a location to achieve proper reducing agent distribution and atomization. Injection nozzles shall be oriented with respect to engine exhaust gas flow for optimum dispersion of the reducing agent into the engine exhaust gas upstream of the catalyst bed.

   b. The injection lance shall be of the two-phase type using compressed air to atomize the reducing agent.

   c. The injection lance assembly shall be designed for ease of installation and service. The catalyst manufacturer shall supply mating flange for saddle connection of the lance to the exhaust duct

5. Compressed air system, for urea atomization shall be provided by the Supplier.

6. The reducing agent metering and control system shall be capable of insuring, that the maximum ammonia slip to atmosphere from the SCR system does not exceed the limits specified in Attachment No. 2 under all engine operation conditions. Use of an oxidation catalyst mounted downstream of the SCR catalyst to eliminate excess ammonia slip to atmosphere is prohibited.

7. The Urea/water solution shall be directed into the exhaust gas stream by means of a metered injection nozzle system.

8. The Supplier shall provide one (1) 360 gallon, polyethylene storage tank for urea/water solution. The tank supplied shall be installed indoors within the generator enclosure and be of vertical design. The Urea tank should be manufactured from High Density Cross linked Polyethylene or steel. It should be one piece seamless molded designed with wall thicknesses conforming to ASTMD-1998 standards for liquid storage. Accessories included with the tank:

   a. Level Indication

   b. High/Low Level Alarms

   c. Fill system with vacuum break

D. Piping/Tubing

1. All Urea solution and compressed air pipe/tube materials and components shall be stainless steel. Minimum tube size shall be 1/2 inch nominal. Minimum tubing thickness is 0.063 of an inch.

2. Stainless steel tubing sizes shall be limited to 1" and below. Carbon steel, cast, ductile, or malleable iron piping material shall not be used

3. All stainless steel Urea piping shall be welded. Threaded connections shall be minimized. Pipe threads shall conform to ANSI B2.1, Taper Pipe Threads. Taper threaded connections are unacceptable in stainless steel.

2.4 INSTRUMENTATION AND CONTROLS

A. PLC based, closed loop analysis and reactant injection system to maximize reactant injection efficiency by continuously sampling and analyzing the treated exhaust gas.

B. The SCR control system shall be equipped with an interface display and with a serial interface to permit communication and monitoring of the SCR system from the Building Automation System (BAC). The Supplier shall provide and configure the Modbus communications interface, provide programming of all parameters required to effectively monitor the SCR system from the BAC.

C. Completely pre-wired Control panel, built in accordance to manufacturer standards, with UL listed components, shall be provided.

D. The Temperature and Urea flow information shall be continuously stored in an electronic data storage for the EPA compliance record.

E. General

1. All Control system components shall be designed to operate on 208VAC, Single Phase, 60Hz power with a maximum current draw of 10 Amps per engine set.

2. The control system shall be Programmable Logic Controller based and provide automatic SCR system start-up, operation, shutdown, monitoring and annunciation of abnormal conditions.

3. All tubing within the system shall be either Type 316 stainless steel tubing or heavy wall Teflon. Tubing shall be laid out to minimize elbows and bends, and to present neat, orderly assembly.

4. Wiring within the panel shall be arranged in wire tray to not interfere with routine servicing. All wiring shall be numbered at both ends. Analog signal wiring shall be routed away from power wiring to avoid potential interference. All wiring to and from the metering panel shall terminate on easily accessible, numbered terminal blocks. All components shall be identified with a device tag corresponding to the wiring diagrams and P&ID supplied with the equipment.

5. The control system shall control and provide automatic SCR system start-up, operation, shutdown, monitoring and annunciation of abnormal conditions.

6. The metering panel shall control the amount of reducing agent injected into the exhaust gas stream. The panel shall contain the reducing agent metering equipment and their controls. Controls shall include a main disconnect breaker for power supply; indication of operating status; a PLC to perform all interlock, sequencing, alarm, and injection rate control functions; 24 Volt DC power supply.

7. The reducing agent to be used in the SCR system shall be technical grade urea dissolved in demineralized water to provide a 32 to 40 percent aqueous solution or 19% aqueous ammonia solution.

F. Closed Loop Control Unit

1. Reactant injection rate shall be based on NO emission values and may not be solely dependent on engine speed or power output feed back.

2. Analysis of the NO concentration shall be via a redundant integrated electrochemical cell based sample system. Interfacing with 3rd party analysis systems shall not be allowed

3. Measuring system accuracy and zero must be confirmed on 5 minute intervals by the control system without the use of external calibration/span gas.

4. Data shall be available to the operator via an LCD display. The following data shall be included:

   a. Emission Value

   b. Emission Target

   c. Reactant Injection Rate

   d. Operational Alarms with ID Number and Description

5. The system shall automatically stop and re-start under the following conditions:

   a. Catalyst bed temperature less than 572 °F

   b. Engine shutdown

6. Data Logging capabilities. The Controller should be able to data log every 5 minutes and store up to 3 months of data for troubleshooting purposes the following items.

   a. Date

   b. Time

   c. Engine Load (%)

   d. Dosing Valve Opening

   e. NO after SCR (ppm)

   f. NO emissions (ppm)

   g. Reactant flow (l/hr)

   h. Temperature after converter (C)

i. Temperature in Converter (C)

j. Pressure drop across converter (mbar)

7. Networking: The controller platform will utilize TCP / IP networking and can accommodate up to 16 control panels and 2 pump controllers on the same network. This network will allow visualization of the network from any controller. Remote access to network via internet for visualization or troubleshooting should be available via dedicated IP address.

2.5 FINISHES

A. All carbon steel surface and equipment shall be primed and finished painted in accordance with manufacturer's standards. In the absences of specific manufacturer's standards, prime paint with a Zinc rich primer (dry film thickness - 2.0 mils min, 2.5 mils max), finish coat shall be of Aliphatic Polyurethane (dry film thickness - 2.0 mils min, 2.5 mils max) or standard manufacturer epoxy paint.

B. Stainless steel components shall not be painted.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas, equipment bases, and conditions, with installing Contractor present, for compliance with requirements for installation and other conditions affecting SCR installation and performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before SCR system installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. The installation shall be performed in accordance with shop drawings, specifications, and the manufacturer's instructions, and with recognized industry practices, to ensure proper performance in accordance with the specifications.

B. Provide enclosure manufacturer’s site personnel to supervise reassembly of the enclosure as well as provide engine manufacturer's certified technicians to perform reassembly of the generator set on site to maintain integrity of the product and warranty.

C. Coordinate with the work of other trades including piping, breeching, electrical power and accessories as necessary to provide a complete operational system.

D. Include the installation of control and monitoring and power panels and other appurtenances to the extent that such appurtenances are not factory installed and wired.

E. Include field inter wiring and power supply and control connections for air compressor, air dryer, urea pumps, switches, solenoid valves and other miscellaneous items as required in

accordance with manufacturers wiring diagrams. Such wiring shall include (but not be limited to):

1. Wiring between urea control panel and power supplies thereto.

2. Power supply wiring and control wiring for engine jacket water heater.

3. Power supply wiring and control wiring for fuel pumps, integral fuel tank, float switches, valves and other urea supply system components.

F. Ground equipment.

3.3 FIELD QUALITY CONTROL

A. The complete installation shall be checked for procedural and operational compliance by a representative of the system manufacturer's authorized local dealer. The engine lubricating oil and antifreeze, as recommended by the system manufacturer, shall be provided by the generator set dealer. If different manufacturers furnish switchgear and generator sets, technical representatives of both manufacturers' authorized dealers shall verify the installation meets requirements. Any deficiencies shall be noted and corrected by the Contractor.

B. The system manufacturer's dealer representative shall be present to assist the Contractor during start-up, systems check, adjusting, and any site testing required after the installation is complete.

3.4 POST-INSTALLATION TESTING

A. The bidder shall furnish all consumables necessary for testing. Any defects, which become evident during the test shall be corrected by the bidder at his own expense prior to shipment to the jobsite.

1. Furnish one full tank of urea.

B. After final connections are made and prior to authorizing payment, specified equipment shall be tested for compliance with all specified features in the presence of the Engineer using acceptance procedures provided by the manufacturer.

C. Following installation, the following tests shall be performed by the system manufacturer's local dealer representative(s) in the presence of the owner's engineer or designated appointee:

D. Operation

1. Load - Four hours operation at 100% of full load rating. After the first fifteen minute stabilization period at full load, the following shall be recorded at fifteen-minute intervals:

a. Voltage and amperage (3 phase), frequency

b. Fuel pressure, oil pressure and water temperature

c. Exhaust gas temperature at engine exhaust outlet

d. Ambient temperature

2. Proper operation of controls, engine shutdown, and safety devices shall be demonstrated.

3.5 CLEANUP

A. Touch-up damage to painted finishes.

B. Wipe and clean equipment of any oil, grease, and solvents, and make ready for use.

C. Clean area around equipment installation and remove packing or installation debris from job site.

D. Notify Engineer for acceptance inspection.

3.6 TRAINING

A. The Supplier shall provide on-site training for operating and maintenance personnel. This service shall include operating instructions and training for Owner's personnel. Instructions shall include, but not be limited to, training materials, hands-on and classroom instruction and complete review of all manuals. Classroom training shall be performed in a maximum of 8-hour daily sessions. The hands-on instructions shall include start-up, operation (normal and expected transients), shutdown and maintenance of all systems.

3.7 SERVICE MANUALS AND PARTS BOOKS

A. The system manufacturer's authorized local dealer shall furnish one copy each of the manuals and books listed below for each unit under this contract:

B. Operating Instructions - with description and illustration of all SCR controls and indicators.

C. Parts Books - which illustrate and list all assemblies, subassemblies and components, except standard fastening hardware (nuts, bolts, washers, etc.).

D. Preventative Maintenance Instructions - on the complete system that cover daily, weekly, monthly, biannual, and annual maintenance requirements and include a complete lubrication chart.

E. Troubleshooting Chart - covering the complete SCR system showing description of trouble, probable cause, and suggested remedy.

F. Recommended Spare Parts List - showing all consumables anticipated to be required during routine maintenance and test.

G. Wiring Diagrams and Schematics - showing function of all electrical components.

H. All manuals and books described above shall be contained in rigid plastic pouches.

3.8 SPECIAL TOOLS

A. The Supplier shall furnish one (1) set of special tools required for the SCR system proposed.

PART 4 – ATTACHMENTS

4.1 Data Sheets for SCR System, Emissions Data and Electrical Requirements

ATTACHMENT NO. 1 - SCR SYSTEM DATA SHEET

Service: Selective Catalytic Reduction system (SCR) for one (1) 1000 (+/-5%) kW engine generator set. The SCR system shall reduce the exhaust gas emissions to the level as listed in Attachment No. 2.

Scope: Supplier shall supply, as a minimum, SCR system components as follows:

(1) SCR Reactor housing for horizontal gas flow (with support steel and insulation supports) loaded with SCR catalyst material

(1) Static Mixer

(1) 360 gallon Urea Storage Tank with level transmitter and tank trim

(1) Urea injection system, pumps, dosing box, atomizing air compressor

(1) Electrical equipment and control system

Note: Supplier to furnish information marked with * with the BID

Operating Data	**Specified Information**	**Information by**
Natural Gas Engine Manufacturer	By Supplier	*
Natural Gas Fuel Consumption	By Engine Supplier	*
Load, [%] HP/ kW	By Engine Supplier	*
Exhaust flow rate, wet basis	By Engine Supplier	*
Exhaust flow rate, dry basis	By Engine Supplier	*
Engine exhaust gas temperature	By Engine Supplier °F	*
Consumption of Urea	By SCR Supplier	*
Consumption of water	By SCR Supplier	*
Pressure drop across SCR	By SCR Supplier	*
Pressure drop across Static Mixer	By SCR Supplier	*
Guarantee for SCR catalyst	By SCR Supplier (operating hours)	*

SCR SYSTEM DATA:

Descriptio	**Specified Information**	**Information by**
Urea Consumption – 32.5%	N/A	*
SCR Pressure Loss, inches WC	N/A	*

SCR REACTOR DIMENSIONS:

Descriptio	**Specified Information**	**Information by**
Length / Width / Height	N/A	*

Cross section approx.	N/A	*
Reactor material	Stainless Steel	*
Weight without catalyst material	N/A	*
Weight of Catalyst material	N/A	*
Inlet/outlet flange Type/Size	ASME B16.5	*

SCR-CATALYST MODULE

Descriptio	Specified Information	Information by
Make / Model / Manufacturer	By SCR Supplier	*
Catalyst Module	(*) layers Catalysts + (1) spare	*
Catalyst type /material	By SCR Supplier	*
Catalyst module dimensions	Incl. stainless steel wire mesh	*
Length / Width / Height	By SCR Supplier	*
Catalyst module quantities	By SCR Supplier	*
Arrangement	By SCR Supplier	*
Total catalyst surface	By SCR Supplier	*
Guarantee life of catalyst	By SCR Supplier (operating hours)	*
Min / Max Catalyst Bed Temp	By SCR Supplier	*
Min / Max Temp at Urea Injection	By SCR Supplier	*
Min/Max exhaust gas Temp. at SCR	By SCR Supplier	*
Min / Max press drop across	By SCR Supplier	*
Ammonia Slip (ppmvd)	< 8 ppmvd	*

CO-CATALYST MODULE

Descriptio	Specified Information	Information by
Make / Model / Manufacturer	By SCR Supplier	*
Catalyst Module	(*) layer(s)	*
Catalyst type /material	By SCR Supplier	*
Catalyst module dimensions	Incl. stainless steel wire mesh	*
Length / Width / Height	By SCR Supplier	*
Catalyst module quantities	By SCR Supplier	*
Arrangement	By SCR Supplier	*
Total catalyst surface	By SCR Supplier	*
Guarantee life of catalyst	By SCR Supplier (operating hours)	*
Min / Max Catalyst Bed Temp	By SCR Supplier	*
Min / Max Temp at Urea Injection	By SCR Supplier	*
Min / Max press drop across	By SCR Supplier	*

SCR STATIC MIXER DIMENSIONS

Descriptio	Specified Information	Information by
Length / Width / Height	N/A	*
Cross section approx.	N/A	*
Material	Stainless Steel	*
Weight	N/A	*
Inlet/outlet flange Type/Size	ANSI/ASME B16.5	*

UREA SUPPLY, METERING and INJECTION SYSTEM:

Metering pump w/speed controlled drive (Capacity to be confirmed by Supplier)

Injection lance nozzle with high temperature protection, to be mounted into the static mixer

Injection lance material including set of stainless steel fittings.

80 microns (Supplier to confirm) filter to precipitate suspended particulate from Urea solution with SS screen. Air Compressor with accessories for atomization of urea solution.

ELECTRICAL and CONTROL SYSTEM

Automatic urea metering and control system shall be equipped with closed loop gas analysis system that shall inject urea in accordance with engine load.

SCR Supplier shall furnish temperature sensors for field installation by Contractor, to measure the operating temperature across the SCR catalyst and to release the urea injection upon the catalyst temperature exceeds the required minimum operating temperature for the exothermal reaction of the NOx oxidation. The temperature sensors shall de-energize the injection system upon the Engine shut down. Completely pre-wired UL listed Control panel, built in accordance to manufacturer standards, shall be provided.

UREA STORAGE TANK:

Manufacturer: * Model Number: * Type: Vertical

Capacity: 360 gal (Nominal) Dimensions: * Material: Polyethylene or Steel

Manhole: *" Dia. Flanged w/cover Mounting : *
Tank wall thicknes: * Level Transmitter (LT) Required: (X) Yes ( ) No

Tank Connections (sizes and type to be confirmed by Supplier):

Fill (w/internal dip tube if located on top): *" NPT *

System Return (w/internal dip tube if located on top): *" NPT *

Level Transmitter: *" NPT *

Drain: *" NPT Overflow: *" NPT Pump Suction:*" NPT Vent:*" NPT

Spare connection on the top of the Tank: *" NPT (w/blind flange)

UREA METERING PUMP:

Manufacturer: * Model Number: * Type: *

Horsepower: * Flowrate Required: * gpm Pressure Required: * Pump Speed: * Spm

Pump Material: * housing / * internals / * Non wetted parts

All necessary piping/tubing and associated hardware between urea tank and urea injection nozzle shall be provided including, but not limited to, th following:

Pump air mufflers, strainers/filters, check valves and ball type shut-off valves.

Valve Material: 304 SS or 316 SS * Pipe/Tube Material: 304 SS or 316 SS

UREA ATOMIZING AIR COMPRESSOR:

Manufacturer: *	Model Number: *	Type: *
Horsepower: *	Flowrate Required: * scfm	Pressure
Speed: * rpm	Materials of construction: *	

ATTACHMENT NO. 2 - EMISSION DATA

EMISSION DATA	
EMISSION REQUIREMENTS (see note)	**PERFORMANCE DATA**
Nitrogen Oxides (Nox) Grams/BHP-hr Lbs/Mw-hr Ppmvd @ 15% O2 Percent Reduction	 * * 65 *
Carbon Monoxide (CO) Grams/BHP-hr Ppmvd @ 15% O2 Percent Reduction	 * 270 *
VOC Grams/BHP-hr Ppmvd @ 15% O2	 * 60
Ammonia Slip Ppmvd @15% O2	 10
NOTE: Supplier shall confirm emission performance data is in accordance with latest Federal, State and Local Codes for natural gas fueled internal combustion reciprocating engines. All testing requirements shall conform to the regulations set by the County of San Diego Air Pollution Control District.	

END OF SECTION

ATTACHMENT A1
CONSULTANT'S PROPOSAL

REQUEST FOR PROPOSAL

Metropolitan Transit System

Construction Management Services for the IAD Zero Emission Bus Overhead Charging – Phase 1

July 30, 2024
via PlanetBids

WOAXXXX-CM12

TRC

Table of Contents

A. Introduction

A. INTRODUCTION

Understanding the IAD ZEB Project

The Imperial Avenue Division (IAD) Zero Emission Bus (ZEB) Overhead Charging System will deliver electrical charging capabilities at IAD, continuing Metropolitan Transit System's commitment to renewable power reliance for an additional 40 electrified buses. Phase 1 of this project will more than double MTS's bus charging capacity from the existing 24 terminals currently in service at the South Bay Bus Maintenance Facility (SBBMF), establishing MTS as a regional leader committed to public sector sustainability through cutting-edge technological advancement. IAD is home to a functioning bus maintenance facility as well as MTS operations offices, presenting a need for uninterrupted access and on-going operational capabilities throughout the construction process.

Construction of the overhead charging system will require civil improvements, electrical switchgear, DC chargers, overhead pantographs, conduit/conductors/cable tray systems, structural steel framework, back-up equipment, a new PV and battery storage system, and standby generation system. Successful delivery of these improvements depends largely on the experience of a construction management team that understands all of moving pieces and the challenges associated with each one and how they impact on-time delivery.

*In tandem with MTS, TRC conducted a site tour of the South Bay Bus Maintenance ZEB Overhead Facility project at the **2023 ZEB Con conference***

TRC Engineers, Inc. (TRC) provided construction management and inspection services (including electrical) for the South Bay Bus Maintenance Facility ZEB (SBBMF ZEB) Overhead Charging Facility. This was the first multi-vehicle bus charging station on a grand scale to be implemented in the United States. Having been front and center on this project, we understand the potential risks and challenges that lie ahead for the IAD facility through lessons learned and relationships made along the way. The SBBMF ZEB Overhead Charging Facility was a featured tour during the 2023 ZEB Con conference in San Diego, with TRC and MTS staff hosting the tour and answering questions. Our experience on SBBMF ZEB will facilitate delivery of IAD while minimizing schedule delays including coordinating closely with SDG&E and staying ahead of long-lead procurement items.

As detailed in Section B, TRC is proposing a construction management team with proven experience on SBBMF ZEB Overhead Charging Facility with proposed staff positioned to provide preemptive solutions for lessons learned that can reduce risk and schedule slip. All requested key positions will be available to MTS throughout the contract term, and several can serve in dual roles. Lastly, our team is highly qualified to manage the three additive/alternatives (battery energy storage system, permanent backup generator, and hazardous soil removal) and understand how they would integrate into the current project.

*The TRC team is highly qualified to manage **battery energy storage system, permanent backup generator,** and **hazardous soil removal** with its proposed personnel*

B. Project Team

B. PROJECT TEAM

TRC is proposing a team with recent experience on SBBMF ZEB Overhead Charging Facility and other similar projects while serving in their proposed roles. Our organizational strategy will facilitate delivery of the Phase 1 project as currently scheduled. The Resident Engineer, Electrical & Communications Inspector, and Scheduling Engineer positions are critical to the integrity of the project and its progress. We are offering John Gentry, PE, QSD, Jesse Sandhu, PE, and Dagher Dagher, PE, PSP, PMP, respectively, to fill these roles with backup support provided by a committed team of highly vetted field and office staff with similar experience and work history on multiple MTS projects. Our team includes Verdantas (formerly Leighton) who has supported MTS on more than a dozen projects over the last several years, including SBBMF ZEB Overhead Charging Facility, and has a successful history working with TRC that spans 14 years. **Our organization chart, complete with subconsultants and time commitments for key staff, is presented on the following page**. Below we introduce our key team members and proposed roles. Detailed resumes are provided in the Appendix.

Our key project team members bring expertise in key areas specific to ZEB overhead bus charging facilities that can impact schedule, cost, and start-up

Henry Stultz, PE, Project Manager

Role: Serve as liaison between TRC and MTS for contract administration purposes. Henry will be the signatory on contracts on behalf of TRC, oversee internal quality control and progress of the project, and provide periodic reports regarding budget and schedule.

In his 30-year career managing transportation infrastructure projects for both public agencies and private consulting firms across Southern California, Henry has served as Project Manager, Director of Project Delivery, Construction Manager, and Structures Representative. His career includes 20 years at Caltrans Office of Structures Construction as Senior Bridge Engineer. Henry is currently effectively serving as Contract Manager for SANDAG at the Pershing Bikeway project and Consultant Project Manager for the MTS ZEB/IRIS project providing as-needed closeout services.

John Gentry, PE, QSD/P, Resident Engineer, Civil and Structural Inspector

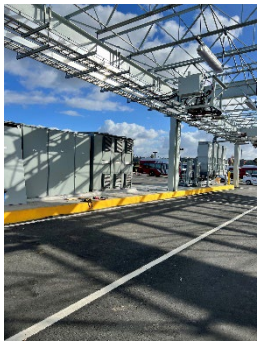
Role: Primary point of contact working under the direction of MTS Project Manager. John will oversee and coordinate implementation of the technical aspects of the project and perform the duties outlined in the RFP. Emphasis will be on communication/coordination with MTS, SDG&E, design team, Contractor, and stakeholders. John will oversee management of the office team as well as fill key roles in field activities.

John's 35-year career includes serving as Resident Engineer, construction manager, project manager, inspector, and structures representative on heavy civil infrastructure improvement projects, including bus rapid transit projects transitioning to electrification for MTS. John served as Resident Engineer and Senior Inspector on the IRIS Station Improvements Project and construction of the SBBMF to accommodate new ZEBs. In this role, John ran all weekly meetings, oversaw all document control, interdisciplinary communications, change management, invoice processing, submittal and RFI review, conducted steel fabrication shop audit and inspections as a Certified Welding Inspector, and performed close-out duties for the $30M award winning design/build SBBMF project; delivered on schedule and under budget. His skills and accreditations allow him to serve in multiple roles on a single project, evidenced by his work with MTS, SANDAG, and Caltrans. John is a long-time resident of San Diego and has worked on projects within County boundaries for years, including MTS, SANDAG, Caltrans, and City of Encinitas, and has coordinated utility relocations with SDG&E on numerous projects.

John served as RE and Senior Inspector on the IRIS Station Improvements Project and construction of the SBBMF to accommodate new ZEBs He is currently wrapping up a project for SDG&E in downtown San Diego as Quality Control Manager for construction of ***SDG&E's electrical substation expansion.***

Jesse Sandhu, PE, Electrical and Communication Inspection

Role: Serve as lead field inspector for electrical installations. Jesse will be instrumental in design review, asking the hard questions in a partnering spirit to troubleshoot any design issues early on and contribute to their solutions. He will support the commissioning process, and perform the duties outlined in the RFP.



Power ON! *Jesse's expertise led to a successful start-up of the SBMMF ZEB Overhead Charging Facility*

Jesse was one of the pioneers behind the development **of PV generation system, battery storage system, standby power production facilities, and Zero Emission Vehicle programming** with Caltrans. He also served as the Lead Electrical Inspector for the SBBMF ZEB Overhead Charging Facility distribution system for 24 pantographs with automatic charging capabilities. He has worked on more than 70 solar PV projects and many standby power production facilities with Caltrans, Dept. of Mental Health and City of Redding Water Treatment Plant and thus brings extensive experience in standby power production and solar PV battery storage systems. Jesse is a seasoned engineer with the ability to analyze and understand the electrical components of ZEB overhead charging facilities and their interactions with the entire electrification system.

Robert Hehman, Assistant RE/Office Engineer/Civil and Other Inspector

Role: Assist the RE and perform the duties outlined in the RFP. Rob will also provide inspection (civil, structural steel, source, and other disciplines) as requested by MTS Project Manager.

Rob brings 30+ years of experience in construction management, inspection, and contracting, as well as a number of subtrades, including electrical. He has served as inspector for seven MTS projects, including SBBMF ZEB Overhead Charging Facility which involved excavation for underground facilities for SDG&E transformers and switchgear being added to the project site. He also served as civil and MEP inspector on the SBBMF with QA oversight responsibilities.

Dave Sluga, PE, QSD/P, ToR, Storm Water Inspection

Role: Manage Contractor's compliance with all terms and conditions of MTS Contract Documents. Dave will attend pre-construction meeting to discuss NPDES and environmental requirements for the project per MTS contract documents and will be responsible for review of required submittals, quarterly inspections as directed by the RE, and all SOW items for this position as listed in the RFP.

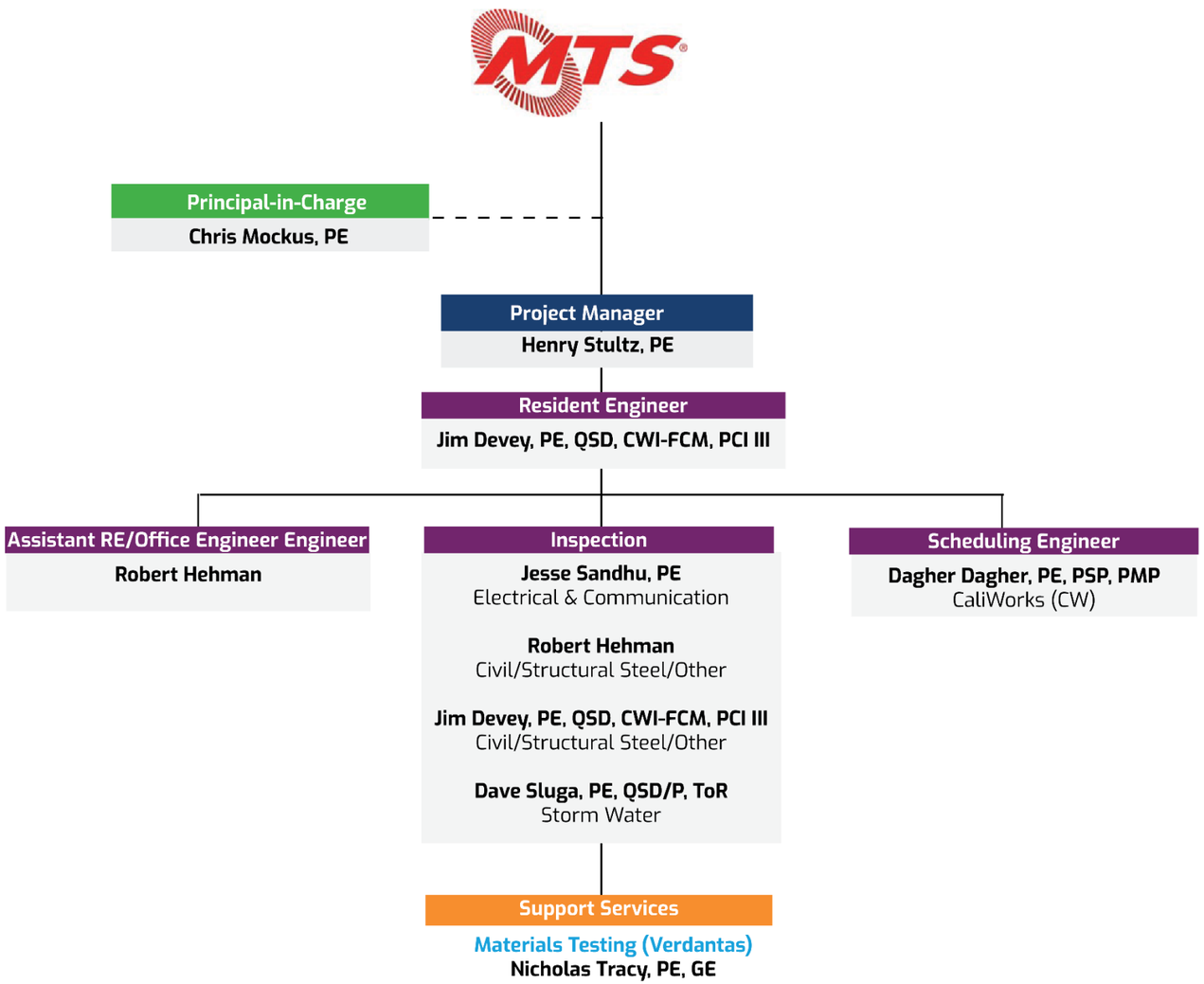
A former Caltrans employee for seven years, David brings 34 years of experience to the team with specific expertise in stormwater management. He is a Certified Trainer of Record (ToR), and for the last 20 years has assisted public agencies, Caltrans, and contractors with NPDES permit compliance at construction sites and maintenance facilities. In addition to multiple Caltrans contracts for stormwater compliance, Dave has contributed his storm water expertise to SANDAG projects (for example, Mid City Rapid Bus and Del Mar Bluffs Stabilization Project III and Bayshore Bikeway in the Port of San Diego).

Dagher Dagher, PE, PSP, PMP, Scheduling Engineer (CaliWorks)

Role: Review and comment on Contractor's CPM baseline schedule and monthly CPM monthly updates. Dagher will also perform independent TIA if requested.

Dagher is a certified expert in project management, project controls, critical path method (CPM) scheduling, construction schedule management, resource loading, risk analysis, cost controls, forensic analysis, and delay claims/entitlement analysis. For 15 months, Dagher served as project scheduler on the SBBMF ZEB Overhead Charging Facility project, with responsibility for analysis and review of baseline schedule, monthly updates, and Time Impact Analysis reports submitted by the contractor. His 12 years of experience spans over $1 billion worth of transportation infrastructure projects, including ZEB overhead charging stations, as well as major highways, bridges, roads, dams, airports, basins, and pump stations.

Project Organization with Subconsultants and Time Commitment



Subconsultants			
Company Name	**Scope**	**Company Name**	**Scope**
verdantas • Formerly Leighton • 63 years of materials testing and inspection • Proposed personnel exceed required 5 years of experience • San Diego laboratory • 12 MTS projects including SBBMF ZEB Overhead Charging Facility	*Materials sampling, materials testing, and hazardous material monitoring and testing*	CALIWORKS • Certified SBE (#1796861) • Certified expert in CPM, project controls, risk analysis • Proposed personnel exceeds required 5 years of experience • SBBMF ZEB Overhead Charging Facility scheduler for 15 months	*CPM scheduling, Time Impact Analysis, schedule analysis*

Time Commitment Table of Key Personnel

Name / Proposed Role	Firm	Dedicated Hours per Month	
		2024	2025
Henry Stultz, PE *Project Manager*	TRC	10	10
Jim Devey, PE, QSD, CWI-FCM, PCI III *Resident Engineer/Other Inspection*	TRC	168	168
Robert Hehman *Assistant Resident Engineer/Office Engineer/Other Inspection*	TRC	128	88
Jesse Sandhu, PE *Electrical and Communication Inspection*	TRC	88	88
Dave Sluga, PE, QSD/P, ToR *Storm Water Inspection*	TRC	12	12
Dagher Dagher, PE *Scheduling Engineer*	CaliWorks	12	12
Nicholas Tracy, PE, GE *Materials Testing*	Verdantas	80	80

C. Project Understanding and Approach

TRC

C. PROJECT UNDERSTANDING & APPROACH

Approach

TRC's approach to construction management and inspection is rooted in **prevention, not reaction**. This philosophy spans from site safety to the management of risk to reduce cost and schedule impacts. We will implement this same approach to manage the IAD ZEB Overhead Charging project, increasing the success of this project by employing a team with recent ZEB bus charging facility experience, an understanding of the IAD campus, previous history with MTS managing integrated structures and facilities with its operations, and experience with SDG&E. Safety will be a top priority before and during construction at every stage of the project.

Safety

First and foremost, in all public works construction, is the safety of the public, workers, owners, and stakeholders on the project. Safety is the first order of business in every Weekly Construction Meeting, where weekly tailgate Safety Meetings are tracked, as well as all safety incidents and close calls. John Gentry, PE, our proposed Resident Engineer, will review, approve and enforce the Contractor's Safety Plan as one of the first pre-construction activities. No work will begin on the project until the Contractor Safety Plan has been approved. Lock-out/tag-out procedures will be thoroughly understood by all parties before any electrical activities are undertaken. The IAD site presents security challenges as well, due to the homeless population near the property. All TRC personnel will be made aware of the risks associated with maintaining security of the site at all times. Before any groundwork begins, we will make sure that the Contractor performs all required underground utility locations, as well as address any overhead utility clearance issues. Every proposed TRC field personnel is OSHA trained for all conditions likely to be encountered on this project including trenching/shoring, lock-out/tag-out, flagging, fall safety, confined space, CPR, and hand tool safety.

Communication

Resident Engineer John Gentry, PE, will be the gatekeeper of all project communication and management activities. He will monitor project progress continually and address all issues in the weekly construction meeting; where they will be resolved or tracked and addressed each meeting until resolution. Our approach is to identify issues before they affect schedule and/or budget. The Weekly Construction Meeting is the forum where all stakeholders may be informed of the project status on a regular basis. Our Scheduling Engineer, Dagher Dagher, PE, will perform monthly review of the contractor's CPM Schedule. Any items identified in the Contractor's CPM Schedule, or the 3-week look-ahead as possible impacts to the project schedule will be identified and discussed with the contractor to avoid delays. All potential impacts to project delivery are identified, discussed and tracked by RFI, Change Order, or other appropriate action. TRC will utilize MTS's preferred software for documentation and tracking or use its own upon approval of MTS.

At the onset of activity on the CM task order, the RE and OE will develop the project Communication Plan to be updated continually throughout the duration of the project. The RE will be gatekeeper of all communication between project personnel, Contractor, design team, MTS, outside utilities, the City and permitting agencies and other stakeholders. All project information will be coordinated tracked and filed through this system, with regular updates to MTS as requested under this contract.

Coordination, Communication, and Cooperation with SDG&E

Cooperation and coordination with SDG&E regarding the installation of electrical components will be critical to keeping this project on schedule. This requires complete commitment of the Resident Engineer in proactively engaging with the utility before construction and through close-out. Our approach includes John Gentry, PE, serving as Resident Engineer, to conduct initial coordination meetings with SDG&E representatives and maintain close communication with the utility throughout the course of the project. SDG&E will be copied on all weekly meeting minutes, as well as regular check-in updates. Our key core team members (John Gentry, PE, Jesse Sandhu, PE, and Rob Hehman), all have years of experience delivering projects with SDG&E input and participation. Specifically, Jesse Sandhu, PE, is thoroughly familiar with SDG&E procedures and has freshly reviewed SDG&E specifications for this project and brings many lessons learned to this project as a result of his key involvement in SBBMF Overhead Charging Facility.

Procurement

Before the start of construction, the Resident Engineer, Office Engineer, and Electrical and Communications Inspector will identify, prioritize and review the most time-critical and long-lead contractor material submittals. This is especially crucial for the specialty electrical equipment, which may take considerable time to order, fabricate, assemble and ship. Upon receipt of materials and equipment to the jobsite, TRC will verify project specific specifications and industry standards for materials.

Claims & Delays

Again, our goal is to prevent or minimize potential delays through a clear stream of communication and accountability. Any potential claims or delays will be identified as they develop and addressed accordingly. Project information will be centralized on a Shared Drive directory with access by project personnel as determined by MTS. All files will be named and filed according to a standardized system.

Change Order/Claims Management

Our proposed Resident Engineer, John Gentry, PE, will promptly respond to any requests for information (RFIs) or communication from the Contractor that may lead to a change request or claim. Claims procedures will be followed for response times and content. All potential claims will be addressed and recorded at the weekly meeting.

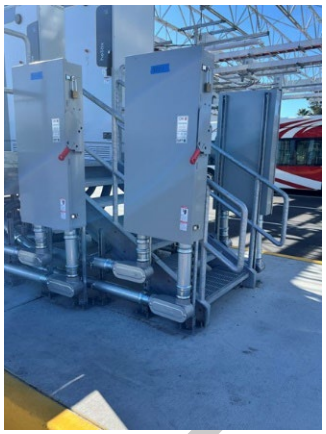
Innovative Approach

Approach to Electrical Challenges

The IAD ZEB Overhead Charging Facility project is, in itself, quite innovative and also highly complex in terms of power distribution, and integration, functionality and operation. It is crucial that the Electrical Protective Devices Coordination Study be completed *prior to approval of the electrical equipment shop drawings*. It is our experience and recommendation that this becomes the first order of work. Remember, MTS is constructing a highly complex and integrated system; it is our job as the construction manager to understand how **all** of the electrical components fit into the overall electrical system's installation while complying with project plans and specifications, and above all California Electrical Code and Local City/County Code design per the specifications and design. For this reason, **TRC's innovative approach focuses largely on dividing the electrical construction management and field construction work into three basic divisions:**

1. **Contractor to Order the "Electrical System's Overcurrent Protective Devices Coordination Study" While Shop Drawing Submittals for Major Electrical Switchgear Are Being Prepared**

The submission of major electrical equipment switchgear and electrical systems coordination study/analysis must be submitted and reviewed concurrently to determine suitability of electrical equipment protection from the available fault current at their intended location. In the event the available fault current exceeds the withstand and interrupting capacities of the electrical equipment, mitigating measures will have to be implemented to protect the equipment and safety of maintenance personnel. Electrical equipment foundation work can only begin after completion of approved major electrical equipment.



Untimely conduction analysis of OPD coordination study resulted in added electrical equipment (current limiting devices) which resulted in added contract change order costs and added workdays to the contract schedule

Value to MTS: ***This study will determine the accuracy of assumptions made during design and the specifications writing process. If those assumptions happen NOT to be true, then timely revisions can be made to the electrical equipment selection prior to procurement, resulting in timely savings of very expensive contract change order(s) to revise the installation after the equipment has been installed. Furthermore, this approach can result in saving of contract time, unnecessary finger pointing and/or frustrations, and impacts to contract funding.***

2. **Order and Procure Materials Upon Approval of Shop Drawings Prior to Performing Trenching**

While the materials for miscellaneous electrical work (i.e., installation of underground conduit duct bank and manhole system) are being procured, Contractor will be asked to map out the area of work for the presence of any existing underground utilities and devise a plan of action to mitigate interference if there is any to determine exact depths of existing underground utilities.

Value to MTS: ***This step would assist in speeding up construction activities without any undue wait for miscellaneous materials procurement, resulting in timely completion of the contract work.***

3. **Separate Electrical Underground Conduit Work for the BP Pulse Fleet Management and Miscellaneous Communication Systems**

At no time shall the electrical underground power system conduit work mix with the other communication systems. This approach will avoid the unwanted hunt for communication cables that are suitable for installations along with power conductors or addition of inner ducting to mitigate electromagnetic interferences.

Value to MTS: ***This pre-planning will prevent untimely and unavoidable mixing of power system conductors along with communication cables, thus avoiding the search for unneeded means and methods to make ZEB installation compliant with the California Electrical Code and local City/County Codes.***

Approach to Our Team Organization

A unique aspect about TRC's proposed organization and approach is providing a team whose key team members can **function in multiple roles**. As the Resident Engineer, John Gentry, PE, will oversee review of the Contractor's structural steel shop drawings and welding/bolting plans. Additionally, with 36 years of experience performing certified welding/bolting inspections and fabrication audits, Mr. Gentry will be instrumental in determining the qualification of the fabricator as well as deliverable steel components and final erected structure. Rob Hehman will use his technical and organizational skills to serve as both Office Engineer and Civil Inspector. Additionally, TRC's subconsultant, Verdantas, will provide additional support as staff proposed for this project bring extensive experience on MTS projects and can also serve in inspection roles. Our cross-functional team will provide MTS an overlap in skill sets to keep the project on track.

Risks & Solutions

Top Risk #1: Procurement and Installation of Specialty Electrical Equipment

Critical to keeping the project on schedule will be the procurement of electrical equipment. As previously mentioned, Contractor material submittals for electrical equipment for items such as DC chargers, pantograph, medium voltage transformer and low voltage switchboard and other PV production and standby power generation equipment will receive top review priority to reduce lead-time impact.

Heliox DC battery charger Distribution Switchboard – delivery of this equipment delayed the acceptance of the contract SBBMF ZEB Overhead Charging Facility

Solution

In projects involving "coordination of overcurrent protective devices (OPD)", the first order of work in construction must be to "conduct electrical system coordination study" as described in the project specifications. The following steps must be followed:

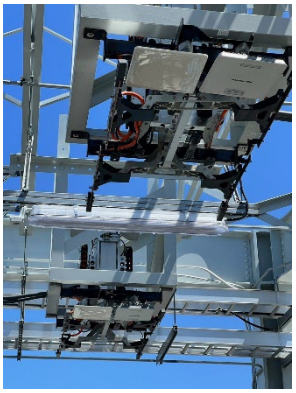
1. The work of system coordination study outcomes and electrical equipment submittals/shop drawings review/approval must be conducted "concurrently" to make certain that the electrical equipment "withstand and interrupting capacities" is equal to or greater than the "available short circuit current " at a given equipment location. This rule must never ever be voided or overlooked.
2. If the conditions in step No. 1 did not comply, then designers must go back to the drawing board to incorporate means such as current limiting circuit breakers or fast acting fuses to limit fault currents energy at a given equipment location within the equipment's "withstand and interrupting ratings".
3. Once all conditions outlined above are satisfied, only then electrical equipment should be ordered. For maintenance's sake, all electrical equipment should be from the same manufacturers.

Top Risk #2: Pantograph Shop Drawing Approval

The second electrically related challenge is to incorporate methods during shop drawings approval process of the pantograph and their installation details.

Solution

TRC's approach will be to make sure the following conditions are incorporated:



Deficiencies in the design detail added extra costs and extended the number of working days on the SBBMF ZEB Overhead Charging Facility

1. Account for bus parking drainage slope while planning for mounting of pantograph
2. Design pantograph's mounting height and sloping to accommodate parking lot floor slope
3. Consult/involve owner in determining location of each bus when parked; draw white visible marking on pavement for drivers to see while parking the bus *as a guide*
4. Project this point up the ceiling of the canopy for locating exact pantograph's location
5. Determine pantograph's up/down tolerances of a given pantograph; ask owner for exact height of the EV buses to be charged
6. Based upon all these assumptions, then determine pantographs mounting height.

While the above outlined electrical work is being conducted, the electrical equipment (i.e., conduits, conductors, conductor ladders, manholes, etc.) must be submitted and reviewed, and only then be ordered for procurement and inspection.

Additional Risks to Consider

Our experience as construction manager for the SBBMF ZEB Overhead Charging Facility has given us insight into other potential risks we wish to share with MTS.

Schedule

Schedule creep is the most likely budget impact within control of the CM team. Our solution to reducing schedule creep is timely submittal review, SDG&E cooperation, and immediate field support. TRC's proposed Scheduling Engineer (Dagher Dagher, PE) served as Project Scheduler for 15 months on SBBMF ZEB Overhead Charging Facility project with responsibility for analysis and review of baseline schedule, monthly updates, and Time Impact Analysis reports submitted by the contractor. With Dagher in the driver's seat alongside our proposed Resident Engineer (John Gentry, PE, PSD/P), the team will make it a top priority to maintain constant review of construction operations and planned activities to head off potential impacts.

Control of Civil/Structural Elements

Steel fabrication and dimensional information can derail a project. Our solution is to have our Resident Engineer, John Gentry, PE, undertake site verification of dimensional control for all elevations and coordinates of the structural and civil improvements before fabrication of structural steel. Having been a Certified Welding Inspector and performed numerous fabrication shop audits for MTS and other local agencies, John Gentry will verify contract and industry standard compliance of the steel fabrication and its QC program before start of fabrication.

Unforeseen Conditions

Any underground activities present the potential encounter of unsuitable soils, unforeseen buried manmade obstructions, utilities (existing and abandoned), archeological or paleontological items, and/or impacted materials. Our Resident Engineer, John Gentry, PE, will address the Contract requirements for potholing and utility locations at the pre-construction meeting. The field inspection team will assist with such activities. All assumed design criteria, such as soil condition/type and groundwater, will be verified by the contractor.

D. Schedule

D. SCHEDULE

Local Resources

The TRC team provides MTS with the following key features to keep the project on schedule:

- A highly experienced team that brings recent CM experience on the SBBMF ZEB Overhead Charging Facility in each of the critical aspects of the work to keep the project on track
- A highly committed team with availability throughout the contract term
- A San Diego-based office on Viewridge Avenue
- A materials testing lab managed by Verdantas on Murphy Canyon Road in San Diego
- Additional, qualified material inspection and testing staff available to MTS as needed with the minimum 5-year experience criterium
- Locally based key personnel who reside in San Diego

Our team is cross-trained and largely locally based including a TRC home office in San Diego and Verdantas testing lab in San Diego

Our cross-trained team, in its totality, including both subcontractors, has worked together before, many on previous MTS projects including SBBMF ZEB and IRIS projects. All key field staff assigned to the IAD ZEB Overhead Charging project with daily responsibility will be locally based during construction activity. Our proposed Resident Engineer, John Gentry, PE, is a resident of San Diego. He visited the proposed site, has served as RE on previous MTS projects, and understands the local environment, stakeholders, and utilities, specifically SDG&E. Robert Hehman, our proposed ARE, OE, and Inspector, also lives in San Diego. Our key materials testing expert, Nicholas Tracy, PE, GE, is also based on San Diego.

This organizational structure will provide seamless inspection, office engineering, and construction management services during the contract term. ALL TRC proposed key team members will be available to MTS, in person as needed, for meetings with the agency or Contractor at the request of MTS.

Appendix –
Key Team Resumes

TRC

Henry Stultz, PE, QSD/P

PROJECT MANAGER

Experience in Critical Areas

Education

- MS, Public Administration, California State University San Bernardino
- BS, Civil Engineering, University of Texas, San Antonio

Licenses / Certifications

- Professional Civil Engineer, CA No. C52831
- Qualified SWPPP Developer/Practitioner (QSD/P)

Years of Experience: 30+
Years with Firm: 1

In his 30-year career managing transportation infrastructure projects for both public agencies and private consulting firms across Southern California, Henry has served as Project Manager, Director of Project Delivery, Construction Manager, and Structures Representative. His career includes 20 years at Caltrans Office of Structures Construction as Senior Bridge Engineer. His portfolio includes high-profile infrastructure projects in Southern California, many of which have included hazardous soil removal (one of three additions/alternatives to this contract). Henry brings important experience coordinating with agencies within San Diego, including SDG&E, Caltrans, railroads, and environmental agencies. In addition, he is a well-rounded construction management professional with experience in civil engineering, transporation engineering, structures construction, contract management, and project management. **Henry is currently effectively serving as Contract Manager for SANDAG at the Pershing Bikeway project and Consultant Project Manager for the MTS ZEB/IRIS project providing as-needed closeout services.**

Pershing Bikeway project ribbon cutting

SIMILAR PROJECT EXPERIENCE

SR-210 Lane Addition/Base Line Interchange Improvements, San Bernardino County Transportation Authority, Inland Empire

Henry served in the capacity of Director of Project Delivery and Construction Manager, overseeing delivery of the SR-210 widening through three cities (San Bernardino, Highland, and Redlands). This complex project involved 19 bridge widenings and was designed to eliminate an existing bottleneck and added one mixed-flow lane in each direction at certain points, as well as auxiliary lanes and acceleration lates. The project involved pavement rehabilitation through a cooperative agreement with Caltrans. As Construction Manager, Henry monitored progress for on-time delivery and enforced compliance with federal, state, and local laws, regulations, policies, and practices. He supervised coordination with stakeholders, property owners, and **utility companies. Under his leadership, the project was completed three months ahead of schedule and $20 million under budget.**

LEGEND

Rapid Bus Transit | MTS Experience | SDG&E Coordination

Monte Vista Grade Separation, SBCTA, Montclair
As Senior Project Manager, Henry provided overall project management and construction management support to SBCTA for the $29 million Monte Vista Grade Separation in Montclair. This project reconfigured the current at-grade crossing and constructed a grade separation over three Union Pacific Railroad tracks and State Street along Monte Vista Avenue. Henry recommended approaches to resolve construction issues and advised the Resident Engineers and staff on compliance with the contract plans, specifications, and regulations. **Henry oversaw the efficient and effective resourcing of the consultant staff.**

San Bernardino County Transportation Authority – Project Delivery
Henry served as Director of Project Delivery/ Construction Manager with responsibility for the successful delivery of the SBCTA Major Projects Program to the communities of San Bernardino County. He supervised the Project Delivery Managers and Construction Managers during the environmental phase, PS&E phase, right-of-way acquisition, Plans, Specification and Estimates, Utility Agreements, Railroad Construction and Maintenance Agreements and Interagency Cooperative Agreements. His successful management approach included monitoring and enforcing compliance with federal, state, and local laws, regulations, policies, and practices. This approach resulted in the on-time delivery of project development and construction, within scope and budget. Henry supervised coordination with stakeholders, property owners, and utility companies, and provided technical guidance to Project Managers, Designers, Construction Managers, and the Construction Management consultant firms.

Caltrans District 8 and 9, San Bernardino
As the Area Senior Bridge Engineer for the Caltrans Office of Structures Construction in District 8 and 9, Mr. Stultz managed and supervised Resident Engineers, Structures Representative Engineers, Inspectors and Office Engineers on a wide range of Caltrans construction projects. Participated and supervised Value Analysis Studies, Risk Management Teams, Design constructability reviews and construction contract administration. Provided supervision with respect to reports, payment estimates, contract change orders, design changes, notice of potential claims, materials testing, construction inspection, falsework design and reviews, shoring and other technical submittal reviews and approvals, risk management teams, project delivery teams, partnering and community task force presentations. Made presentations to project's Dispute Review Boards, effectively resolving potential claims. Other assignments included Instructor for the statewide Bridge Construction Engineers Forum and the Structures Construction Falsework Academy. Major Project Assignments Include: I--10/I-15 Interchange Seismic Retrofit, SR 52/125 Interchange, Big Bear Dam Bridge, SR 62 Colorado River Bridge, and the 215/60/91 Interchange.

TRC

Jim Devey, PE, QSD, CWI-FCM, PCI III

RESIDENT ENGINEER / CIVIL & STRUCTURAL INSPECTOR

Experience in Critical Areas

Education

BS, Civil Engineering, University Washington

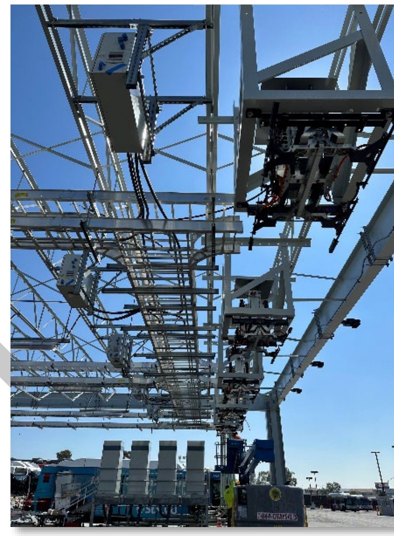
Licenses / Certifications

- Professional Engineer (Civil), CA No. 75458
- Qualified SWPPP Designer No. 75458
- PCI Level III, No. 17275
- AWS Certified Welding Inspector, No. 15061111
- ACI Concrete Field Testing Technician – Grade I
- IACET C2 Confined Spaces in Construction/Fall Protection
- U.S. Army Corps of Engineers, Construction Quality Management for Contractors, No. 784
- CTM 547 Caltrans Certified – Bridge Profilograph

Years of Experience: 26

Years with Firm: 3

Jim's 25+-year career in the heavy civil construction industry includes serving as Resident Engineer, construction manager, project manager, inspector, and structures representative on infrastructure improvement projects, including bus rapid transit projects transitioning to electrification for MTS. **Jim served as Resident Engineer/Office Engineer on the MTS Zero Emission Bus Overhead Charging Facility as well as the IRIS Rapid Bus Stop Improvements projects.** His skill set and accreditations allow him to serve in multiple roles on a single project, evidenced by his work on projects for MTS, as well as for SANDAG and Caltrans. In addition, Jim's expertise includes source inspection for steel and other materials fabrication and therefore brings a keen understanding to sourcing and realistic procurement schedules to the team. He also brings experience coordinating with **SDG&E** on numerous projects, and even served as a Principal Construction Advisor to SDG&E's Portfolio and Project Management Quality Assurance Team for several years.



In 2016, Jim received an "Outstanding Engineering Merit Award" from the Orange County Engineering Council recognizing his contributions to multiple agencies and projects across the State of California.

SIMILAR PROJECT EXPERIENCE

South Bay Bus Maintenance Facility Zero Emission Bus Overhead Charging Facility, MTS, Chula Vista
Jim served as Resident Engineer/Office Engineer during construction of the ZEB overhead steel gantry structure for bus electrification, which in a sense was a follow-on phase of the 12-year SBBMF project as a whole. Administered as a "sister" project to the IRIS project, both projects benefited from shared inspection personnel, creating efficiencies in staffing, continuity in inspection personnel, and an understanding among the team of MTS processes, procedures, and stakeholders. The ZEB project involved extensive coordination with SDG&E's work order to bring in new 12kv electrical service to the project, requiring medium voltage switchgear, substations, transformers, low voltage switchboard, (8)

LEGEND

Overhead Steel Gantry Systems | Electrification | Rapid Bus Transit | MTS Experience | SDG&E Coordination

180kW Heliox Chargers feeding (24) inverted overhead Schunk pantographs, RFID/Wi-fi communication between each bus and overhead pantograph, large trenching and shoring operations for conduits, vaults, overhead cable trays and raceways, bp pulse smart charging communication monitoring and controllers. The project also included heavy coordination with manufacturers, contractors, MTS, the design team, City of Chula Vista, and the inspection and testing team. Jim's responsibilities included filing and managing per Caltrans 63 Category for submittals, RFIs, punch lists, change orders, and weekly construction and special coordination meetings in addition to his role as Resident Engineer. Due to supply chain issues with the Low Voltage Switchboard, Jim also coordinated multiple meetings with MTS, contractor, and manufacturers in providing a Temporary 1200Amp Panelboard to meet critical key milestone dates that buses needed to be charging. From initial notification of the supply chain delay, this temporary solution was provided in less than 2 months with the option for MTS to utilize the panelboard for future MTS projects as well.

IRIS Rapid Bus Stop Improvements, MTS, Chula Vista
Jim served as Resident Engineer for MTS's IRIS Rapid Bus Stop Improvements from Dahlia /Seacoast Drive to along Coronado Ave. to Iris Avenue on through to Beyer Blvd. This also included a new IRIS Transit Center West facility and improvements to Iris Transit Center East. These new rapid bus routes were constructed for the purpose of the new zero emission buses coming onboard. Project included 14 bus shelters, 14 VMS signs connected via fiber optic or 4G/WiFi, bus stop electrical and communication, signal and lighting, plaza lighting, signs, thermoplastic striping, HMA, PCC, curb and gutter, landscaping, and bioretention. Jim was involved with coordination with the City for traffic control, permitting, and public outreach requirements. He coordinated with MTS and TRC on performing constructability reviews (civil, structural, electrical, landscaping, SWPPP) and issuing change orders.

San Diego Gas & Electric, Portfolio and Project Management Quality Assurance Team, San Diego
Served as Principal Construction Advisor/Project Manager to the Portfolio and Project Management Quality Assurance Team. This role involved facility audits, standardizing QA review processes, serving as a technical expert to Engineering, providing guidance and support to management, and providing guidance to the data analytics team in analyzing SDG&E's construction and fabrication with a focus on tracking and improving quality processes, work with assigning QA targeted plant inspections, training of QA Team, and overseeing team's reviews and assessments of fabricators and manufacturers. He developed an automated concrete mix design Excel spreadsheet for the team to assist with reviews and had been requested to do this for weld procedures. Responsibilities included management of SharePoint Doc Control site for all of SDG&E Manufacturing and Fabrication (submittals, design drawings/Calculations RFIs, NCRs, transmittals, notices). SDG&E was seeking to add more higher-tier item components and suppliers to this site in order to have better accountability of products. Mr. Devey was instrumental in the development of KPIs and the data analytics team. He developed skeleton framework for mobile inspection app that feeds data analytics. He also assisted management in developing specific timesheet cost coding and budgets for 2021 as previous budgets billed only to overhead.

Jaswinder "Jesse" Sandhu, PE

ELECTRICAL & COMMUNICATION INSPECTOR

Experience in Critical Areas

Education

- MS, Electrical and Electronic Engineering, California State University, Sacramento
- BS, Electrical Engineering, Punjab University, India

Licenses / Certifications

- Professional Engineer, Electrical, CA No. 11803

Years of Experience: 45

Years with Firm: 4

Jesse was one of the pioneers behind the development of Zero Emission Vehicle and Photovoltaic System development program with Caltrans. He also served as the **Lead Electrical Inspector for the SBBMF ZEB Overhead Charging Facility distribution system for 24 pantographs with automatic charging capabilities.** He has worked on more than 70 solar PV projects and brings extensive experience in standby power production and solar PV battery storage systems. Jesse is a seasoned engineer with the ability to analyze and understand the electrical components of ZEB overhead charging facilities and their interactions with the electrification system.

MTS South Bay Bus Maintenance Facility ZEB Overhead Charging Facility just prior to powering it up

Jesse has performed complete electrical power distribution system design and has provided civil and electrical inspection for various contracts and encroachment permits. In addition, he has provided electrical inspection of conductors, conduits, pull boxes and electric service enclosures for various electrical services.

SIMILAR PROJECT EXPERIENCE

South Bay Bus Maintenance Facility Zero Emission Bus Overhead Charging Facility, MTS, Chula Vista
Served as Lead Electrical Inspector responsible for electrical construction inspection for the Capital Improvements project under an on-call CM and inspection contract with the MTS, totaling $6 million. Projects included installation of 10 MW, 12 kV substation, 3.75 MW 12 kV/480volt, 3-phase, 4-wire substation for supplying ZEV DC Chargers, and installation of DC Chargers and DC distribution system for 24 pantographs with automatic charging capabilities. In addition, Jesse was responsible for reviewing and leading the design team for the forthcoming Battery Energy Storage System and photovoltaic facility project at the site. While reviewing this project, **Jesse emphasized the importance of coordinating with SDG&E** regarding the location of the Photovoltaic System AC Disconnect switches in reference to the Main Service Disconnect at the site.

LEGEND

Overhead Steel Gantry Systems | Electrification | Rapid Bus Transit | MTS Experience | SDG&E Coordination

Otay Mesa West CT/CHP Port of Entry, Caltrans District 11 On-Call Construction Management & Inspection, Otay Mesa
Served as Lead Electrical Designer and Construction Inspector for the Caltrans D11 California Highway Patrol Commercial Vehicle Weigh and Inspection Facility at the Otay Mesa West Port of Entry. Work included addition of third truck lane and in-station Truck Traffic Management Control System design and installation work on SR905, south trade corridor area expansion project at the US/Mexico Border.

Caltrans District 11, On-Call Construction Management and Inspection Services, San Diego
Served as Electrical Inspector on this on-call contract totaling more than $17 million. Jesse was responsible for electrical inspection for the Capital Improvements projects. Projects included the $17+ million FO System installation project in the San Diego area, specifically on routes I-5, SR-905 and I-805, in the trade corridor area.

Sacramento County Regional Sewer Treatment Facility, On-Call Construction Management and Inspection, Sacramento
Served as Lead Electrical Inspector on this on-call contract totaling over $1 billion. Jesse was responsible for electrical inspection, testing and commissioning for various Capital Improvement projects including the $88 million Disinfection Chlorine Storage and Injection System, Sodium Bi-sulphite Storage, and Injection System; $440 million Nitrification of Side-Stream Water; $48 million Return Activated Sewage Sludge System; and Emergency Raw Sewage Standby Basin Systems. In addition, his duties included providing testing and commissioning of the completed systems.

Caltrans Division of Structure Design and Division of Structure Construction, Sacramento and San Diego
As a Retired Annuitant, Jesse performed complete electrical power distribution system design (renovation work) work of the 2+ mile-long Coronado Bay Bridge electrical system and provided construction engineering services during renovation of the bridge electrical system. In addition, he served as lead testing/commissioning engineer for the department and performed the testing/commissioning of the bridge electrical systems and was responsible for successful completion of the construction contract. The construction was completed in September of 2019. Jesse's duties included interpreting drawings and field instructions, overseeing contractor's work progress, and preparing list of deficiencies for corrections. **Jesse coordinated with SDG&E for the successful procurement of three electrical services for the bridge.**

Caltrans, Engineering Service Center, Sacramento
Serving as Senior Electrical Engineer (Supervisor & Specialist), Jesse performed design and directed and coordinated the work of a team of electrical engineers and technicians within the branch in the preparation of plans, specifications, and estimate (PS&E) for standby generating facilities, photovoltaic system, SCADA Systems, storm drainage pumping plants, vehicular tunnels, movable bridges, water and wastewater treatment systems for the Caltrans Safety Roadside Rest Areas including over 100 sewer lift stations, cathodic protection systems, fixed and toll bridges strong motion sensors and health monitoring sensors and recording systems, building environmental control systems, Caltrans maintenance stations, Caltrans equipment shops, Caltrans toll plazas, CHP truck weigh-in-motion and safety inspection facilities, agriculture inspection facilities, and other transportation related facilities. Jesse conducted, directed, and coordinated the work of personnel for factory acceptance testing (FAT),

construction inspection, punch list of deficient items and system testing and commissioning services (SAT/SIT/RAT testing) of projects in construction to the Caltrans Division of Structures Construction. Construction services also included approving shop drawings, answering RFIs, initiating and preparing Contract Change Orders, and preparing recommendations for final acceptance of the completed projects. Throughout his career at Engineering Service Center, Jesse was responsible for the design, construction inspection services and testing/commissioning of several tunnels/underpasses, including the I-405/I-105 Tunnels (Los Angeles); Orange Polk Tunnels (San Diego); Elephant Dome Tunnel (Oroville Area); and SR34/I-210 Tunnels (Pasadena). Jesse conducted, directed, and coordinated the review of the design work completed by private consulting engineering firms for Caltrans and local agencies. In addition, he reviewed and approved the electrical designs, standard details, prepared standard plans, prepared standard special provisions, and served as a consultant to various Districts within Caltrans, cities, and counties on issues relating to storm drainage pumping plant and movable bridges.

California Department of Mental Health (DMH), Sacramento
Jesse served as Senior Electrical Engineer responsible for directing and coordinating the multi-million-dollar renovation program of five State Hospitals within the State of California. While working for DMH, Jesse tested and commissioned large (3 megawatts) standby power and co-generation power production facilities at three of the State Hospitals. His duties included setting design standards for the design of State Hospitals and reviewing design work performed by consulting engineering firms on State Hospitals to comply with Title 24 and other applicable codes. He prepared project scopes, preliminary design, and estimates for approval from the Department of Finance and interacted with department budget analysts. Jesse's duties also included reviewing "Statement of Qualifications" for various consulting engineering firms, preparing short lists, and serving as a member of the Consultant Selection Committee for the selection of consulting engineering firms to perform design development work for the State Hospitals.

Robert Hehman

ASSISTANT RESIDENT ENGINEER / OFFICE ENGINER / CIVIL & OTHER INSPECTOR

Experience in Critical Areas

Licenses / Certifications

- Comtrain Climbing Certificate
- First Aid / CPR
- 10-Hour OSHA Health and Safety Training, April 2024
- Bombardier Railway Safety Program Certificate
- MTS Railway Safety Program Certificate

Years of Experience: 35
Years with Firm: 13

Rob brings 35 years of experience in construction management, inspection, and contracting, as well as a number of subtrades, including electrical. He has served as **inspector on seven MTS projects, including SBBMF ZEB Overhead Charging Facility** which involved excavation for underground facilities for SDG&E transformers and switchgear being added to the project site. He also served as civil and MEP inspector on the SBBMF with QA oversight responsibilities. In addition to his inspection experience, Rob has served in the capacity of Office Engineer on numerous projects, with responsibility for reviewing and writing RFIs; completing, reviewing, and submitting daily reports of completed work; verifying correct Quantities of materials; verifying that all specifications coincide with the work being done per approved plans; and otherwise assisting the Resident Engineer both in the field and administratively.

SIMILAR PROJECT EXPERIENCE

South Bay Bus Maintenance Facility Zero Emission Bus Overhead Charging Facility, MTS, Chula Vista
In his role as Inspector, Rob was on site during excavation for underground facilities for **SDG&E transformers and switchgear** that were installed for purposes of charging new electric buses. He also observed the excavation, rebar, and concrete placement of the footings and grade beams required for the structure. He was responsible for keeping daily reports and photographs to document each activity while on the project.

Pershing Bikeway Project, SANDAG, San Diego County
The Pershing Bikeway project improved access to Balboa Park amenities and now serves as a critical regional connection for people who live, ride, and walk in the area. Project stakeholders were many, and included the **City of San Diego, SDG&E** and other utility providers, as well as local businesses and residents. As Construction Inspector, Rob was responsible for the day-to-day inspection of construction phases from grading, and excavation, to construction of drainage structures; concrete placement; back fill and compaction of structures; irrigation for landscape; curb and gutter placement; bikeway paving; and roadway paving. He maintained constant communication with the City of San Diego on items for inspection for City representatives and provided daily written reports and photo documentation of project progress, inputting all into e-Builder as required by contract documents.

LEGEND

Overhead Steel Gantry Systems | Electrification | Rapid Bus Transit | MTS Experience | SDG&E Coordination

Mid-Coast Corridor Transit Project – Segments 1 and 2, Construction Management Services, SANDAG, San Diego
As construction inspector for the project, Mr. Hehman's responsibilities included quantity calculations, checking grade and alignment, labor compliance interviews, documenting compliance with project construction and contract documents, measuring and verifying progress of work for payment purposes, reviewing, inspecting, and approving traffic control lane closures, and inspecting above and below ground utilities such as drainage, electrical, fiber optic, cable, gas, sewer, water, and telephone lines and facilities.

MTS Wheel Truing Machine, SANDAG, San Diego
As Inspector Level III, Rob provided MEP and Civil inspection services for the MTS Trolley LRV Wheel Truing Machine installation. Work consisted of construction of the pit for the new wheel truing machine under existing rail inside the maintenance building for the trolley cars. Project scope also involved oversight of demolition of existing track and concrete aprons, excavation of the new pit areas, dewatering, and construction of the new pit for the new wheel truing machine.

MTS Downtown Bus Rapid Transit, SANDAG, San Diego
Rob served in the capacity of Inspector Level III for the completion of the Downtown Bus Rapid Transit Project consisting of 19 new bus stop locations around the downtown San Diego area. The project required constant inspections of the demolition of existing sidewalk and roadway sections, and installation of new roadways and walkways along major bus routes. This required constant traffic and pedestrian monitoring and rerouting to keep the community safe and operating smoothly.

MTS South Bay Bus Maintenance Facility, SANDAG, San Diego
As Inspector Level III, Rob provided MEP and civil inspection and QA oversight for approximately 18 months on this $31 million project. Duties included inspections of all structural footings, rebar installation and verification of proper mill certs; and trenching for underground utilities including electrical, gas plumbing, sewer and storm drain. Inspected the site daily for cleanliness and ensures that proper SWPPP is maintained. Reviewed submittals and RFIs to verify correct materials are being used. Maintained daily inspection reports with photos for backup for the progress of the project. Verified correct prevailing wage rates are being paid via labor compliance interviews. Photographed daily events and documented any concerns or issues for the owner. Maintained a complete set of as built drawings as the project is progressing.

MTS Building A Communications and Electrical Improvements, SANDAG, San Diego
As Lead Inspector, Rob provided MEP and civil inspection as part of the construction management team in connection with the remodeling of the existing MTS Building A Interim Control Center, Mechanical Room, Communications Room, and Electrical Room. Work generally included civil and structural building modifications, new Uninterrupted Power Supply (UPS), modifications to the existing emergency backup power system, new fire alarm system and modifications to existing fire suppression system, modifications to existing security systems, two new 25-ton air conditioning units (including humidity controls), remodel and new ventilation systems in the communication room to create a hot air containment system in existing and new aisles, and installation of eight new communication racks.

Dagher Dagher, PE, PSP, PMP

SCHEDULING ENGINEER

Experience in Critical Areas

Education

BS, Construction Engineering, California State Polytechnic University, Pomona

Licenses / Certifications

- Professional Engineer (Civil), CA #92407
- Planning & Scheduling Professional (PSP) #1733
- Project Management Professional (PMP) #1964198

Years of Experience: 12

Years with Firm: 10

Dagher Dagher is a certified expert in project management, project controls, critical path method (CPM) scheduling, construction schedule management, resource loading, risk analysis, cost controls, forensic analysis, and delay claims/entitlement analysis. For 15 months, Dagher served as **project scheduler on the SBBMF ZEB Overhead Charging Facility project**, with responsibility for analysis and review of baseline schedule, monthly updates, and Time Impact Analysis reports submitted by the contractor. Dagher is highly proficient in using Primavera P6, Microsoft Project, Schedule Analyzer Pro, and several other schedule analysis software. He has developed and established several cost and resource-loaded CPM schedules, while also performing baseline schedule reviews, monthly update reviews, what-if scenario schedules, budget evaluation, change order reviews, and payment applications reviews for consistency with CPM schedules. In the event of a delay, Dagher uses legally defensible Time Impact Analysis (TIA) methods for quantifying delays and damages. His analysis reports have successfully defended public agencies from millions of dollars of cost claims due to time related overhead (TRO) disputes. Dagher also has experience with developing project scheduling specifications, schedule management procedures, training programs for agency personnel, and has even developed software for tracking contract time and delays that is being used on 100's of projects within Los Angeles County.

SIMILAR PROJECT EXPERIENCE

South Bay Bus Maintenance Facility Zero Emission Bus Overhead Charging Facility, MTS, Chula Vista
In his role as Project Scheduler, Dagher was responsible for analysis and review of baseline schedule, monthly updates, and Time Impact Analysis reports submitted by the contractor. His other duties included coordination with the Resident Engineer, contractor negotiations, job-site meetings, and creating "What-If" scenario schedules for analysis of any project delays. This project included construction of ZEB overhead charging stations.

I-10 Road Reconstruction, Caltrans District 8
Dagher serves as Construction Scheduling Support Analyst for a 20-mile road reconstruction project on the I-10. His role is to review and analyze baseline schedule, monthly updates, and Time Impact Analysis reports submitted by the contractor. Dagher was also a key person in evaluating a $20 million Value Engineering Change Proposal (VECP) on the I-10 project. He worked with field staff, senior Caltrans engineers, and Caltrans Headquarters to analyze value engineering design changes, direct cost reports, quantity changes, production rates, schedule impacts, alternative sequencing, and more. He participated in multiple negotiation meetings with the contractor and partnering sessions.

LEGEND

Overhead Steel Gantry Systems

Electrification

Rapid Bus Transit

MTS Experience

On-Call Critical Path Method (CPM) Analyses Services, Caltrans District 7 (07A4430, 07A5109)
From 2018 – 2020, Dagher served as Construction Scheduling Support Analyst responsible for analysis and review of baseline schedule, monthly updates, and Time Impact Analysis reports submitted by the contractor. Dagher was also involved in the claims process and assisted the Department in DRB meetings. Dagher has been an active member in the CPM Unit by attending weekly meetings, providing training, and assisting other Caltrans employees on their projects. Other duties included coordination with the Resident Engineer, contractor negotiations, job-site meetings, and creating What-If scenario schedules for analysis of any project delays.

As-Needed Construction Services, Los Angeles County Public Works (PW14080, PW13561)
Dagher served as Construction Scheduling Support Analyst responsible for analysis and review of construction schedules (baseline/updates) and Time Impact Analysis (TIA) reports submitted by the contractor for all Project Management Division 3 projects. He also developed various other project schedules, attended jobsite meetings, provided training, developed software, assisted with change orders, cost estimates, status reports, budgeting, updating databases, and evaluated project impacts. **Dagher also developed the Construction Scheduling procedures and specifications for the division.**

David Sluga, PE, QSD/P, ToR

STORM WATER INSPECTOR

Experience in Critical Areas

Education

BS, Civil Engineering, California State University, Long Beach

Licenses / Certifications

- CA, Civil Engineer, CA, No. 51177
- Certified Trainer of Record (ToR)
- Qualified Stormwater Developer/Practitioner, No. 00047

Years of Experience: 34

Years with Firm: 10

A former Caltrans employee for seven years, David brings 34 years of experience to the team with specific expertise in stormwater management. He is a Certified Trainer of Record (ToR), and for the last 20 years has assisted public agencies, Caltrans, and contractors with NPDES permit compliance at construction sites and maintenance facilities. In addition to multiple Caltrans contracts for stormwater compliance, Dave has contributed his stormwater expertise to SANDAG projects (for example, Mid City Rapid Bus and Del Mar Bluffs Stabilization Project III and Bayshore Bikeway in the Port of San Diego). David is well versed in the implementation of environmental and pollution control requirements during planning, design, and construction phases of development. He has extensive knowledge of Caltrans Standard Specifications, Standard Plans, and Caltrans policies and procedures. During his career, he has held various positions, including construction inspector, resident engineer, project manager, and technical specialist in NPDES permit compliance. Functioning as the project manager and task order manager, Mr. Sluga has assisted Caltrans with NPDES permit compliance at construction sites and maintenance facilities.

SIMILAR PROJECT EXPERIENCE

Caltrans District 43 (43A0409, 43A0366) On-Call Professional and Technical Stormwater Quality Assurance Services, Statewide

Dave has served as Contract Manager/Southern California Task Order Manager for two consecutive contracts for on-call services with the Caltrans Division of Environmental Analysis (headquarters). He manages a large team of consultants providing site compliance reviews for construction projects, maintenance facilities, and maintenance activities throughout the state. He is responsible for developing work plans, budgets, task orders, and protocols, and managing field staff. David meets regularly with and discusses field issues with District and Headquarters personnel.

Caltrans District 43 (43A0321) On-Call Professional and Technical Stormwater Quality Assurance Services, Statewide

Dave served as Contract Manager/Southern California Task Order Manager to provide statewide field compliance monitoring to verify that Caltrans' stormwater objectives were being met. Compliance monitoring included field reviews of construction projects, maintenance facilities, and maintenance storage sites. His responsibilities included coordinating with Caltrans for scheduling of field compliance monitors for site reviews; reviewing draft IQA reports; maintaining SharePoint site for storage of completed IQA reports and corrective action reports; maintaining Excel spreadsheet of site visits and corrective actions; attending contract status meetings; assisting with CCEP and AMOCRP updates; and assisting with the development of year-end performance reports.

LEGEND

Rapid Bus Transit

MTS Experience

Caltrans District 43 (43A0307) On-Call Technical and Professional Consultant Services for Stormwater District Assistance, South Sacramento
Stormwater Compliance Specialist. TRC developed site-specific FPPP documents for Districts 9 and 11 Maintenance facilities. Working as a subconsultant under two task orders on this contract, Dave attended a kick-off meeting, researched existing conditions for each maintenance facility, conducted site visits to each facility to gather information on BMPs, and drafted site specific FPPPs with updated site maps using Caltrans FPPP templates.

On-Call Construction Management Services, San Diego County, San Diego
As Storm Water Permit Specialist, Dave conducts storm water IQA reviews at various projects throughout San Diego County. Duties include coordinating site visits with field staff, reviewing the construction site, reviewing storm water document in project files, and developing an IQA Report for use by pertinent parties.

Del Mar Bluffs Stabilization Project III and Bayshore Bikeway Segments 7 and 8A, San Diego
As Construction Manager, Dave was responsible for contract documentation, quality assurance, contract change orders, contractor payments, communication with the contractor, railroad personnel, local agencies, and SANDAG Managers, and controlling the budgets of the construction contracts. The following two projects ran concurrently: The $2.2 million Del Mar Bluffs Stabilization Project III, which consisted of drilling 92 each 36-inch diameter holes for soldier piles spaced approximately 10 feet on center and 40 to 65 feet in depth. Work involved installing steel reinforcement beams into the holes; backfilling the holes with concrete; installing tiebacks at some locations; and finishing with an architecturally enhanced pile cap. The $1.2 million Bayshore Bikeway Segments 7 & 8A added 1.8 miles of a Class 1 bikeway facility in Chula Vista and a portion of the facility traveled through railroad and the Port of San Diego District right-of-way.

Caltrans District 8, Oversight, SR-71 Construction Inspection, San Bernardino
Dave served as Project Manager/Assistant Resident Engineer for this fast-track project to remove and reconstruct two lanes on SR-71 (Euclid Avenue to Route 91). The project included excavation and placement of one million cubic meters of fill material adjacent to a large environmentally sensitive area. The project also involved implementation of SWPPP best management practices and required a full range of construction contractor oversight, coordination, and site management activities. Caltrans District 8 staff was closely involved with the project.

verdantas

Nicholas “Nick” Tracy, PE, GE

MATERIALS TESTING

Experience in Critical Areas

Education

BS, Civil Engineering, California State Polytechnic University, San Luis Obispo

Licenses / Certifications

- CA – Geotechnical Engineer - #3058
- CA – Professional Engineer - #74777
- Metropolitan Transit System Roadway Worker Protection
- North County Transportation District Roadway Worker Protection

Years of Experience: 20

Years with Firm: 4

Nick is based in the San Diego Verdantas office and brings 20 years of experience to the TRC team providing a wide variety of geotechnical engineering services. Nick has been a key performer on three MTS projects **(including SBBMF ZEB Overhead Charging Facility) and two SDG&E projects**, all in the boundaries of San Diego County. He has performed geotechnical investigations using an array of techniques including hollow stem auger drilling equipment, cone-penetration testing equipment, backhoes, seismic refraction, and hand auger. Nick also has extensive forensic project experience on slope failures, differential settlement condition s, and erosional issues. Consulting services have been provided for public works, school, hospital, college, commercial, and residential developments.

MTS South Bay Bus Maintenance Facility

SIMILAR PROJECT EXPERIENCE

South Bay Bus Maintenance Facility Zero Emission Bus Overhead Charging Facility, MTS, Chula Vista

Nick served as Project Manager for the MTS ZEB Bus Project for which Verdantas provided geotechnical testing and observation and QA source and specialty inspection services. These services included compaction of trench backfill and footing bottoms, asphalt concrete compaction, soil and aggregate laboratory testing, hazardous materials testing and QA field inspection to support the development and construction of various proposed transportation and transit related projects.

IRIS Corridor QA Testing Services, MTS, Chula Vista

Nick served as Project Manager providing geotechnical testing and observation and QA source and specialty inspection related to the material testing and QA of the MTS construction on the IRIS Corridor project. Testing and observation services included compaction of trench backfill and footing bottoms; drilled pier excavation; asphalt concrete compaction; soil and aggregate laboratory testing; and reinforced concrete inspection and sampling. Verdantas also performed **hazardous material soils testing** and QA field welding and bolting inspection.

LEGEND

Overhead Steel Gantry Systems | Electrification | Rapid Bus Transit | MTS Experience | SDG&E Coordination

Light Rail Vehicle Maintenance Building Improvements, MTS, San Diego
Nick served as Project Manager for improvements to MTS Maintenance Buildings A and C and Building C Track C-1 East. Improvements consisted of new foundations for support of new scaffolding. Performed inspections of foundation excavations for compliance with project plans and specifications. Reviewed concrete and controlled low strength material (CLSM) submittals and material testing results.

SDG&E Rose Canyon Storm Drain Repair, San Diego
Following a Caltrans storm drain failure at the I-805 Rose Canyon Bridge, an emergency repair was performed involving Caltrans, **MTS**, and **San Diego Gas & Electric**. The storm drain blowout within Caltrans ROW caused erosion which undermined an SDG&E pole foundation and created sediment deposits blocking MTS tracks. As **SDG&E's geotechnical engineer of record**, remedial grading recommendations were provided as well as construction observations during the emergency storm drain and pole foundation repair. The repair involved detailed coordination with all three agency stakeholders.

SDG&E Sunnyside Substation Expansion, Bonita
Nick served as Project Manager for the design and construction phase of the substation expansion project. Performed settlement analyses within compressible alluvial soils. Remedial grading measures included a "stabilization layer" consisting of a layer of crushed drain rock and geogrid. Other aspects of the project included retaining walls, pavement design, evaluation of shallow and deep foundations for substation structures, and shoring inspection.

4393 Viewridge Ave. Suite A
San Diego, CA 92123

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ATTACHMENT B
NEGOTIATED FEE PROPOSAL

Work Order Estimate Summary

MTS Doc. No.	**G2501.0-21**
Work Order No.	**WOA2501-CM12**
Attachment:	**B**

Work Order Title: **Phase 1 - (CM) for the IAD Zero Emission Buss Overhead Charging**

Project No:

Table 1 - Cost Codes Summary (Costs & Hours)

Item	Cost Codes	Cost Codes Description	Total Costs
1		PHASE 1 Construction Management and Inspection Services	$1,317,825.71
		Totals =	**$1,317,825.71**

Table 2 - TASKS/WBS Summary (Costs & Hours)

Item	TASKS/WBS	TASKS/WBS Description	Labor Hrs	Total Costs
1		PHASE 1 Construction Management and Inspection Services	4,984.0	$1,317,825.71
		Totals =	**4,984.0**	**$1,317,825.71**

Table 3 - Consultant/Subconsultant Summary (Costs & Hours)

(If Applicable, Select One)				Consultant	Labor Hrs	Total Costs
DBE	DVBE	SBE	Other			
				PHASE 1 TRC Engineers	4,538.0	$1,226,319.00
				PHASE 1 Leighton Consulting (Now Verdantas)	446.0	$91,506.71
				Totals =	**4,984.0**	**$1,317,825.71**

Work Order Estimate Summary

Consultant/Subconsultant: **TRC Engineers**

MTS Doc. No.: **G2501.0-21**

Work Order No.: **WOA2501-CM12**

Work Order Title: **Phase 1 - (CM) for the IAD Zero Emission Buss Overhead Charging**

Attachment: B

Total Hours = **4,538**

Total Costs = **$1,212,834.89**

Item	TASKS/WBS	TASKS/WBS Description	ODCs (See Attachment)	Task Order Manager	Engineer, Supervising	Field Inspector, Civil, Mechanical	Techincal Expert - Other (Electrical)	Stormwater Compliance, Technical Expert							Total Hours	Totals
				Henry Stultz	Jim Devey, PE	Rob Hehman	Jesse Sandhu, PE	David Sluga								
				$ 245.43	$ 286.34	$ 208.40	$ 340.88	$ 259.07								
1	**Task 1**	**Construction Management and Inspection**														
	Task Order Management		$13,484.11	42											42	$23,792.17
	Resident Engineering				1760										1,760	$503,958.40
	Office Engineering															
	Field Inspection					1760	800								2,560	$639,488.00
	Electrical Submittal and Shop Drawing Reviews															
	QA/QC - Source and Specialty Inspection															
	Scheduling Analysis															
	Labor Compliance Monitoring															
	Stormwater Compliance Monitoring							176							176	$45,596.32
		Subtotals (Hours) =	N/A	42	1760	1760	800	176							4,538	$1,212,834.89
		Subtotals (Costs) =	$13,484.11	$10,308.06	$503,958.40	$366,784.00	$272,704.00	$45,596.32							**4,538**	**$1,212,834.89**
		Subtotals (Hours) =	N/A													
		Subtotals (Costs) =														

Totals (Summary) = **Totals =** **4,538** **$1,212,834.89**

Total (Hours) =	N/A	42	1760	1760	800	176		4538
Total (Costs) =	$13,484.11	$10,308.06	$503,958.40	$366,784.00	$272,704.00	$45,596.32		$1,212,834.89
Percentage of Total (Hours) =	N/A	1%	39%	39%	18%	4%	100%	
Percentage of Total (Costs) =	1%	1%	42%	30%	22%	4%		100%

Work Order Estimate Summary

Consultant/ Subconsultant: **TRC Engineers**

Work Order Title: **Phase 1 - (CM) for the IAD Zero Emission Buss Overhead Charging**

Contract No: **G2501.0-21**

Task Order No. **WOA2501-CM12**

Attachment: **B**

TASKS/WBS (1-5)

ODC Item	Description	Unit	Unit Cost	Task 1		Task 2		Task 3		Task 4		Task 5	
				Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total
1	Vehicles	Monthly	$709.69	19	$13,484.11								
2	QA Surveying (If Required) Invoice												
3													
4													
5													
6													
7													
8													
9													
10													
				Subtotal =	**$13,484.11**	Subtotal =		Subtotal =		Subtotal =		Subtotal =	

TASKS/WBS (6-10)

ODC Item	Description	Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total	Totals Quantity	Totals Total
1	Vehicles											**19**	**$13,484.11**
2	QA Surveying (If Required) Invoice												
3													
4													
5													
6													
7													
8													
9													
10													
		Subtotal =		Subtotal =		Subtotal =		Subtotal =		Subtotal =		**Totals =**	**$13,484.11**

Work Order Estimate Summary

Consultant/Subconsultant: **Leighton Consulting (Now Verdantas)**

MTS Doc. No.: **G2501.0-21**

Work Order No.: **WOA2501-CM12**

Work Order Title: **Phase 1 - (CM) for the IAD Zero Emission Buss Overhead Charging**

Attachment: B

Total Hours = **446**

Total Costs = **$89,288.91**

Item	TASKS/WBS	TASKS/WBS Description	ODCs (See Attachment)	Engineer, Supervising	Engineer, Senior	Geologist, Senior	Geologist III	PW Tech	PW Tech	PW Inspector	PW Inspector	PW Inspector	CADD III	Admin III		Total Hours	Totals
				TBD	TBD	TBD			TBD					TBD			
				$ 264.53	$ 185.16	$ 164.94	$ 132.27	$ 188.60	$ 193.13	$ 232.03	$ 232.03	$ 232.88	$ 117.30	$ 88.62	$ -		
1	**Task 1**	**QA Material Testing**															
	ODCs		$2,217.80														$2,217.80
	Project Management and Communications			7	50	14										71	$13,418.87
	Geotechnical Sampling and Testing								266							266	$51,372.58
	Environmental Sampling																
	Special Inspection										88			7		95	$21,038.98
	Document Control													14		14	$1,240.68
	Project Accounting and Labor Compliance																
		Subtotals (Hours) =	N/A	7	50	14			266		88			21		446	$89,288.91
		Subtotals (Costs) =	$2,217.80	$1,851.71	$9,258.00	$2,309.16			$51,372.58		$20,418.64			$1,861.02		**446**	**$89,288.91**
		Subtotals (Hours) =	N/A														
		Subtotals (Costs) =															

Totals (Summary) =											**Totals =**	**446**	**$89,288.91**
Total (Hours) =	N/A		7	50	14		266		88		21	446	
Total (Costs) =		$2,217.80	$1,851.71	$9,258.00	$2,309.16		$51,372.58		$20,418.64		$1,861.02		$89,288.91
Percentage of Total (Hours) =	N/A		2%	11%	3%		60%		20%		5%	100%	
Percentage of Total (Costs) =		2%	2%	10%	3%		58%		23%		2%		100%

Work Order Estimate Summary

Consultant/ Subconsultant: **Leighton Consulting (Now Verdantas)**

Work Order Title: **Phase 1 - (CM) for the IAD Zero Emission Buss Overhead Charging**

Contract No: **G2501.0-21**

Task Order No. **WOA2501-CM12**

Attachment: B

TASKS/WBS (1-5)

ODC Item	Description	Unit	Unit Cost	Task 1		Task 2		Task 3		Task 4		Task 5	
				Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total
1	Mileage	MI	$0.670	840	$562.80								
2	Modified Proctor	EA	$220.00	2	$440.00								
3	Modified Proctor (6 inch)	EA	$245.00	1	$245.00								
4	Sieve Analysis	EA	$175.00	2	$350.00								
5	Sand Equivalent	EA	$105.00										
6	Durability Index	EA	$200.00										
7	Specific Gravity	EA	$130.00										
8	R-Value	EA	$310.00	2	$620.00								
9	HMA Theoretical Max Density	EA	$130.00										
10	Concrete/CLSM Testing	EA	$25.00										
11	Sample Pick Up	EA	$90.00										
12	PID and PPE	EA	$150.00										
13	CA Title 22 Metals	EA	$128.00										
14	TPH ext.	EA	$83.00										
15	VOCs	EA	$105.00										
				Subtotal =	**$2,217.80**	Subtotal =		Subtotal =		Subtotal =		Subtotal =	

TASKS/WBS (6-10)

ODC Item	Description	Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total	Totals Quantity	Totals Total
1	Mileage											**840**	**$562.80**
2	Modified Proctor											**2**	**$440.00**
3	Modified Proctor (6 inch)											**1**	**$245.00**
4	Sieve Analysis											**2**	**$350.00**
5	Sand Equivalent												
6	Durability Index												
7	Specific Gravity												
8	R-Value											**2**	**$620.00**
9	HMA Theoretical Max Density												
10	Concrete/CLSM Testing												
11	Sample Pick Up												
12	PID and PPE												
13	CA Title 22 Metals												
14	TPH ext.												
15	VOCs												
		Subtotal =		Subtotal =		Subtotal =		Subtotal =		Subtotal =		**Totals =**	**$2,217.80**

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 8

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

Social Equity Listening Tour (SELT) Bus Stop Shelter Upgrades Design Services – Work Order Agreement

RECOMMENDATION:

That the San Diego Metropolitan Transit System (MTS) Board of Directors authorize the Chief Executive Officer (CEO) to execute Work Order No. WOA353-AE-34 (in substantially the same format as Attachment A) under MTS Doc. No. PWL353.0-22, with Dokken Engineering (Dokken), in the amount of $688,221.76 to provide design services for upgrading twenty-eight (28) existing bus stops to accommodate shelters.

Budget Impact

The total contract cost is estimated to be $688,221.76. This project will be funded by the Capital Improvement Project (CIP) 1008123001 – SELT Bus Stop Shelter Upgrades.

DISCUSSION:

After holding a SELT in the summer of 2022, MTS was made aware of the needs and priorities that riders had, and the current service areas that were lacking various amenities. The SELT findings concluded that bus shelters and seating were the most desired amenities. The twenty-eight (28) locations in this project were identified using the Board's Transit Amenity Plan, with a focus on locations suggested during the SELT public engagement process, ridership statistics for each stop, and a cost and feasibility review of the level of construction or external coordination required to make the necessary improvements. Some locations only require installation of new shelters, while others also require construction around the stop. This project will provide the design to modify existing sidewalk conditions to accommodate bus stop shelters and meet Americans with Disabilities Act (ADA) clearance requirements.

This Work Order will address the design of sidewalk modifications for the placement of shelters at twenty-eight (28) designated bus stop locations. Designs shall be closely coordinated with MTS.

Under this proposed work order, Dokken will conduct field investigations, records research, and all plan preparation, to provide design plans and support for twenty-eight (28) bus stop shelter upgrades, at the following locations:

STOP	DIR	STREET	CROSS STREET	CITY	NOTES
PRIORITY GROUP 1 - NATIONAL CITY AND CHULA VISTA					
NATIONAL CITY					
99315	EB	18th St	Highland Ave	National City	Convert asphalt into concrete sidewalk.
12884	NB	Highland Ave	28th St	National City	Landscaping, relocation of backflow, electrical pedestal.
50062	WB	30th St	Highland Ave	National City	Encroach into Mobil gas landscaping island.
50085	WB	Plaza Bl	Euclid Ave	National City	
CHULA VISTA					
12553	NB	3rd Av	H St	Chula Vista	May require a retaining wall.
30085	EB	H St	3rd Av	Chula Vista	Remove hedges, fill in behind sidewalk to retaining wall, may not be 10ft.
30278	WB	East H St	Otay Lakes Rd	Chula Vista	May require retaining wall, replicate existing retaining wall east of stop.
11385	WB	E St	3rd Av	Chula Vista	
PRIORITY GROUP 2- CITY OF SAN DIEGO					
CITY HEIGHTS/COLLEGE AREA					
88938	EB	University Av	College Av	City of San Diego	Existing wrought iron fence would need to be moved, currently 5ft+/- from curb face.
12943	NB	College Av	University Av	City of San Diego	Would require Taco Bell landscaping changes, including relocation of backflow and pull boxes.
12185	SB	54th St	Trojan Av	City of San Diego	Requires tree removal and bollards (parking space behind stop).
12952	NB	College Av	Billman St	City of San Diego	Retaining wall needed.
SOUTH EAST CENTRAL					
10948	WB	National Ave	36th St	City of San Diego	
11413	WB	University Ave	60th St	City of San Diego	Asphalt in terrible condition, needs concrete sidewalk and potential retaining wall.
10195	EB	National Ave	35th St	City of San Diego	Convert dirt between sidewalk and curb into concrete pad, note the driveway west of stop.
10205	EB	National Ave	38th St	City of San Diego	Convert dirt between sidewalk and curb into concrete pad.
13441	EB	Logan Ave	45th St	City of San Diego	Convet asphalt between broken parking lot and curb into a concrete pad, note similar issues to Market/25th EB, needs bollards.
10544	EB	Natioanl Ave	30th St	City of San Diego	Convert dirt between sidewalk and curb into concrete pad.
13440	WB	Logan Ave	45th St	City of San Diego	Convert dirt between sidewalk and curb into concrete pad. Will need bollards behind shelter to keep cars from hitting in parking lot. Possible tree removal needed.
11382	WB	Logan Ave	Euclid Ave	City of San Diego	Major sidewalk repairs needed to repair existing damage. Add pad behind sidewalk
11000	WB	Logan Ave	Jarrett Ct	City of San Diego	Potentially move stop to other side of stairs, if needed to accommodate a shelter. Potential retaining wall.
50123	SB	Euclid Ave	Logan Ave	City of San Diego	Major tree removal required.
10956	WB	Ocean View Bl	38th St	City of San Diego	Convert dirt between sidewalk and curb into concrete pad.
11309	WB	National Ave	32nd St	City of San Diego	
50198	SB	Highland Ave	Eta St	City of San Diego	
10516	SB	Ocean View Bl	Commercial St	City of San Diego	
12165	SB	Euclid Ave	Brooks Huffman Plaza	City of San Diego	
SOUTH BAY					
60579	WB	Camino De La Pla	Willow Rd	City of San Diego	Landscaping removal.

On September 15, 2021, MTS issued a solicitation for On-Call Architectural and Engineering (A&E) Design Services by requesting Statements of Qualifications (RFSQ) from firms with expertise in a variety of A&E design and related consulting services separated into the following three (3) categories:

Category A: Comprehensive/Full Service - Five (5) prime contracts

Category B: Small Business (SB) Set Aside - Three (3) prime contracts awarded to a certified SB or a Disadvantage Business Enterprise (DBE) certified firm, (which is also considered to be a SB)
Category C: Specialty Prime – Up to Five (5) specialty service contracts

As a result of the RFSQ, seven (7) firms were selected to perform various A&E services. For projects requiring A&E Services, work orders are issued to these firms.

On June 21, 2024, MTS issued a Request for Proposals (RFP) to all firms in Categories A and B. On July 30, 2024, MTS received a total of two (2) proposals from the following A&E firms:

Firm Name	Firm Certification
Dokken	None
Psomas	None

An evaluation panel was comprised of MTS representatives, and the proposals were evaluated based on the following criteria.

Criteria	Points
Project Team	25
Project Team's Capabilities	25
Project Understanding and Approach	30
Schedule	20
Total Possible Score	**100**

On May 22, 2024, the selection committee evaluated the initial proposals and scored as follows:

Ranking	Proposer Name	Total Score
1	Dokken	91.40
2	Psomas	87.00

As a result of the evaluations, Dokken was deemed to be the most qualified firm to perform the services.

Dokken's initial proposed amount for the services was $725,962.08. Through negotiations, staff was able to reduce the cost by $37,740.32, a 5.20% savings to MTS. The Independent Cost Estimate (ICE) for the services was $456,630.59. Based on the level of effort and proposed classifications, Dokken's final cost proposal in the amount of $688,221.76 was determined to be fair and reasonable.

For this project Dokken will utilize the following subconsultants:

Subconsultant Name	Subconsultant Certification	Subconsultant Amount
Aguirre & Associates	DBE, MBE and SB	$144,408.28

Therefore, staff recommends that the MTS Board of Directors authorize the CEO to execute Work Order No. WOA353-AE-34 (in substantially the same format as Attachment A) under MTS Doc. No. PWL353.0-22, with Dokken, in the amount of $688,221.76 to provide design services for upgrading twenty-eight (28) existing bus stops to accommodate shelters.

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachment: A. Draft Work Order WOA353-AE-34

Metropolitan Transit System

November 14, 2024

MTS Doc. No. PWL353.0-22
WOA353-AE-34

Mr. John Klemunes, PE
Regional Manager
Dokken Engineering
1450 Frazee Road, Suite 100
San Diego, CA 92108

Dear Mr. Klemunes:

Subject: WORK ORDER WOA353-AE-34, TO MTS DOC. NO. PWL353.0-22, ENGINEERING SERVICES FOR SELT BUS STOP SHELTER UPGRADES

This letter shall serve as Work Order WOA353-AE-34, under the General Engineering Consultant Agreement, MTS Doc. No. PWL353.0-22, as further described below.

SCOPE OF SERVICES

This Work Order shall provide design services SELT Bus Stop Shelter Upgrades project in accordance with the attached Scope of Services (Attachments A and A1). Federal terms do not apply.

SCHEDULE

The Scope of Services shall remain in effect for a period thirty-two (32) months from the date of the Notice to Proceed through the completion of construction. Construction services are anticipated to be completed in thirteen (13) months from the start to completion.

PAYMENT

Payment shall be based on actual costs in the amount of $688,221.76, and shall not be exceeded without prior authorization of MTS (Attachment B).

Please sign below, and return the document to the Contracts Specialist at MTS. All other terms and conditions shall remain the same and in effect.

Sincerely,

Sharon Cooney
Chief Executive Officer

Accepted:

John Klemunes, PE
Regional Manager, Dokken Engineering

Date: _____

Attachments: Attachment A, Scope of Services
Attachment A1, Consultant's Proposal
Attachment B, Negotiated Fee Proposal

ATTACHMENT A
SCOPE OF SERVICES

ATTACHMENT A1
CONSULTANT'S PROPOSAL

ATTACHMENT B
NEGOTIATED FEE PROPOSAL

ATTACHMENT A
SCOPE OF SERVICES

TITLE: SELT BUS STOP SHELTER UPGRADES **WOA#: WOA353-AE-34**

I. PROJECT DESCRIPTION

After holding a social equity listening tour in the summer of 2022, Metropolitan Transit System (MTS) was made aware of the needs and priorities that riders had, and the current service areas that were lacking various amenities. From the findings, more shelters and seating were the most desired amenities. Some new shelters only require installation, while others also require construction. This project will provide the design to modify existing sidewalk conditions to accommodate bus stop shelters.

This Work Order will address the design of sidewalk modifications for the placement of shelters at twenty-eight designated (28) bus stop locations (Exhibits A and B, Bus Stop Locations). Some bus stop locations have special conditions, or will require more extensive improvements, as noted in the right column of Exhibits A and B. Designs shall be closely coordinated with MTS.

These improvements shall require the Consultant to provide a design to accommodate a shelter that complies with ADA Section 810 for Transportation Facilities; to be packaged as two separate construction projects for bid advertisement. All locations shall be designed to the highest level of improvement feasible at each site, in the order listed below:

1) Accommodates a standard 13’ or 17’ MTS advertising shelter
2) Accommodates a standard 13’ or 17’ MTS non-advertising shelter

Also, Consultant shall be responsible for providing all necessary forms, fees, and support for plan review/approval and permitting required by all applicable agencies outside of MTS. This shall include processing DS-3179 Construction Plans for approval and permit issuance for work within the City of San Diego right-of-way. Consultant shall provide two (2) sets of half-size prints of fully permitted plans to MTS project manager.

II. SCOPE OF WORK

The scope of work shall consist of the following tasks and deliverables:

TASK 1: PROJECT MANAGEMENT AND COORDINATION

1.1 Provide project management services including the requirements for invoicing, quality assurance, and administration of the Consultant’s team.
1.2 Provide quality control as part of the development of the deliverable.
1.3 Provide coordination with outside agencies for review and approval of the plans. All bus stops locations are presumed to be within the local municipal public right-of-way. Permits are required for construction within City right-of- way.
1.4 Facilitate plan review as an electronically submitted over the counter permit, and shall address review comments and design related issues.
1.5 Provide design assistance as-needed during the construction phase.

TASK 2: FIELD INVESTIGATION

The Consultant shall visit each site and perform the following:

2.1 Record measurements based off existing face of curb for bus stop dimensions, sign and bench locations, locations of any fences or obstructions, distance to nearest curb return

of the nearest intersection from bus stop sign, and other pertinent obstructions, furnishings, or limits of work.

2.2 Photo log locations with a straight facing shot, two angled front shots at approximately 45 degrees, and two side shots along curb/sidewalk - one from each side.

2.3 Provide licensed surveyor to inspect each applicable site, perform a boundary survey for the right-of-way, and complete monument preservation certification on sheet 3 of City of San Diego Development Services form DS-3179 for sites within City of San Diego Right-of-Way.

TASK 3: RECORDS RESEARCH

3.1 Consultant shall perform a records research of as-built street improvement plans at the City of San Diego or National City for each bus stop location and field confirm all existing conditions. The bus stop design plans shall include, but are not limited to, right-of-way information and existing utilities taken from as-built drawing research.

3.1.1 If as-builts do not match existing field conditions, report the differences to MTS prior to proceeding with plan preparation for that application location(s). MTS may provide the Consultant additional reports or documentation as a resource for reference, if applicable.

3.1.2 Proposed improvements that will encroach on private property shall be reviewed by MTS prior to final design. If the necessary improvements must encroach on private property with no alternative, MTS will decide if the bus stop shall remain in this scope of work.

TASK 4: PLAN PREPARATION AND BUS STOP DESIGN

There are two (2) groups for completion of the bus stop designs. From Exhibit A, Priority Group 1 includes all National City and Chula Vista stations, and from Exhibit B, Priority Group 2 includes all City Heights, College Area, South East Central, and South Bay stations. Consultant may work on all locations at the same time, but shall complete Priority Group 1 first.

4.1 Consultant shall prepare an existing layout for each bus stop location. Bus stop locations in the City of San Diego shall use the latest form DS-3179. The existing layout shall be based on survey information and the measurements and photos gathered from all field investigations in Task 2. Field Investigation.

4.1.2 Consultant shall prepare an Encroachment Maintenance and Removal Agreement (EMRA) using the latest City of San Diego EMRA form for any new infrastructure fixtures, including, but not limited to, retaining walls.

4.2 Information from Task 3, Records Research will be plotted into the base map. This will act as the basis for each bus stop design.

4.3 Per City of San Diego requirements, the Consultant shall provide traffic control plans for bus stops in San Diego (Priority Group 2) for roadways with Average Daily Traffic (ADT) volumes greater than 5,000.

4.4 Consultant shall determine the ADA criteria, standard drawings and technical specification references necessary at each bus stop location. (Note that certain locations are unique and will anticipate specific design not subject to the general criteria, i.e. small retaining walls, crosswalk improvements, additional permitting, utility obstructions, etc.)

4.5 Consultant shall provide 95% design plans for MTS review prior to submitting final plans for permit.

TASK 5: FACILITATE PLAN REVIEW AND PERMIT ASSISTANCE

5.1 Consultant shall be responsible for the coordination with all outside agencies for review and approval of the plans.
5.2 Consultant shall obtain all permits required for construction within City right-of-way.
5.3 Consultant shall facilitate plan review processes and shall address review comments and design related issues.
5.4 Consultant shall keep a record log to track all City review comments and design revisions. The record log shall be included for all City permitting review re-submittals. A template log has been provided in the attachments.
5.5 Consultant shall assist the Contractor with City permit processing required during the construction phase.
5.6 Consultant shall provide updates when the permit is submitted and notify of acceptance or revision within seven (7) days.

TASK 6: ENGINEER'S COST ESTIMATE

6.1 Consultant shall prepare an engineer's cost estimate for the total sum of items to be constructed for this project.
6.1.1 Cost estimate shall include a list of construction bid items with each item being measured for cost quantity.
6.1.2 Unit costs for each bid items will be developed based on recent construction bid data.

TASK 7: DESIGN SUPPORT DURING CONSTRUCTION

7.1 Consultant shall perform design support during construction throughout the construction phase of the project.
7.1.1 Consultant shall assume they will not be needed for construction progress meetings. However, Consultant shall allocate hours for personnel to assist with potential in-field design changes and to provide direction to the contractor.
7.1.2 As directed by MTS, the Consultant shall review and respond to reasonable and appropriate Contractor RFI's forwarded from the MTS Project Manager and issue necessary clarifications and interpretations of the Contract Documents as appropriate. Any orders authorizing variations from the Contract Documents will be made by the MTS PM. The Consultant shall use SharePoint software system to respond to RFIs electronically. It is our assumption that the CM team would address the majority of the RFI's.

III. PERIOD OF PERFORMANCE

The period of performance for the required services shall remain in effect for a period thirty-two (32) months from the date of the Notice to Proceed through the completion of construction. Construction services are anticipated to be completed in thirteen (13) months from the start completion.

IV. SCHEDULE OF SERVICES/MILESTONES/DELIVERABLES

A. Tasks Schedule – Includes Priority 1 and Priority 2 Locations

Task	Begin/End Dates/Duration
1. Project Management and Coordination	NTP / NTP + through completion of construction

2. Field Investigation	NTP + 1 week / NTP + 8 Weeks / 8 Weeks
3. Records Research	NTP + 8 weeks / NTP + 16 Weeks / 8 Weeks
4. 95% Plan Preparation and Bus Stop Design	NTP + 16 weeks / NTP + 28 Weeks / 12 Weeks
5. Facilitate Plan Review	After Task 4 / NTP + 54 Weeks / 26 Weeks
6. Engineer's Cost Estimate	After Task 4 / 4 Week Duration
7. Design Support During Construction	After construction contract NTP / 54 Week Duration

B. Milestones/Deliverables Schedule - Includes Priority 1 and Priority 2 Locations

Milestone/Deliverable	**Due Date**
1. 95% Design Plans	NTP + 28 Weeks
2. Permitted/Conformed Plan Set	NTP + 54 Weeks
3. Engineer's Cost Estimate	NTP + 32 Weeks

V. MATERIALS TO BE PROVIDED BY MTS AND/OR THE OTHER AGENCY

List all materials to be provided by MTS and/or the Local Agency.

- Exhibit C - Designing for Transit (Attached Separately on PlanetBids)OR
- Exhibit D - Bus Stop Area Specifications (Attached Separately on PlanetBids)
- Exhibit E – Design Review Comment Log (Attached Separately on PlanetBids)Not Applicable.

VI. SPECIAL CONDITIONS

Any condition listed below applies solely to this Work Order and does not otherwise alter the Agreement or other Work Orders.

List any specific Work Order required conditions, exemptions and/or changes to the Standard Agreement Terms and Conditions here. Be sure to mark the required check box in the Work Order Cover (Signature) Sheet.

OR

Not Applicable.

VII. MTS ACCEPTANCE OF SERVICES:

Contractor shall not be compensated at any time for unauthorized work outside of this Work Order. Contractor shall provide notice to MTS' Project Manager upon 100% completion of this Work Order. Within five (5) business days from receipt of notice of Work Order completion, MTS' Project Manager shall review, for acceptance, the 100% completion notice. If Contractor provides final service(s) or final work product(s) which are found to be unacceptable due to Contractors and/or Contractors subcontractors negligence and thus not 100% complete by MTS' Project Manager, Contractor shall be required to make revisions to said service(s) and/or work product(s) within the Not to Exceed (NTE) Budget. MTS reserves the right to withhold payment associated with this Work Order until the Project Manager provides written acceptance for the 100% final completion notice. Moreover, 100% acceptance and final completion will be based on resolution of comments

received to the draft documents and delivery of final documentation which shall incorporate all MTS revisions and comments.

Monthly progress payments shall be based on hours performed for each person/classification identified in the attached Fee Schedule and shall at no time exceed the NTE. Contractor shall only be compensated for actual performance of services and at no time shall be compensated for services for which MTS does not have an accepted deliverable or written proof and MTS acceptance of services performed.

VIII. DEFICIENT WORK PRODUCT

Throughout the construction management and/or implementation phases associated with the services rendered by the Contractor, if MTS finds any work product provided by Contractor to be deficient and the deficiently delays any portion of the project, Contractor shall bear the full burden of their deficient work and shall be responsible for taking all corrective actions to remedy their deficient work product including but not limited to the following:

- Revising provided documents,

At no time will MTS be required to correct any portion of the Contractors deficient work product and shall bear no costs or burden associated with Contractors deficient performance and/or work product.

IX. DELIVERABLE REQUIREMENTS

Contractor will be required to submit any and all documentation required by the Scope of Work. The deliverables furnished shall be of a quality acceptable to MTS. The criteria for acceptance shall be a product of neat appearance, well-organized, and procedurally, technically and grammatically correct. MTS reserves the right to request a change in the format if it doesn't satisfy MTS's needs. All work products will become the property of MTS. MTS reserves the right to disclose any reports or material provided by the Contractor to any third party.

Contractor shall provide with each task, a work plan showing the deliverables schedule as well as other relevant date needed for Contractor's work control, when and as requested by MTS.

Contractor's computer data processing and work processing capabilities and data storage should be compatible with Windows compatible PC's, text files readable in Microsoft Word, and standard and customary electronic storage. Contractor shall maintain backup copies of all data conveyed to MTS.

Contractor shall provide MTS with hard copy or electronic versions of reports and/or other material as requested by MTS.

X. PRICING

Except where otherwise noted herein, pricing shall be firm and fixed for the duration of the Work Order and any subsequent Change Orders/Amendments to the Work Order. There shall be no escalation of rates or fees allowed.

Work Order will be performed as Time and Materials with a Not to Exceed amount.
Permit Fees will be paid as an Other Direct Cost, not to exceed $750 per location.

Any permits required outside of the City of San Diego and National City will be coordinated by MTS.

XI. ADDITIONAL INFORMATION

List additional information as applicable to the specific Work Order scope of services.

XII. PREVAILING WAGE

Prevailing wage rates apply to certain personnel for these services? ☐ Yes ☐ No

EXHIBIT A
BUS STOP LOCATIONS – PRIORITY GROUP 1

STOP	DIR	STREET	CROSS STREET	CITY	NOTES
PRIORITY GROUP 1 - NATIONAL CITY AND CHULA VISTA					
NATIONAL CITY					
99315	EB	18th St	Highland Ave	National City	Convert asphalt into concrete sidewalk.
12884	NB	Highland Ave	28th St	National City	Landscaping, relocation of backflow, electrical pedestal.
50062	WB	30th St	Highland Ave	National City	Encroach into Mobil gas landscaping island.
50085	WB	Plaza Bl	Euclid Ave	National City	
CHULA VISTA					
12553	NB	3rd Av	H St	Chula Vista	May require a retaining wall.
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30278	WB	East H St	Otay Lakes Rd	Chula Vista	May require retaining wall, replicate existing retaining wall east of stop.
11385	WB	E St	3rd Av	Chula Vista	

EXHIBIT B
BUS STOP LOCATIONS – PRIORITY GROUP 2

STOP	DIR	STREET	CROSS STREET	CITY	NOTES
PRIORITY GROUP 2- CITY OF SAN DIEGO					
CITY HEIGHTS/COLLEGE AREA					
88938	EB	University Av	College Av	City of San Diego	Existing wrought iron fence would need to be moved, currently 5ft+/- from curb face.
12943	NB	College Av	University Av	City of San Diego	Would require Taco Bell landscaping changes, including relocation of backflow and pull boxes.
12185	SB	54th St	Trojan Av	City of San Diego	Requires tree removal and bollards (parking space behind stop).
12952	NB	College Av	Billman St	City of San Diego	Retaining wall needed.
SOUTH EAST CENTRAL					
10948	WB	National Ave	36th St	City of San Diego	
11413	WB	University Ave	60th St	City of San Diego	Asphalt in terrible condition, needs concrete sidewalk and potential retaining wall.
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11309	WB	National Ave	32nd St	City of San Diego	
50198	SB	Highland Ave	Eta St	City of San Diego	
10516	SB	Ocean View Bl	Commercial St	City of San Diego	
12165	SB	Euclid Ave	Brooks Huffman Plaza	City of San Diego	
SOUTH BAY					
60579	WB	Camino De La Plaza	Willow Rd	City of San Diego	Landscaping removal.

ATTACHMENT A1
CONSULTANT'S PROPOSAL

SUBMITTED TO:
STEVE AUGUSTYN
PROCUREMENT SPECIALIST
METROPOLITAN TRANSIT SYSTEM
1255 IMPERIAL AVENUE
SUITE 1000
SAN DIEGO, CA 92101

Metropolitan Transit System

PROPOSAL

A&E MASTER AGREEMENT AWARDS FOR SELT BUS STOP SHELTER UPGRADES - WOAXXXX-AE-34

SUBMITTED BY: **Frank Flores, PE**
Project Manager
1450 Frazee Road, Suite 100
San Diego, CA 92108
(858) 514-8377
fflores@dokkenengineering.com

SUBMITTED ON:
July 30, 2024

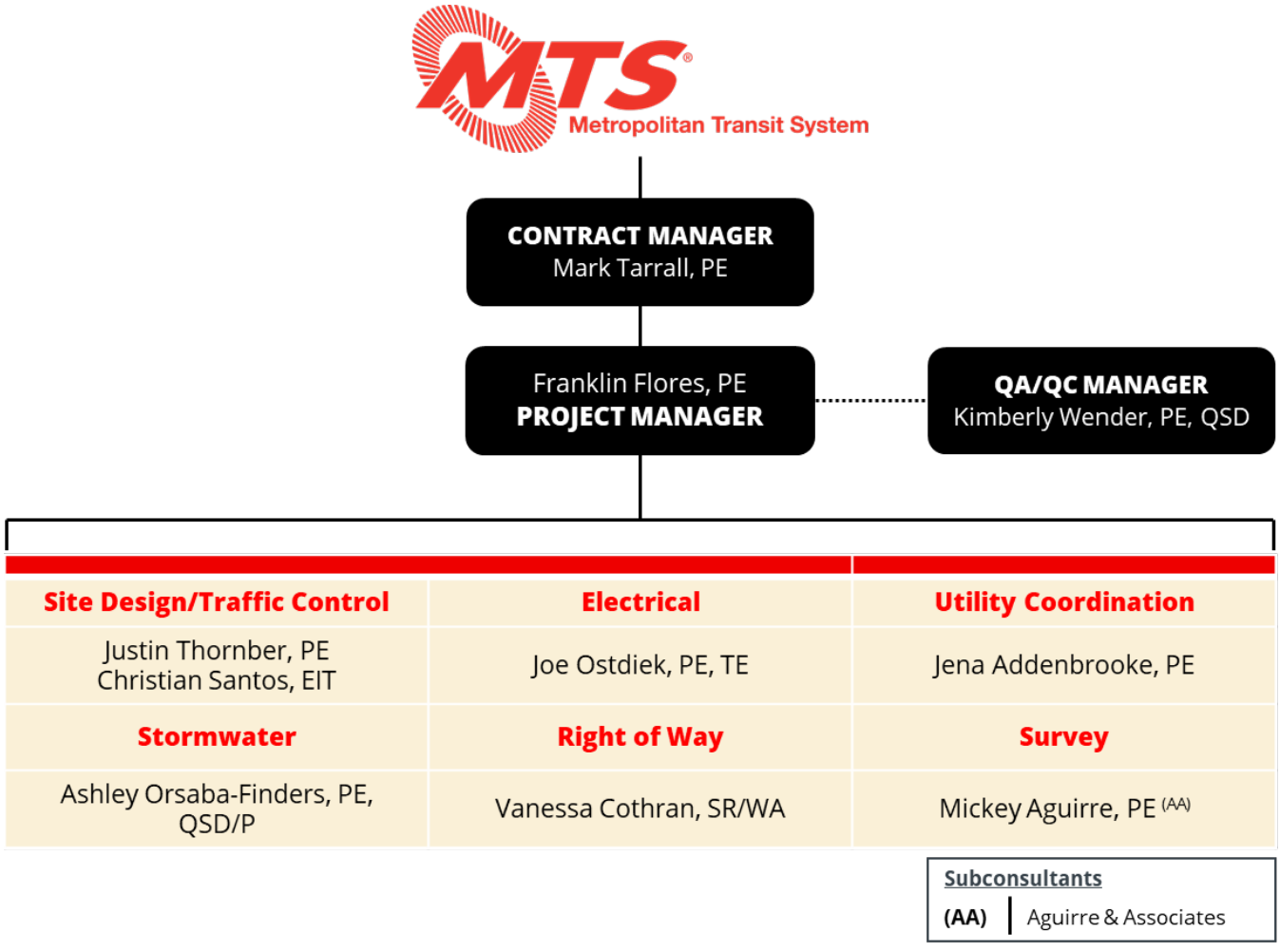
EXECUTIVE SUMMARY

The Dokken team appreciates the opportunity to continue being your trusted partner for the SELT Bus Stop Shelter Upgrades project. The following proposal details our expansive knowledge and experience delivering similar bus stop improvement projects for MTS and NCTD, while also providing an exceptionally high level of customer service. Our extensive knowledge of transit operations, bus stop site improvement design, and the local agencies permitting process enables our team to be the most qualified to help MTS deliver the best project to the Community.

1. Project Team

QUALIFICATIONS AND RELEVANT EXPERIENCE

Dokken Engineering has assembled a highly qualified team of engineers, technical experts, and support staff to deliver the SELT Bus Stop Shelter Upgrades project. Project Manager, Franklin Flores, has over 16 years of experience working closely with multiple transit agencies, and the cities in which they operate, to provide efficient, safe pedestrian and rider friendly facilities. Franklin will lead delivery of the task order scope of services and be responsible for planning, executing, and managing the team. Our team was selected based on experience with similar ongoing and recently completed projects and availability to focus on your project. The qualifications that make our team uniquely suitable for this project are represented in the descriptions below. Detailed resumes of key staff are included in Exhibit A.



Franklin Flores, PE | Project Manager: Frank has extensive experience in transit station, transit center, bus stop, parking lot, and site design. He has performed existing site assessments and developed construction document packages for new BRT station and bus stop locations, including site furnishings and amenities, park and ride lots, fueling station sites, and bus bay transit centers.

Kimberly Wender, PE | QA/QC Manager: Kimberly has a strong portfolio of transit facilities and public works projects, including mobility hubs, bus transit centers, bus rapid transit, bus stop engineering, and light rail stations. She has worked closely with multiple transit agencies, and the cities in which they operate, to provide safe, efficient, pedestrian, and rider-friendly facilities.

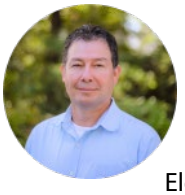
Christian Santos, EIT | Site Design: Christian assists in various aspects of roadway and transit design in accordance with City, County, Caltrans, and MTS standards. Christian is proficient in both AutoCAD Civil 3D and MicroStation V8i/OpenRoads design software. Christian has supported numerous projects through COSD DSD permit review process.

Jena Addenbrooke, PE | Utility Coordination: Jena has 16 years of roadway design experience, specializing in the area of utility coordination. She has extensive understanding and complies with the FHWA's regulations and requirements under Code of the Federal Regulations governing utility relocations to ensure proper and complete utility clearance.

Vanessa Cothran, SR/WA | Right of Way: Vanessa has worked in the right of way industry on a variety of public projects including roads, trails, bridges, pedestrian improvements, and interchanges. She has demonstrated expertise in providing acquisition and relocation assistance services and is knowledgeable of the Uniform Act and Caltrans policies and procedures.

Mark Tarrall, PE | Contract Manager: Mark has 25 years of experience specializing in the management, permitting, and design of transportation-related projects, including local roadway, interchange, bike path, highway widening, and transit projects. He has extensive experience with transit infrastructure delivery and has coordinated and designed multiple MTS facilities.

Justin Thornber, PE | Site Design: Justin has a demonstrated history of civil design excellence, specifically with roadway, ADA compliance, site development, mass/precise grading, and construction support. He is a member of ASCE and currently serves as the webmaster for the San Diego section. Recent relevant project experience includes SBMF ZEB, IAD ZEB, and CTAC.



Joe Ostdiek, PE, TE | Electrical: Joe has 25 years of experience in the design of traffic signals, street lighting systems, ramp metering systems, fiber optic and ITS. Joe is well versed in the Caltrans Electrical Systems Design Guide, the IES Roadway Lighting Manual and Caltrans Standard Plans and Specifications. Joe leads the traffic signals and lighting design for all of Dokken's civil projects.

Ashley Orsaba-Finders, PE, QSD/P | Stormwater: Ashley is a Senior Engineer with 17 years of experience in water resources and transportation engineering, project management, site development, planning, and GIS analysis. She is experienced in the design of water resources and transportation projects including hydraulic modeling, alternatives analysis, and utility coordination.

Mickey Aguirre, PE | Survey: Mickey's experience includes rail and light rail, public works, residential, commercial, churches, schools and other institutional projects. Mr. Aguirre has extensive surveying and mapping experience under contracts for local agencies in San Diego County including MTS for rail and light rail projects.

UNIQUE QUALIFICATIONS OF PROJECT PERSONNEL & TIME COMMITMENT TO PROJECT

A summary table of our project personnel outlining each of their qualifications, years of experience, and relevant project experience is included below. Full resumes of key staff are provided in **Exhibit A** detailing our team's qualifying experience.

KEY PERSONNEL ROLE	YEARS EXP.	EDUCATION/LICENSES	SIMILAR PROJECT PERFORMANCE	CURRENT COMMITMENTS	AVAILABILITY TO MTS
FRANKLIN FLORES Project Manager	16 yrs	• BSCE • Professional Civil Engineer (CA)	• NCTD Bus Stop Improvements 23006 • NCTD Bus Stop Improvements 25612 • E Palomar St Transit Station, Park & Ride and DAR at I-805	• I-10/Oak Valley Parkway • East Campus Loop Road • NCTD Bus Stop Improvements 23006	**50%**
MARK TARRALL Contract Manager	25 yrs	• MSCE • BSCE • Professional Civil Engineer (CA)	• SBMF ZEB Concept Plan and Final Engineering • IAD ZEB Concept Plan and Final Engineering • CTAC Master Plan	• MTS As-Needed • NCTD As-Needed Engineering Services • Alvarado Canyon Rd Realignment	**30%**
KIMBERLY WENDER QA/QC Manager	16 yrs	• BSCE • Professional Civil Engineer (CA) • Qualified SWPPP Developer	• Iris Rapid Corridor & Station • CTAC Master Plan • NCTD Bus Stop Improvements 23006	• CTAC (Completion Fall 2024) • 12th and Imperial Transit Center (Completion Fall 2024) • East County ZEB Master Plan (Completions Winter 2024)	**45%**
JUSTIN THORNBER Site Design	14 yrs	• BSCE • Professional Civil Engineer (CA)	• Iris Rapid Corridor & Station • San Pablo Ave Streetscape • McFadden Ave Protected Bike Lane & Bicycle Blvd	• SBMF ZEB Construction Support • IAD ZEB Construction Support • Iris Rapid Corridor	**50%**
CHRISTIAN SANTOS Site Design	5 yrs	• BSCE • Engineer in Training (CA)	• Iris Rapid Corridor & Station • IAD ZEB Concept Plan and Final Engineering • East Campus Loop Road	• Iris Rapid Construction Support • East Campus Loop Road	**60%**
JOE OSTDIEK Electrical	25 yrs	• BSCE • Professional Civil Engineer (CA) • Professional Traffic Engineer (CA)	• Oroville Transit Center • E Palomar St Transit Station, Park & Ride and DAR at I-805 • San Pablo Streetscape	• Santa Monia Pier Bridge Replacement • Caltrans District 3 On-Call	**45%**
JENA ADDENBROOKE Utility Coordination	16 yrs	• BSCE • Professional Civil Engineer (CA)	• Mid-Coast Corridor Transit • E Palomar St Transit Station, Park & Ride and DAR at I-805	• East Campus Rd Realignment • Otay Mesa East Port of Entry • San Diego LOSSAN Rail Realignment	**40%**
ASHLEY ORSABA-FINDERS Stormwater	17 yrs	• MBA • BSCE • Professional Civil Engineer (CA) • QSD/QSP	• San Diego Naval Base Improvements • South Bay BRT East Palomar Street Improvements • Otay Mesa Transit Center	• Caltrans District 9 On-Call • Cripple Creek Repairs • Laguna Creek Inter-Regional Trail Crossing at SR-99	**40%**
VANESSA COTRHAN Right of Way	19 yrs	• BA Sociology • CA Licensed Real Estate Salesperson, #01788740	• Iris Rapid Corridor & Station • El Camino Real Widening • Autry Ln,. Monte Vista Ave., & Lower Wyandotte Rd. SRTS	• FEMA Storm Drain Repair • Rosa Morada Bridge Replacement • W San Carlos Street Improvements	**70%**
MICKEY AGUIRRE Survey	50 yrs	• MSCE • BSCE • Professional Civil Engineer (CA)	• NCTD Contract 16041-02 Bus Stop Improvements TO 5 • Iris Rapid Corridor & Station	• SANDAG Task Order • American Plaza • MTS TPSS	**45%**

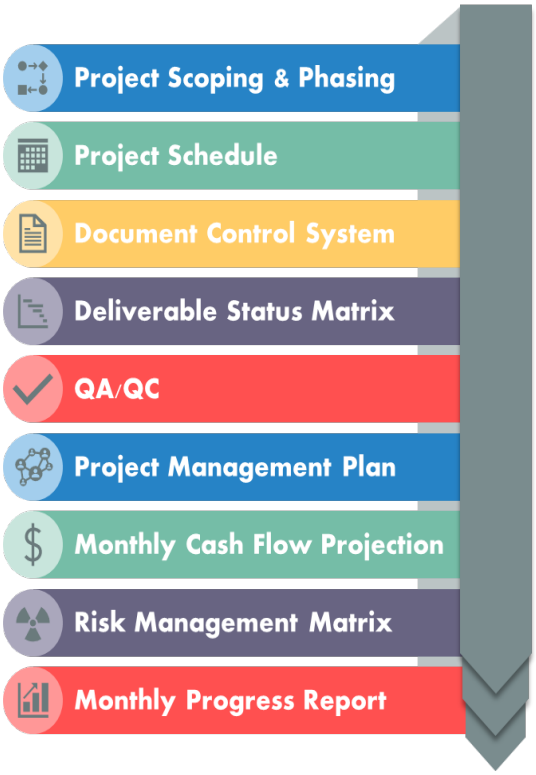
2. Project Team's Capabilities

MANAGEMENT, COORDINATION AND SCHEDULING ABILITIES

Dokken's clients are almost exclusively repeat clients - a true testament of our team's ability to deliver successful projects. Franklin is persistent and passionate about project delivery for his clients, which is demonstrated through client testimonials including, *"Dokken Engineering has provided outstanding professional services to the City of Santee for many Capital Improvement program projects since 2011. We hope Dokken Engineering pursues future contracting opportunities for City as-needed design services for the City's Capital Improvement Program projects."- Steven Miller, Principal Civil Engineer, City of Santee.*

Franklin and the Dokken Team will operate as an extension to MTS Staff, working in coordination with the MTS Project Manager to develop a project schedule, identify key tasks, set up PDT meetings, provide recommendations, obtain information needed from various departments, facilitate decisions from key stakeholders, develop deliverables, execute the quality control plan, and deliver the quality products on time and within budget.

Dokken's guiding principles for the development of successful projects include:



"No Surprises" Communication: Franklin and team will maintain constant communication with MTS counterparts. For this project, Franklin will lead regularly scheduled PDT meetings, so that MTS staff are always engaged in the latest project progress. We have enhanced communication with staff from MS TEAMs calls to in-person meetings or on-site field visits to ensure all team members are on the same page and issues are identified and resolved early. Our staff are local to San Diego County, allowing us to mobilize for a meeting or site visit quickly.

Clear, Concise, and Complete Reporting: Franklin will produce monthly progress reports accompany invoices and include accomplished tasks, upcoming tasks, pending issues, and scheduled completion target dates. We customize our MTS progress reports to also include, a budget summary, and prior/upcoming milestones.

Project Schedule Monitoring: The successful delivery of the project is guided by the baseline schedule established at the onset of the project. To achieve the target milestones on time, Franklin and team will outline the major intermediate activities and then monitor these activities to ensure that the deliverables are completed on schedule. These milestone dates are reviewed at least weekly, so that obstacles can be identified and addressed in a timely manner.

Construction Costs: Accurate cost estimating is a challenge in today's market. While some construction costs have settled post-pandemic, we are still seeing spikes in construction costs – making engineer's estimates a challenge. We are using every tool available to help ensure accurate estimates are provided to our clients. Our most recent method includes utilizing recent contract awards that the City of San Diego has made available to the public online at the following website: https://www.sandiego.gov/cip/reports/constructioncontracts. We review these recent contract awards to understand unit cost trends and catalog in a matrix. While we work with MTS, we will use similar data to help build our cost database for the best chance of an accurate estimate. Building this detailed matrix has provided our team with real time "check-in" for low-bid estimates.

Risk Assessment: Assessing and tracking risk is a key component to managing the scope, schedule and budget of every project. Dokken collaborates with our clients to identify risks as each project progresses, monitors each risk on a regular basis and actively works to mitigate, avoid or accept each risk. A Risk Register is used to track project risk and for our current contract, risks are reported/discussed during the PDT meetings. We believe it is everyone's role to know and mitigate risks on projects.

Coordination: As an extension of MTS staff, Franklin and team will use a suite of communication techniques to keep MTS informed and maintain the project schedule. The diagram below identifies the key communication methods to deliver this project for MTS.

Internal: Dokken Engineering has long-standing relationships with our subconsultants, and we have established communication protocols that all team members understand. We host weekly internal team conference calls to track progress and keep everyone current on project status and recent decisions that affect their awareness and productivity.

External: Our number one goal when working with our clients is successful project delivery. We identify risks early in the process and develop ways to mitigate these risks. We work closely with our clients to keep them informed on the status of their projects and any pending decisions, and we are extremely responsive to their needs.

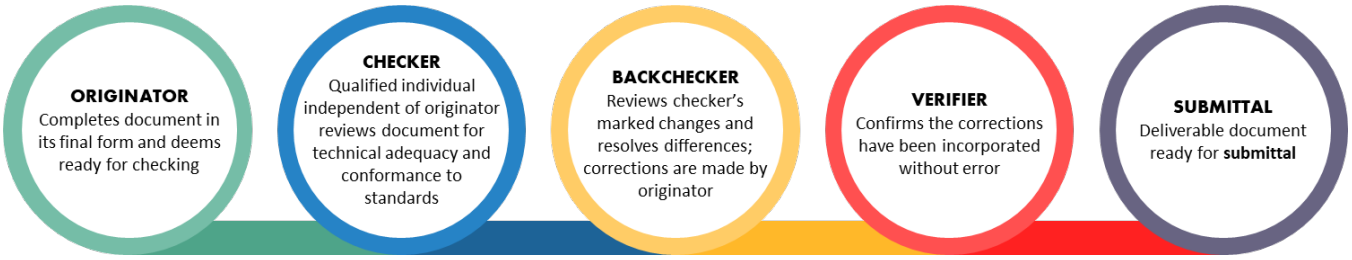
Dokken Engineering will also serve as an extension of staff on this task and act as the principal point of contact for MTS.

OTHER ONGOING PROJECTS/COMMITMENTS AND STAFF AVAILABILITY

Our key team members were specifically selected not only for their technical abilities but also for their availability for this project. All staff listed on the organization chart are committed and ready to work on this project. Based on the RFP schedule and anticipated NTP in November 2024, our team will be ready for the next task with MTS. The timing of this project works out very well as many of our team members are wrapping up design work on the MTS IAD ZEB Phase I project this summer and the MTS CTAC 15% Design this fall, allowing a smooth transition to the SELT project. ***The table on page 3 presents other ongoing projects/current commitments of our project personnel showing real availability and capacity to successfully deliver this project.***

QUALITY ASSURANCE AND QUALITY CONTROL

Dokken Engineering and our team members are **committed to deliver project documents whose quality exceeds the standards in the industry - we want to set the bar**. For our team, quality is not just a priority, it is a core value. The QA/QC procedures will be prepared and implemented in accordance with our scope of work for all deliverables. The review of deliverables needed to satisfy the QA/QC procedure is built into our proposed schedule. The following flow chart outlines our QA/QC procedures:



Additionally, Dokken Engineering has implemented our ***internal QA/QC Training Program***. Dokken created the program to provide hands-on training for less experienced staff to ensure our team's deliverables undergo a QC review by all levels working on the project, not just the Project Manager. This program is led by our CEO, Rick Liptak, who leads a small team comprised of two designers, an environmental planner, and right of way agent through a rigorous 40+ hour review that includes the plans, special provisions, and the estimate. Environmental planners and right of way agents have been included in our program to assure breadth of coverage within our company. By completing the QC Training Program, young engineers develop an understanding of each component of a submittal package and learn the process to properly complete a QC review.

We take quality very seriously, as a quality plan set provides the most competitive bidding opportunities for projects and helps keep projects within their overall budgets, ultimately resulting in a high-quality project being built, on schedule and with minimal or no change orders.

At Dokken, **we take pride in consistently having projects complete construction with less than 5% added cost during construction through construction change orders**. While the industry standard hovers around 10%, Dokken far exceeds industry comparisons.

COST CONTROL MEASURES

The best way to control the budget is to follow the project schedule. This avoids costly over-runs and extended production times. The key to preserving budgets is to start on time, get it right, and submit deliverables per the deadlines. A key component of delivering project on time and within budget is maintaining consistent project team members. Dokken has the unique distinction of maintaining a very low staff turnover rate (approximately 8% annually). In fact, currently 36% of today's employees have been with Dokken for over 10 years. This employee retention eliminates inefficient orientation time and repeat site visits required for new team members.

Our cost management is both simple and effective. Our team assesses the status of every project budget each month. We review the percentage of budget obligated versus the estimated work completed and schedule time elapsed. By completing this monthly, we are able to determine the overall project budget and schedule status and make adjustments as required.

STAFF AVAILABILITY/COMMITMENT TO PROJECT

In order to meet MTS's needs for this project, we have organized a team with a proven track record and availability to deliver the SELT Bus Stop Shelter Upgrades project. The team was also developed to provide MTS the maximum flexibility possible in order to meet all of the contract's needs. As presented in the previous **Other On-Going Projects/Commitments and Staff Availability** section, our team has the capacity and availability to work and complete this project according to MTS's requested schedule.

PROJECT EXPERIENCE

Our team offers outstanding experience and technical competence to successfully deliver projects similar to the requirements of the Beyer Boulevard Pathway Beautification project, as shown in the following project examples.

IRIS RAPID CORRIDOR AND TRANSIT STATION | San Diego, CA

This project will provide new and upgraded bus stop locations along Seacoast Drive, Imperial Beach Blvd, and Coronado Ave, a new 4-bay transit center island at the westerly MTS parking lot at Iris Avenue, and modifications to the existing Iris Avenue Transit Center. Modifications to existing traffic signals, new transit priority signaling, fiber optic backbone infrastructure, and restriping of existing streets are included as part of the project.

This new bus route will extend from the Otay Mesa and Imperial Beach—connecting residents to coastal destinations, regional employment and activity centers, and the UC San Diego Blue Line. Rapid services are high-frequency, limited-stop routes that help move people to their destinations more quickly than traditional local bus services. Dokken Engineering is providing support to MTS for PS&E, including surveying, preliminary and final project plans, technical specifications, and an Opinion of Probable Cost (OPCC).

The project improvements span multiple local jurisdictions within the south bay area of San Diego, including the City of Imperial Beach, City of San Diego, and Caltrans owned right of way. In addition, there are several private parcels located along the bus route that require permission to enter and construct within or immediately adjacent to their property. The Dokken team completed coordination with the Cities of IB and San Diego to obtain design approvals and process right of way/engineering permits with each agency.

NORTH COUNTY TRANSIT DISTRICT BUS STOP IMPROVEMENTS PROJECT 25612 | OCEANSIDE, ESCONDIDO, VISTA, CA

Dokken Engineering completed the Plans, Specifications, and Estimate (PS&E) for upgrades to existing NCTD bus stop sites located in the cities of Oceanside, Escondido, and at the Buena Creek Transit Station in Vista. Site design covered concrete bus stop platforms, replaced sidewalks, and bus stop amenities (e.g., shelters, benches, trash receptacles, and guide signage.) Dokken obtained the Right of Entry Permits, coordinated design reviews with the City staff, performed field survey, prepared the final PS&E package and provided design support during construction. Construction of $145k in bus stop improvements was completed in the Spring of 2018.

Dokken Engineering provided land surveying to establish control an each or the twelve bus stops from Oceanside to Escondido. The work included researching GPS monuments at each location tied to the 1991.35 Epoch so that the projects could be related to the CCS83 coordinate system. Dokken Engineering provided topographic mapping and developed a plan of the existing condition at each bus stop meeting the requirements of the North County Transit District, which included the closest intersection to the bus stop, sidewalk elevations, curbs and gutter along with pavement elevations, the drip line of any trees in close proximity of the bus stop and any existing signage or benches. The existing visible utilities were also mapped and field verified near the proposed improvement area at each site to review for conflicts with propose site improvements. The street centerline control monuments along with any found property corners were located to establish the street Right of Way. A final existing condition topographic and Right of Way map was provided to the engineers to develop their bus stop improvements.

NORTH COUNTY TRANSIT DISTRICT BUS STOP IMPROVEMENTS PROJECT 23006 | OCEANSIDE, ESCONDIDO, VISTA, CA

Dokken Engineering is currently working on the Plans, Specifications, and Estimate (PS&E) for upgrades to thirty (30) existing NCTD bus stop sites located in the cities of Oceanside, Escondido, and Vista CA. The improvements to the bus stop sites will include the construction of ADA complaint concrete bus stop boarding pads, construction of small retaining walls, sidewalks replacement, replacement of minor landscaping and irrigation improvements, pavement markings and the installation of bus stop amenities (e.g., shelters, benches, trash receptacles, and guide signage.). Dokken will obtain the Right of Entry Permits, coordinate design reviews with the City staff, perform field survey/ site investigations, prepare the final PS&E package, and provided design support during construction. The project design will be completed in approximately 9 months and the project construction is estimated to start on August of 2025.

Dokken established jurisdictional approved horizontal and vertical control to the bus stop sites. The datum based on horizontal NAD83, California State Plane Coordinates and vertical NAVD88 datums. Dokken Engineering will provide topographic mapping and develop a plan of the existing condition at each bus stop meeting the requirements of the North County Transit District, which include the closest intersection to the bus stop, sidewalk elevations, curbs and gutter along with pavement elevations, above ground utilities, curb ramps tree and tree wells, any existing signage, benches, and other existing above ground features. Dokken will perform right of way records research for the bus stop locations. Dokken will search and locate monuments of record such as monument wells, pipes, spikes, nails and other relative record right of way and property monuments. Dokken will resolve and map the right of way, parcel lines and centerline of street along each portion of the project bus stop location. A final existing condition topographic and Right of Way map will be provided to the engineers to develop their bus stop improvements. The existing utilities will also be mapped, and field verified at each bus stop and surrounding improvement area to review for conflicts with proposed site improvements.

3. Project Understanding and Approach

DEMONSTRATE KNOWLEDGE OF THE WORK REQUIRED

The SELT Bus Stop Shelter Upgrades Project is another example of MTS's steadfast dedication to providing high-quality transit systems for the future of the San Diego region. MTS plans to upgrade 28 bus stop locations within the City of National City, City of Chula Vista, and City of San Diego communities.

The bus stops identified in the RFP are divided into two different priority groups: Priority Group 1 and Priority Group 2. The Priority Group 1 comprises of 8 bus stops within the City of National City and the City of Chula Vista jurisdiction, while the Priority Group 2 comprises of 20 bus stops within City of San Diego. The Dokken design team will work on both the Priority 1 Group (National City and the City of Chula Vista) and the Priority Group 2 (City of San Diego) concurrently, but the Priority Group 1 design will have a bid ready package first.

As demonstrated in the previous section, Dokken has extensive experience with bus stop improvement projects. Most recently, we have completed the design and permitting phase of the MTS Iris Rapid Route.

Our extensive expertise and experience allow us to focus on the key objectives of the project – ***enhance and modify existing bus stops to improve passenger safety, comfort, and ADA accessibility.***

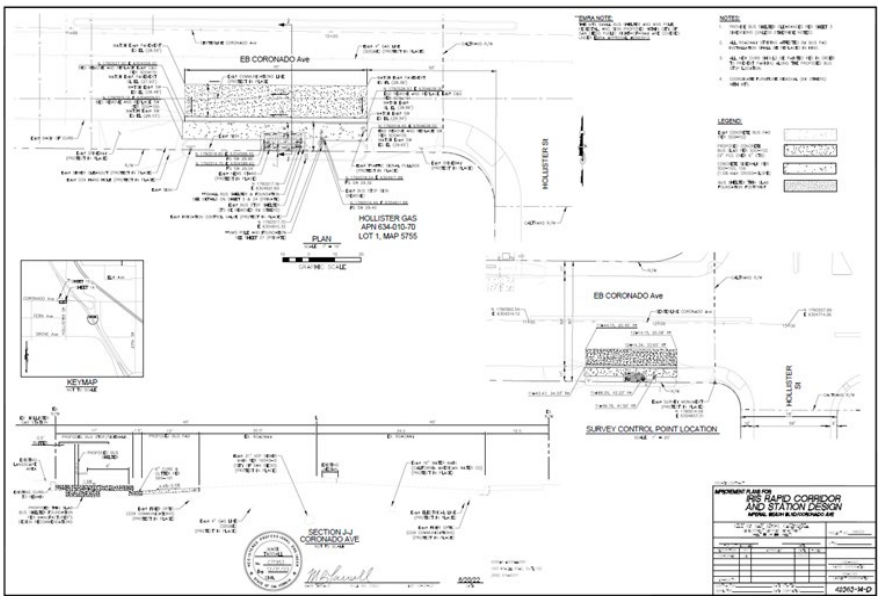
Key elements our team looks for to enhance bus stops include, but are not limited to:

- **Width and condition of existing sidewalk**
  - **Field check with wheel and smart level**
- **Location of right-of-way and identify temporary or permanent impacts to private property**
- **Position of landings with respect to adjacent private driveways or intersections**
- **Connections to adjacent sidewalks or pathways**
- **Proximity to existing street lighting for security**
- **Existing amenities inventory; to be removed, salvaged, and/or replaced**
- **New amenities inventory**
- **ADA compliant loading/unloading zones**
- **ADA compliant width in front of shelters/benches**
- **Existing utility boxes/utility constraints**
- **Curb inlets within bus stop limits**

Our team's extensive knowledge of bus stop improvements, specifically for MTS, allows us to have discussions early with MTS to help identify feasibility of bus stop improvements regarding impacts to private property, utility constraints, etc. We will initiate a specific meeting with MTS prior to mobilizing field activities to identify any stops that may encroach on private property. We have included a sample construction plan sheet from the "Iris Rapid Corridor Project".

Dokken Engineering's Project Manager and key team members have visited each of the twenty-eight bus stop sites to review the existing constraints, traffic conditions, and feasibility for installing new amenities.

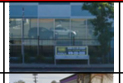
We feel the following matrix not only demonstrates our team's knowledge and understanding of bus stop improvements, but also our dedication to this task order and MTS.



MTS - Bus Stop Shelter Upgrades

Date: 7/24/2024

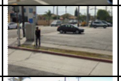
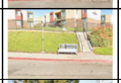
DOKKEN ENGINEERING

No.	Stop ID	Stop Name	City	Photo	Existing Conditions Description	Notes Provided by MTS	Dokken Comments/Recommendations
Priority Group 1							
1	99315	18th St & Highland Ave	National City		Existing Bench and Trash Can, located on top of asphalt concrete; Bench located next to roadway with short curb	Convert asphalt into concrete sidewalk.	Add new shelter, bench, and new concrete sidewalk (for ADA compliance). Remove and replace AC with concrete sidewalk. Add bollards behind shelter/bench.
2	12884	Highland Ave & 28th St	National City		Existing Bench and Trash Can, with landscaping and backflow preventer located behind bench	Landscaping, relocation of backflow, electrical pedestal.	Replace existing bench with new shelter, bench, and trash can.
3	50062	30th St & Highland Ave	National City		2 Existing Benches and Trash Can; Retaining curb with landscaping located behind back of sidewalk; existing bus pad located at this stop; wheelchair ramp located adjacent to bench (path to Mobil gas station)	Encroach into Mobil gas landscaping island.	Replace existing bench with new shelter, benches, and trash can.
4	50085	Plaza Blvd & Euclid Ave	National City		Existing Bench and Trash Can; Retaining wall located behind bench; Deteriorated asphalt located in front of bench; bus pocket with tire marks located at end of bus pocket	N/A	Recommendation to add bus pad. Install new shelter, bench, and trash can. Repair and repaint curb.
5	12553	3rd Ave & H St	Chula Vista		Existing Concrete Bench and Trash Can; Curb and gutter located in front of stop; Located in front of sloped landscaping	May require a retaining wall.	Replace existing bench with new shelter and bench; Add retaining wall/curb.
6	30085	H St & 3rd Ave	Chula Vista		Existing Concrete Bench and Trash Can; Hedges located directly behind bench	Remove hedges, fill in behind sidewalk to retaining wall, may not be 10ft.	Replace existing bench and trash can with new shelter, bench, and trash can.
7	30278	East H St & Otay Lakes Rd	Chula Vista		2 Existing Concrete Benches with graffiti and Trash Can; littered with trash around benches (relocate trash can closer to benches); landscaping behind existing benches	May require retaining wall, replicate existing retaining wall east of stop.	Clear and grub existing landscaping, level out dirt, and add retaining wall. Replace existing benches and trash can with new shelters, benches, and trash can with anti-graffiti coating.
8	11385	E St & 3rd Ave	Chula Vista		Existing Metal Bench and Trash Can with graffiti; Retaining wall/curb and light pole located behind bench	N/A	Replace existing bench and trash can with new shelter with anti-graffiti coating, bench, and trash can. Maintain clear width of sidewalk without impeding right of way onto private property.
Priority Group 2							
9	88938	University Ave & College Ave (EB)	San Diego		Existing Metal Advertising Bench	Existing wrought iron fence would need to be moved, currently 5ft+/- from curb face.	Replace existing bench with new bench and trash can. May not be able to fit shelter, given existing sidewalk width.
10	12943	College Ave & University Ave (NB)	San Diego		2 Existing Metal Advertising Benches with Trash Can in between; Rocks and Irrigation Control Valves located behind bench	Would require Taco Bell landscaping changes, including relocation of backflow and pull boxes.	Extend sidewalk into landscaping area of Taco Bell, remove existing benches and trash can and replace with new shelter, benches, and trash can.
11	12185	54th St & Trojan Ave (SB)	San Diego		2 Existing Metal Advertising Benches; Located near driveway, Gravel landscaping behind sidewalk. Substantial cracking observed in roadway.	Requires extended back of walk and requires tree removal and bollards (parking space behind stop).	Remove 2 Existing Benches and Replace with new shelter, benches, and trash can; Impedes on sidewalk clear width if adding shelter. Parking space behind benches may need relocation. Recommendation to add concrete bus pad.
12	12952	College Ave & Billman St (NB)	San Diego		Existing Metal Advertising Bench and Trash Can; Dirt and mulch behind sidewalk; Narrow sidewalk	Retaining wall needed.	Remove existing bench and replace with new shelter, benches and trash can. Impedes on sidewalk clear width if adding shelter. Extended back of walk and add retaining curb.
13	10948	National Ave & 36th St (WB)	San Diego		Existing Metal Advertising Bench and Trash Can; Adjacent to curb ramp; Grass area behind back of walk; Existing concrete bus pad	N/A	Remove existing bench and replace with new shelter, benches and trash can. May need to add additional concrete panels east of existing stop (replacing grass between back of curb and beginning of sidewalk to fit all amenities.
14	11413	University Ave & 60th St (WB)	San Diego		Existing Advertising Bench; Wide asphalt concrete sidewalk sloping and in very poor condition	Asphalt in terrible condition, needs concrete sidewalk and potential retaining wall.	Remove existing bench and replace with new shelter, benches and trash can. Remove existing asphalt and replace with new concrete panels.

MTS - Bus Stop Shelter Upgrades

Date: 7/24/2024

DOKKEN ENGINEERING

No.	Stop ID	Stop Name	City	Photo	Existing Conditions Description	Notes Provided by MTS	Dokken Comments/Recommendations
15	10195	National Ave & 35th St (EB)	San Diego		Existing Metal Advertising Bench; Aged and worn out sidewalk pavement; Close in proximity to existing curb ramp and driveway	Convert dirt between sidewalk and curb into concrete pad, note the driveway west of stop.	Remove existing bench and replace with new shelter, benches and trash can. Install new concrete panels replacing dirt between existing side walk and back of curb.
16	10205	National Ave & 38th St (EB)	San Diego		No Existing amenities aside from Stop Sign; Existing concrete bus pad; Narrow sidewalk and dirt patch may not be enough space to fit all desired amenities; Existing parking lot behind sidewalk	Convert dirt between sidewalk and curb into concrete pad.	Install new shelter, benches and trash can. Install new concrete panels replacing dirt between existing side walk and back of curb. Add bollards in parking lot to protect shelter.
17	13441	Logan Ave & 45th St (EB)	San Diego		No Existing amenities aside from Stop Sign; Existing sidewalk in poor condition, in need of complete replacement; Existing lot connected to back of sidewalk; Manhole located directly in front of stop	Convert asphalt between broken parking lot and curb into a concrete pad, note similar issues to Market/25th EB, needs bollards.	Relocate stop away from intersection and closer to private driveway. Install new shelter, benches and trash can. Install new concrete panels and bollards.
18	10544	National Ave & 30th St (EB)	San Diego		No Existing amenities aside from Stop Sign; Fire hydrant and utility pole in close proximity to stop on either side; Deteriorating existing curb, in need of replacement; Grassy area on either side of sidewalk	Convert dirt between sidewalk and curb into concrete pad.	Install new shelter, benches and trash can. Install new concrete panels replacing dirt between existing side walk and back of curb. Rebuild curb.
19	13440	Logan Ave & 45th St (WB)	San Diego		Existing Metal Advertising Bench; Existing bollards and parking lot behind back of sidewalk; Existing tree in close proximity to bench; Located on narrow sidewalk and dirt patch	Convert dirt between sidewalk and curb into concrete pad. Will need bollards behind shelter to keep cars from hitting in parking lot. Possible tree removal needed.	Remove existing bench and replace with new shelter, benches and trash can. Install new concrete panels replacing dirt between existing side walk and back of curb. May need to remove existing tree.
20	11382	Logan Ave & Euclid Ave (WB)	San Diego		Existing Metal Advertising Bench and Trash Can; Sidewalk is uneven and displaced; Existing Large tree behind bench; Dirt area behind side walk	Major sidewalk repairs needed to repair existing damage. Add pad behind sidewalk.	Extend sidewalk back into dirt area and add concrete pad. Install new shelter, benches, and trash can.
21	11000	Logan Ave & Jarrett Ct (WB)	San Diego		Existing Metal Advertising Bench; Sloped grassy area behind bench	Potentially move stop to other side of stairs, if needed to accommodate a shelter. Potential retaining wall.	Bus pad recommendation. Install new shelter, benches, and trash can.
22	50123	Euclid Ave & Logan Ave (SB)	San Diego		Existing Metal Advertising Bench (With graffiti)	Major tree removal required.	Convert grassy area with tree into concrete pad to accommodate new shelter, bench, and trash can; add anti-graffiti coating.
23	10956	Ocean View Blvd & 38th St (WB)	San Diego		Existing Metal Advertising Bench; Dirt patch located on either side of narrow sidewalk	Convert dirt between sidewalk and curb into concrete pad.	Currently located on narrow sidewalk, dirt located in front of sidewalk. Remove dirt and replace with concrete for wider sidewalk. Install new benches, shelter, and trash can.
24	11309	National Ave & 32nd St (WB)	San Diego		Existing Metal Advertising Bench and Trash Can; Grassy patch located on either side of narrow sidewalk	N/A	Curb in poor condition, repair and repaint. Add concrete in grassy patch for ADA loading. Install new shelter, benches, and trash can.
25	50198	Highland Ave & Eta St (SB)	San Diego		Existing Metal Non-Advertising Bench; Grassy area located behind bench; Pull boxes located directly next to bench	N/A	Narrow sidewalk, may need to extend sidewalk back (encroach right of way) in order to install new shelter, benches, and trash can.
26	10516	Ocean View Blvd & Commercial St (SB)	San Diego		No Existing amenities; Located on grassy area with narrow sidewalk; Adjacent to private driveway	N/A	Located directly next to driveway and utility boxes. Will need permanent encroachment to install new shelter, benches, and trash can.
27	12165	Euclid Ave & Brooks Huffman Plaza (SB)	San Diego		Existing Metal Advertising Bench	N/A	Potentially relocate stop further south to accommodate all amenities. Install new shelter, bench, and trash can.
28	60579	Camino De La Plaza & Willow Rd (WB)	San Diego		Existing Metal Advertising Bench; Located in front of wooden curb	Landscaping removal	Extend area of new shelter, bench, and trash can into landscaping (encroach right of way).

AGENCIES HAVING JURISDICTION (AHJ) PERMITTING

We understand the importance of meeting with the AHJ early in the design phase for suggested improvements and the brand/style/color of the bus stop amenities. Our team obtained similar approvals for previous bus stop improvements designs for MTS and have done the same for bus stop improvements for NCTD, Riverside Transit Agency, and Foothill Transit. Dokken Engineering will prepare separate plan and specification packages for improvements within each of the three public rights of way to support agency design approvals and the issuance of associated right of way/engineering permits.

Our team is familiar with the City of San Diego DSD permitting review process and has gone through this process in the past for the MTS Iris Rapid Project and other clients including UC San Diego. MTS learned of our broad knowledge and understanding of City of San Diego's DSD permitting process during the Iris Rapid Project. The project went through the approval process with the City, however, MTS ultimately needed to split the contact and award to multiple contractors. This process normally starts a NEW review cycle with DSD. (A new review cycle would have added permit fees, new comments from reviewers that would increase design fees, and would have added 9 months to the schedule for a new Issue for Bid package). Dokken introduced MTS staff to key leadership at DSD and collaborated on an improved solution to avoid a new review cycle, critical to moving the project forward. This process is critical path for meeting the schedule outlined by MTS for the Priority Group 2 Bus Stops. Using our teams extensive experience with the City and DSD process, we ensure our documents will be thorough and complete to aid in the City's review and determination of the project. Dokken team.

The Dokken team is also familiar with the City of Chula Vista and National City approval process. Dokken has cultivated a close relationship of over 15 years with the National City Public Works Director Stephen Manganiello and has collaborated on numerous public works improvements projects including Plaza Blvd Widening Phases 1 and 2. This strong relationship with National City positions our team as a trusted and reliable engineering consultant firm. Dokken has also worked with the City of Chula Vista and key staff for several projects including the East Palomar Transit Station, Park and Ride and DAR at I-805 Project. Most recently, Dokken obtained permits from the City of Chula Vista for the completion of the South Bay Maintenance Facility Zero Emission Bus Overhead Charging Project.

TRAFFIC CONTROL PLANS

As a firm that specializes in transportation improvement projects, we are well versed in the preparation of traffic control plans. We have prepared hundreds of traffic control plans for local agency projects within San Diego County and across the state of California. Our team is currently coordinating with the City of San Diego DSD traffic group to get the final traffic control plan approval for the East Campus Loop Project at UC San Diego. For the MTS SELT Bus Stop Shelter Upgrades Project, the Dokken team will prepare traffic control plans at the bus stops improvements located with-in the City of San Diego roadways with Average Daily Traffic (ADT) volumes greater than 5,000. As required by the City, these plans will be meticulously prepared to ensure safety of pedestrians, MTS users, drivers, and workers during construction activities. By addressing critical aspects such as lane closures, pedestrian and vehicle detours, temporary signage and pavement markings, our firm develops comprehensive strategies ultimately minimize review times and ease approvals.

UTILITY COORDINATION

It is anticipated that new power service will be required at the bus stop locations with advertising shelters. The Dokken team has vast experience coordinating new power service with SDG&E on both large and small scale projects. Our team brings first-hand knowledge and expertise needed to avoid the many pitfalls and challenges with SDG&E's internal processes. We have developed strategies to streamline this process for our clients and understand the importance of having a proactive approach to guide the utility companies through completion of this effort. Our expertise in utility coordination has been a key component to successful project outcomes and satisfied clients. Note that Dokken team can also work with the shelter vendors to implement alternate solar power solutions for advertising shelters if instructed by MTS.

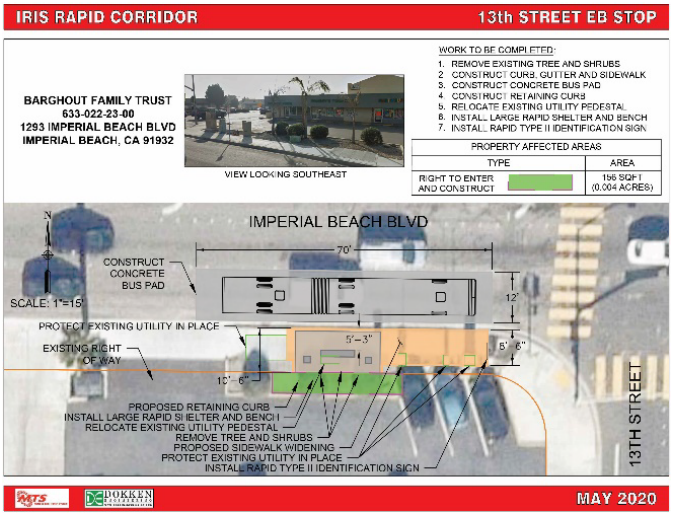
ENCROACHMENT ON PRIVATE PROPERTY

Based on our team's review of the 28 bus stops, the need for temporary or permanent easements to private property may be required at various locations.

Dokken's Right of Way Team has worked on past MTS projects, including a recent bus stop improvement project that required acquiring the necessary rights at two locations. We are familiar with MTS policies and procedures relating to right of way – there is no learning curve with this team should MTS determine to move forward with

One of Dokken's greatest strengths is our exceptional understanding and experience addressing the specific needs of right of way projects and programs. As part of a multi-discipline firm, our right of way team is in contact with engineers, environmental planners, public and regulatory agencies, and property owners and are in integral part in bringing

projects from planning to construction. This direct exposure gives our right of way staff a unique perspective on the nuances of the right of way process, the types of challenges presented, and our solutions.



It is not uncommon for us to approach a property owner for the first time and discover that they are displeased with the project impacting their property. Dokken's right of way team has the interpersonal skills that are needed to work with property owners who often start out opposed to the project. We have found that in-person meetings with property owners is often the best way to diffuse these types of situations. Our goal will be to meet with each owner prior to the appraisal inspection. To clearly define the anticipated project impacts and convey impacts to the affected property owners, our team will develop detailed property owner exhibits for the bus stop sites that warrant property owner input. Each property owner exhibit will illustrate the before and after condition to provide a concise representation of impacts to their frontage, such as tree removals, landscape modifications, or walkway reconstruction. This gives the right of way agent and the property owner a chance to discuss property impacts, and address concerns prior to completion of the appraisals. During these meetings, our agents will write down owner concerns so that they appreciate that we are taking them seriously. Dokken's right of way team will provide this information to the design team and MTS and discuss possible solutions to overcome any potential hurdles. Dokken's right of way team will meet with the property owner and the appraiser during the appraisal inspection. This will provide the appraiser the most up to date information about the design, impacts, and property to assist in decreasing the need for re-appraisal or appraisal modifications later in the project.

The project will impact primarily commercial properties with businesses on site. The majority of potential impacts will be to property improvements, such as fencing and landscaping. Based upon Dokken's acquisition experience with similar property types and projects, we developed the following table to detail potential hurdles that may come about during the right of way acquisition and relocation process and our successful solutions.

	CHALLENGES	SOLUTIONS
1.	Property Owner Opposition of the Project	Dokken will initiate conversations and meet with the affected owners during the initial phase of the project to begin addressing concerns as early as possible.
2.	Property Owner Design Concerns	Dokken will generate a list of concerns for each owner. Our agents will address these concerns with the design team and provide updates to owners to eliminate surprises down the line when the right of way acquisition efforts begin.
3.	Impacts to Commercial Operations	Dokken will meet with property owners prior to the appraisal, to obtain a detailed description of the property utilization to reevaluate certain design choices prior to the appraisal if necessary. This eliminates surprises after the offer is made and allows the appraiser to address issues in their report that cannot be resolved by design.
4.	Disagreement with Appraised Amount	When applicable, Dokken will assist property owners in coming to a reasonable settlement amount and will work with MTS on approval of any settlements above the appraised value. Property owners can also, per State law, obtain their own appraisals when there is a discrepancy over the compensation amount.
5.	Escrow/Title Coordination	When reviewing the preliminary title report Dokken will identify items of concern. Dokken will work closely with the owners and escrow officer to eliminate and clouds to title and remove liens, as necessary.

EXPLANATION OF THE PROJECT/SERVICES REQUIRED

The previous section outlines, in detail, our teams comprehensive understanding of the project and the services required. The Dokken team appreciates the detailed scope that was prepared for the RFP and has the following recommendations:

Task 1: Project Management and Coordination

Dokken suggests MTS consider bi-weekly or monthly PDT meetings. There are many benefits to regularly schedule project meetings. For this project specifically, the regularly scheduled meeting allows our team to show design progress along the way and not waiting until the 95% plan set. This will ensure that all the goals and objectives on the project are met.

Task 4: Plan Preparation and Bus Stop Design

Dokken understands the importance of creating clear plan packages for public agency review. Our team will organize the bus stop improvements based on location and will have cover sheets specific to each agency – City of National City, City of Chula Vista, and City of San Diego. This strategy eases review and ultimately conformed sets for construction.

Task 6: Engineer's Cost Estimates

AHJs typically require an bond estimate when submitting for permit review. Dokken suggests including a cost estimate at the 95% phase than a final estimate prior to bid.

Optional Task: Right-of-Way Assistance

DE shall coordinate with MTS staff regarding property ownership, proposed temporary construction easements or right to enter and construct areas, and joint-use agreements as needed. DE shall define right of way requirements and prepare Property Owner Exhibits for affected properties along new route to identify potential impacts to driveways, parking areas, landscape areas, utilities, etc. at each proposed bus stop site. DE shall attend field meetings with MTS Real Estate staff and affected property owners as requested by MTS.

INNOVATIVE APPROACH AND INTERNAL MEASURES FOR TIMELY COMPLETION

Our company is known for its innovative approaches and robust internal measures that ensures the timely completion of projects. The following

One Single Permit Application Per AHJ

The Dokken Team will coordinate with each of the AHJ's to submit a single consolidated submittal application permit package for bus stop locations within their respective jurisdictions. This approach is intended to facilitate the review process and expedite approval. We can assure that this consolidated permit application packages will streamline communication and improve efficiency for all the parties involved. By coordinating closely with each of the AHJ's, we aim to ensure that all the information is provided in a comprehensive manner.

Narrow Advertising Shelter Design

To prevent right of way impacts and ensure the success of this project, the Dokken team will work closely to coordinate with the shelter suppliers/vendors to provide narrow advertising shelter design options. This approach is intended to prevent or minimized impacts to private property while still meeting the project requirements. We believe that narrower advertising shelter will provide an effective solution, balancing the need for advertising space with the preservation of private property boundaries.

City of San Diego Accela Permitting System and Open DSD

Our staff are experts at using the City of San Diego's online permitting system, Accela. Our project experience has provided us with numerous connections at DSD. This expertise allows our team to efficiently navigate the City's of San Diego's online system, ensuring timely submission of permit applications, receiving comments, and plan check fees - and resulting in streamlined plan check process. Additionally, Dokken has trained MTS staff on OpenDSD, the City of San Diego's public facing website. This enables MTS to concurrently track plan check progress, check invoice payments, and sign off approvals. This proficiency in utilizing Accela permitting system makes the Dokken team confident in our ability to successfully process and deliver the SELT Bus Stop Shelter Upgrades Project. Dokken is also familiar with the City of Chula Vista online permitting "Chula Vista Citizen Access" where the team can check project application status, Pay fees, and also schedule inspections during the project construction.

KMZ Files

Our team has learned through our experience with bus stop improvements, that the best first step is to create a KMZ file for each bus stop location. A KMZ file uses coordinates to track each location within Google Earth. We find this tool extremely valuable for visualization, planning and collaboration when coordinating work with survey crews, meetings with MTS staff, and meetings with public agencies. The KMZ capabilities enhances project visualization enabling the project team to identify site constraints and asses impacts during the early project planning stages. Another capability of KMZ files is that they can be easily shared with our team members, clients, and subconsultants. In Summary, KMZ files and Google earth provide the Dokken design team with advanced and innovative tools leading to efficient and effective project planning and management.

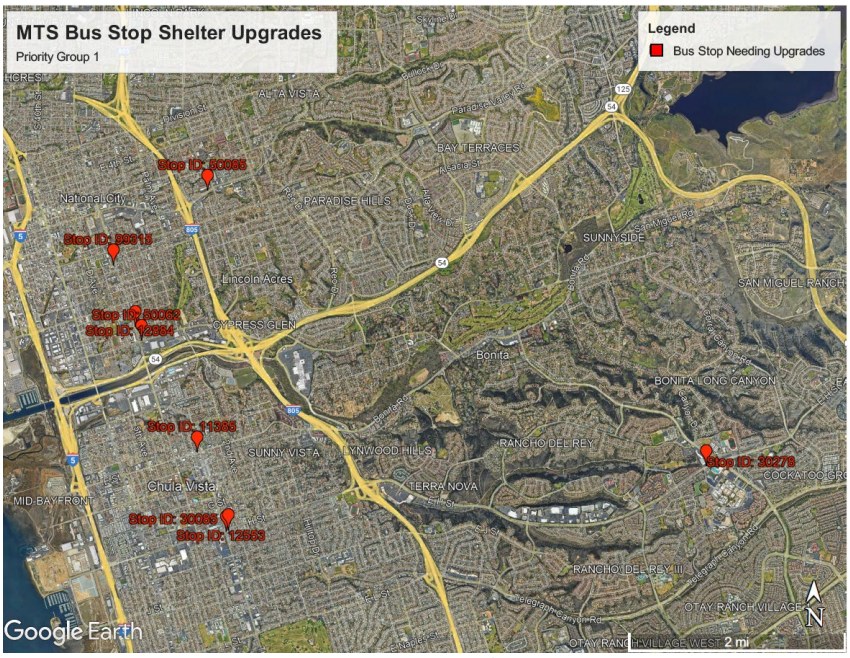


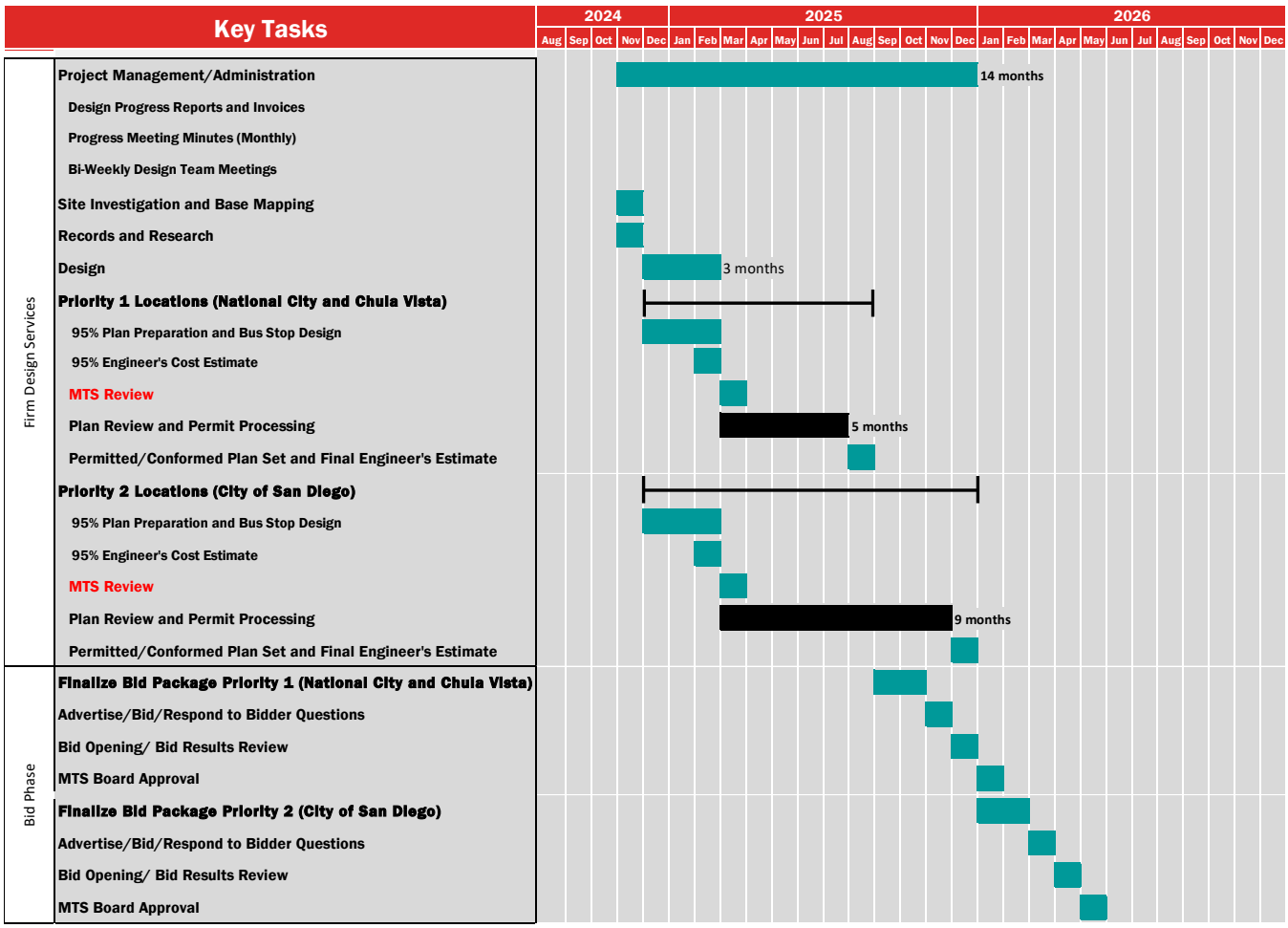
Exhibit 1: Bus Stop Locations within City of Chula Vista and National City

Exhibit 2: Bus Stop Locations within City of San Diego

4. Schedule

Our team of experts are ready to begin work immediately following NTP. Our experienced team will mobilize quickly – scheduling surveys, requesting existing documents/reports, and assigning technical resources at the onset of the project and fully ramp up to meet MTS's schedule.

Each group will have its own approval process. It is expected that Priority 1 Group review and approval process will take 5 months whereas Priority Group 2 will take 9 months. Additionally, Dokken also developed a schedule with distinct timelines for the bidding and construction process of these two groups.



Local Resources for Proposed Services

We have put together a team with extensive experience delivering similar transit improvement projects. Our team will ensure that MTS will get the ***most responsive service*** possible and commit to being available to MTS on short notice throughout the duration of the project.

The Dokken team's key staff are locally based in San Diego, which allows us to attend meetings on a moment's notice, rapidly visit job sites, and maintain effective interactions with MTS and other stakeholders to the project. The team is set up to give MTS the personnel that is most familiar and experienced with delivering projects similar to the SELT Bus Stop Shelter Upgrades project.

We are the right team, with the expertise, and depth of resources to successfully deliver this project for MTS.

5. DBE Subcontractor Utilization Plan

Dokken Engineering maintains a strong commitment to Equal Opportunity in our hiring practices, training, promotions, and sub-contracting. We have supported and participated in the Caltrans and SANDAG outreach programs to small minority consultants. Dokken Engineering is pleased to team up with subconsultants who both are highly qualified in their fields.

We have elected to use Aguire & Associates for surveying services. The following table lists our team's small and disadvantaged business firms and their certifications.

FIRM	ROLE	CERTIFICATION
Aguirre & Associates	Survey	DBE #6729 / MBE #6729 SLBE #11AE0172 SB (Micro) #33859

Metropolitan Transit System

EXHIBIT A: RESUMES

Exhibit A: Resumes

DOKKEN ENGINEERING

FRANKLIN FLORES, PE
PROJECT MANAGER

EDUCATION
2008, BS Civil Engineering
San Diego State University

REGISTRATION
California Professional Civil Engineer, #C83968

EXPERIENCE
16 Years

Mr. Flores experience in transit station, transit center, bus stop, parking lot, and site design. He has performed existing site assessments and developed construction document packages for new BRT station and bus stop locations, including site furnishings and amenities, park and ride lots, fueling station sites, and bus bay transit centers. His responsibilities include development of plan sheets for existing utilities and topographic mapping, site demolition, site layout, pavement improvements, grading, and construction details.

EXPERIENCE

North County Transit District Bus Stop Improvements Project 25612, Oceanside, Escondido, & Vista, CA | Provided plans, specifications and estimate for improvements to 12 existing bus stop sites located in the Cities of Oceanside and Escondido, and one existing bus stop site located within NCTD owned property at the Buena Creek Transit Station. Project improvements include standard NCTD shelter bus stop pads and the installation of furniture, including new dome-roof bus stop shelters, benches, trash receptacles, and bus stop signage. Six of the proposed sites include new ADA compliant concrete sidewalks, shelter pads with landings, landscape replacement, and minor property improvements.

North County Transit District Bus Stop Improvements Project 23006, Oceanside, Escondido & Vista, CA | Providing PS&E for upgrades to thirty (30) existing NCTD bus stop sites located in the cities of Oceanside, Escondido, and Vista CA. The improvements to the bus stop sites will include the construction of ADA complaint concrete bus stop boarding pads, construction of small retaining walls, sidewalks replacement, replacement of minor landscaping and irrigation improvements, pavement markings and the installation of bus stop amenities (e.g., shelters, benches, trash receptacles, and guide signage.). Dokken will obtain the Right of Entry Permits, coordinate design reviews with the City staff, perform field survey/ site investigations, prepare the final PS&E package, and provided design support during construction.

East Palomar St Transit Station, Park & Ride and DAR at I-805, Chula Vista, CA | Provided roadway geometric design and cost estimate. The $38M Caltrans lead agency, SANDAG funded project included nearly 1-mile of freeway widening on I-805, reconstruction of the East Palomar Street overcrossing, a new direct access freeway ramp, two new park and ride lots, a new transit transfer station for the South Bay Bus Rapid Transit system, and associated signing and striping packages. The project required close coordination with the City of Chula Vista, Caltrans, SANDAG, SDG&E and MTS. The Palomar Street Overcrossing and proposed park n' ride lots are within an electrical transmission line corridor, so design of the parking lots and structure required close coordination. Pproject components included detailed drainage analysis and design, retaining wall and sound wall design, utility relocation coordination, stage construction, and right-of-way acquisition. Mr. Flores also provided construction support.

Miramar Street and Athena Circle Improvements, UCSD, San Diego, CA | Responsible for the roadway horizontal and vertical geometric design and plan preparation for the project. In addition, he prepared stage construction and signing and striping plans. He was responsible for preparing the project construction cost estimate which was estimated to be over $8,000,000. The project roadway improvements included: the widening of the existing Miramar Street, The addition of the Miramar Street/ Athena Circle Roadway Connector and the vertical and horizontal re-alignment of Athena Circle.

DOKKEN ENGINEERING

MARK TARRALL, PE
CONTRACT MANAGER

EDUCATION
1997, MS Civil Engineering
Georgia Tech

1996, BS Civil Engineering
Virginia Tech

REGISTRATION
California Professional Civil Engineer, #C71953

EXPERIENCE
25 Years

AFFILIATIONS
American Public Works Association (APWA)

American Society of Civil Engineers (ASCE)

Mr. Tarrall has over 25 years of experience and specializes in the management, permitting and design of transportation related projects including local roadway, interchange, bike path, highway widening, and transit projects. Mr. Tarrall has led both local agency, transit, and Caltrans projects through the concept planning, preliminary engineering, Environmental Document approval, right of way acquisition, and preparation of PS&E. He is experienced in geometric designs, ADA analysis, drainage design, utility coordination, environmental permitting, public outreach, and Caltrans and local agency procedures and standards.

EXPERIENCE

MTS Iris Rapid Corridor and Transit Station, San Diego County, CA | Project Manager for the design of a new Bus Rapid Transit (BRT) route that will run between the Otay Mesa Transit Center to Imperial Beach. The project includes BRT station improvements at 12 locations and a 4-bay transit center at the intersection of Iris Avenue and 30th. Transit Signal Priority improvements and Real Time Message Board installations will be included in the project. Once completed, the Iris Rapid project will be the first BRT route in San Diego County to run on all electric battery busses.

MTS South Bay ZEB Infrastructure Phase 1 Final Design, Chula Vista, CA | Project Manager for the final engineering for Phase 1 of the new Battery Electric Bus (BEB) infrastructure at the SBMF in Chula Vista, CA. The final construction package includes structural, electrical, fire protection, technical specifications, equipment list, and a construction cost estimate for the facility upgrades. MTS operates and maintains a fleet of 235 compressed natural gas (CNG) buses at the SBMF and seeks to implement a scalable and modular battery bus charging system for an initial twelve BEBs, while maintaining current operations. The initial fleet will be an expansion to current fleet and facility improvements are designed to accommodate a sixty-foot vehicle. The proposed infrastructure is the first phase of MTS's regional plan to replace the existing CNG bus fleet with electric buses over the next 20 years.

Imperial Avenue Division ZEB Phase 1, San Diego CA | Project Manager for the concept development and final engineering for Phase 1 of the new Battery Electric Bus (BEB) infrastructure at the Imperial Avenue Division in San Diego, CA. The proposed infrastructure is the first phase of MTS's Master plan to replace the existing CNG bus fleet with electric buses over the next 20 years. The project will accommodate a minimum of 30 new forty-foot electric buses, infrastructure and overhead gantry, 3;1 charging ratio, platform mounted cabinet equipment, switchgear installation, solar panels, battery storage, and a backup generator.

Clean Transit Advancement Campus, San Diego, CA | Project Manager responsible for the engineering design services for feasibility analysis of the proposed CTAC site improvements. Efforts included coordination with MTS regarding anticipate fleet size, building needs and locations, number of staff, and bus maintenance facility requirements. The team developed four conceptual site layouts for the electric bus operations. Including evaluation of site grading, retaining wall location, drainage improvements, utility impacts, and building massing, along with performing a geotechnical paper study to evaluate existing site conditions and substrata. Final Report Recommendations include a Rough Order of Magnitude (ROM) cost estimate for each alternative and recommendations on infrastructure improvements at the site.

DOKKEN ENGINEERING

KIMBERLY WENDER, PE, ENV SP
QA/QC MANAGER

EDUCATION
2008, BS Civil Engineering
University of Connecticut

REGISTRATION
California Professional Civil Engineer, #C85674

Envision Sustainability Professional

Qualified SWPPP Developer, #85674

EXPERIENCE
16 Years

AFFILIATIONS
American Public Works Association (APWA)

American Council of Engineering Companies (ACEC)

Ms. Wender has a strong portfolio of transit facilities and public works projects, including mobility hubs, bus transit centers, bus rapid transit, bus stop engineering, and light rail stations. She has worked closely with multiple transit agencies, and the cities in which they operate, to provide safe, efficient, pedestrian, and rider friendly facilities. She provides a high-level of service through her organizational and expert project control skills. Kimberly's success in managing the timely delivery of projects and meeting client goals and objectives is attributed to her commitment to ongoing communication, technical expertise, and passion for transit mode choice.

EXPERIENCE

MTS On-Call A&E Design Consulting Services, San Diego, CA | Senior Engineer for the On-Call contract which provides various levels of engineering services to MTS. Representative Task Orders include final engineering for Phase 1 of the South Bay ZEB Infrastructure project, concept development and final engineering for Phase 1 of the Imperial Avenue Division ZEB project, engineering design services for feasibility analysis of the proposed Clean Transit Advancement Campus site improvements, and the design of a new Bus Rapid Transit (BRT) route for the Iris Rapid Corridor and Iris Transit Station.

MTS Bus Stop Improvements, San Diego, CA | Project Engineer, as a subconsultant to ND Construction Company, for the civil engineering services to provide construction plans for thirty (30) MTS bus stop locations throughout the San Diego County region. The project consisted of bus stop enhancements requiring electrical service for new illuminated advertisement panes on the bus stop shelters. Scope of work included research and the collection of record documents for underground utilities and surface improvements, field reconnaissance to collect measurements and photo documentation of the existing conditions, preparation of existing conditions base maps based on the field measurements and record plans, and the preparation of the thirty individual construction plans for submittal to the City of San Diego, Development Services Department for construction permitting. The engineered Construction Plans included demolition of surface improvements to facilitate tunneling of the electrical conduits from the SDG&E service point to the shelters, replacement/upgrade of the surface improvements removed, and survey monument preservation.

RapidLink Route 1/Route 16 Bus Stops – Riverside, CA | Project Engineer for the Riverside Transit Agency's (RTA) proposed RapidLink Route 16 Frequent Local Service Enhancement along the 20 mile stretch between the University of Riverside and the City of Corona. The project entails the enhancement of approximately 50 existing or new branded bus stops with upgraded amenities such as ADA accessible shelter platforms, branded premium station signage, transit shelters, seating, and bike racks along these routes. In addition, RTA proposes to construct a temporary bus layover area at Vine Street with the capacity to accommodate several buses for a variety of local operators.

Riverside Transit Agency Downtown/Vine Street Bus Stops – Riverside, CA | Senior Engineer for the relocation and upgrade of 28 bus stops for Riverside Transit Agency in downtown Riverside. Each stop was upgraded with modern shelters, solar-powered lighting, and information signage. Services included assessment of existing conditions, evaluation of ADA compliance, constructability assessment of new bus shelters, benches, trash receptacles, lighting, and final design and construction management services.

DOKKEN ENGINEERING

JUSTIN THORNBER, PE
SITE DESIGN

EDUCATION
2010, BS Civil Engineering
San Diego State University

REGISTRATION
California Professional Civil Engineer, #C88901

EXPERIENCE
14 Years

AFFILIATIONS
American Society of Civil Engineers (ASCE)

Mr. Thornber has a demonstrated history of civil design excellence specifically with roadway, ADA compliance, site development, mass/precise grading, and construction support. Mr. Thornber is a member of the American Society of Civil Engineers (ASCE) and currently serves as the webmaster for the San Diego section. Mr. Thornber is proficient using AutoCAD Civil 3D, Microstation, ArcMAP, Flowmaster, Bluebeam, and Projectwise.

EXPERIENCE

Iris Rapid Bus Route Corridor, San Diego, CA | This project involves completing the corridor and station design for the Iris Rapid bus route. The new bus route extends from Otay Mesa Transit Center to Imperial Beach, connecting both areas to the UC San Diego Blue Line at the Iris Avenue Transit Center. The project includes improvements to the existing transit center located at Iris Ave near 30th street. Provided construction support including response to RFIs and review of submittals.

San Pablo Avenue Streetscape Phases I & II, Palm Desert, CA | Mr. Thornber was responsible for preparing the ATP cycle 4 grant application for San Pablo Avenue. He designed the driveways and curb ramps along the San Pablo corridor from Highway 111 to Fred Waring Drive. He developed the cost estimate separated by funding source to aid with funding decisions. He reduced construction cost by recommending grind and overlay work, instead of full depth removal, between Royal Palm Drive and Fred Waring Drive. He developed solutions to potential right of way issues with the shop owners between Highway 111 and San Gorgonio Avenue.

McFadden Avenue Protected Bike Lane & Bicycle Boulevard, Santa Ana, CA | Project Engineer for the PS&E of this project which will reconfigure the existing four and five lane roadway segments to a three-lane configuration with protected bike lanes in each direction. Improvements include upgraded signalized intersections with separated bicycle lane detection and leading pedestrian intervals, high visibility crosswalks, and bulb-outs. Coordination with the railroad for improved signalization of train arrivals was necessary because of the high volume of pedestrians and cyclists.

South Bay ZEB Infrastructure, Chula Vista, CA | This project involves retrofitting the existing MTS South Bay Maintenance Facility in Chula Vista to include new Battery Electric Bus (BEB) infrastructure that is scalable/modular while maintaining current facility operations. More specifically, the proposed improvements are the first phase of MTS's Regional Plan to replace the existing fleet with electric buses over the next 20 years. Provided construction support including response to RFIs and review of submittals.

Imperial Ave ZEB Infrastructure, San Diego, CA | The project involves completing schematic design, design development, and final engineering for phase 1 of the new Battery Electric Bus (BEB) infrastructure at MTS's Imperial Avenue Division. The proposed infrastructure is the first phase of MTS's Master plan to replace the existing CNG bus fleet with electric buses over the next 20 years. Led the roadway design team for layout recommendations and schematic design.

Clean Transit Advancement Campus, San Diego, CA | MTS is in the process of obtaining five contiguous parcels in order to construct a new Division 6. This project involves evaluating multiple conceptual site layouts, creating a concept level summary memo, and a rough of order of magnitude cost estimate. The final report included the top two preferred alternatives for the site. Completed the existing site research, including existing easements, and evaluated the earthwork and retaining wall requirements for each layout.

DOKKEN ENGINEERING

CHRISTIAN SANTOS, EIT
SITE DESIGN

EDUCATION
2019, BS Civil Engineering
San Diego State University

REGISTRATION
California Civil Engineer in Training, #168855

EXPERIENCE
5 Years

AFFILIATIONS
American Society of Civil Engineers (ASCE)

Mr. Santos assists senior engineers in various aspects of roadway and highway design in accordance with City, County, California Department of Transportation (Caltrans), and American Association of State Highway Transportation Officials (AASHTO) standards. Mr. Santos is proficient in both AutoCAD Civil 3D and MicroStation V8i/OpenRoads design software.

EXPERIENCE

MTS Iris Rapid Corridor and Station, San Diego, CA | Assistant Engineer. Mr. Santos was involved with the design of the BRT station improvements and improvements at the Iris Rapid Transit Center. In addition, he coordinated with the City of San Diego DSD Department, using Accella and OpenDSD, to acquire the construction permit and approval for construction changes. He also coordinated with City of Imperial Beach to acquire the Temporary Street Encroachment Permit for construction.

MTS IAD ZEB Phase I, San Diego, CA | Assistant Engineer. The MTS IAD ZEB Phase I project consists of a Battery Electric Bus (BEB) overhead charging structure and facility improvements at the MTS Imperial Avenue Bus Depot. Mr. Santos is assisting in the ongoing design of the site and facility improvements.

East Campus Loop Road, La Jolla, CA | Assistant Engineer. The East Campus Loop Road project at UCSD consists of roadway realignments, roadway improvements, utility relocations, and site improvements to facilitate the renovations and new medical buildings proposed at UCSD East Campus. Mr. Santos is assisting with the design of ADA improvements and the preparation and development of the City of San Diego construction permit.

Mid-Coast Corridor Transit, San Diego, CA | Assistant Engineer. The Mid-Coast Corridor Transit Project extends the existing Blue Line of the San Diego light rail system for approximately 10.9 miles, from just north of the Old Town Transit Center to the University Towne Center Transit Center in University City. The project is constructing a total of 9 new transit stations, 5 park-and-ride facilities, 14 new and 2 upgraded traction power substations. The Mid-Coast project required over $90M in dry utility relocations involving 15 different utility companies, along with new 12kV electrical and telephone services. Mr. Santos is assisting with the design support during construction.

Superior Avenue Pedestrian Bridge and Parking Lot, Newport Beach, CA | Assistant Engineer. Project involves preparation of the PS&E for a new pedestrian and bicycle bridge and a parking lot. The parking lot improvements added parking capacity for the adjacent Sunset Ridge Park and beachgoers. The pedestrian bridge crosses Superior Avenue providing safe, direct access to the park. In addition, the project included retaining walls, landscaping, and drainage improvements for stormwater collection and water quality treatment.

North SIO Power Conversion, UCSD, La Jolla, CA | Assistant Engineer. Mr. Santos is responsible for preparing plans, specifications, and estimate (PS&E) for the installation of an electrical duct bank and electrical manhole.

DOKKEN ENGINEERING

JOE OSTDIEK, PE, TE

ELECTRICAL

EDUCATION
1999, BS Civil Engineering
San Jose State University

REGISTRATION
California Professional Civil Engineer, #C65334

California Professional Traffic Engineer, #TR2508

EXPERIENCE
25 Years

AFFILIATIONS
Institute of Transportation Engineers (ITE)

Illuminating Engineering Society (IES)

Mr. Ostdiek is a Senior Signal and Lighting Design Engineer with 25 years of experience in the design of traffic signals, street lighting systems, ramp metering systems, fiber optic and ITS. Joe is well versed in the Caltrans Electrical Systems Design Guide, the IES Roadway Lighting Manual and Caltrans Standard Plans and Specifications. As a registered Traffic Engineer Joe is and signing and striping requirements as outlined in the CAMUTCD and has designed over 200 traffic signals throughout the State. Joe also has extensive knowledge and experience with ADA and California Accessibility Standards. As the manager of Dokken's Electrical Design Team, Joe leads the traffic signals and lighting design for all of Dokken's roadway, interchange, bridge, and trail projects.

EXPERIENCE

Oroville Transit Center, Oroville, CA | Lighting Design Engineer. This project replaced the outdated transit facility in the City of Oroville. The project also revitalized a commercial neighborhood, improved community aesthetics, and improved public safety by creating a high-use, high-visibility public facility. Accommodation was included for the future addition of solar panels and automatic vehicle location displays. Decorative streetlights were used to light the area of the transit facility and the entire block of the city street. Mr. Ostdiek was responsible for lighting analysis, lighting design ,and coordination of utility and electric service from PG&E.

East Palomar St Transit Station, Park & Ride and DAR at I-805, Chula Vista, CA | Mr. Ostdiek oversaw the design and preparation of plans for the Traffic Electrical (Lighting, Traffic Signals, Parking Lot and Transit Station Amenities) portion of this project. Critical clearance calculations between electrical equipment and overhead power lines were conducted early and often to ensure all proposed equipment was appropriately located.

San Pablo Streetscape Improvements, Phase I & II, Palm Desert, CA | As senior engineer, Mr. Ostdiek made recommendations for traffic signal modifications and lighting improvements including intersection, roundabout, decorative, and in-pavement roadway lighting. Mr. Ostdiek was responsible for oversight of the PS&E development, as well as the selection of fixtures and writing of electrical specifications for this project.

Friars Road/SR-163 Interchange, San Diego, CA | This interchange improvement project modified the ramps and structures of the existing interchange to improve traffic operations and alleviate congestion. Phase 1 of the project included local road improvements such as widening Friars Road and the overcrossing, adding bike lanes and 10-foot-wide sidewalks, improving Frazee Road and Ulric Street, coordinating signal timing, constructing retaining walls, improving ramp connections, and providing additional pedestrian and bicycle facilities. Six traffic signals were either modified or underwent complete redesign, ramp metering was added along with CCTV and other ITS infrastructure. Street lighting for local streets and freeway lighting was also included in the design.

El Camino Real from Cassia Road to Camino Vida Roble, Carlsbad, CA | Mr. Ostdiek oversaw the design and preparation of plans for the Traffic Electrical for the project which will provide complete street improvements matching adjacent, multi-modal roadway segments along El Camino Real, between Cassia Road and Camino Vida Roble. Roadway widening with a buffered bike lane and newly added sidewalk will be provided north of Cinnabar Way, where the third northbound lane will be carried through.

DOKKEN ENGINEERING

JENA ADDENBROOKE, PE
UTILITY COORDINATION

EDUCATION
2008, BS Civil Engineering
San Diego State University

REGISTRATION
California Professional Civil Engineer, #C82544

EXPERIENCE
16 Years

AFFILIATIONS
Women in Transportation Seminar (WTS)

Ms. Addenbrooke has 16 years of roadway design experience, specializing in the area of utility coordination. She has an extensive understanding and complies with the FHWA's regulations and requirements under CFR governing utility relocations to ensure proper and complete utility clearance prior to Right of Way certification. She communicates clearly and efficiently with utility companies, municipal utility departments, clients, Caltrans, and subconsultants to ensure this critical project function is thoroughly and timely addressed.

EXPERIENCE

Mid-Coast Corridor Transit Project, San Diego, CA | Ms. Addenbrooke assisted with coordination of dry utility relocations for the project. She is responsible for coordinating all utility designs with the respective companies, ensuring relocations are compatible with the combined project plans, processing traffic control and right of way permits for the utility owners, developing and maintaining utility relocation schedules, facilitating coordination meetings with utility companies, and providing construction support during dry utility relocations. She also assisted in the development and coordination of designs for new power and telephone services to support the new traction power substations, LRT transit stations, LRT signaling equipment, traffic signals, and irrigation equipment located throughout the project limits. She assisted utility companies with designs and ensuring they were constructible and compatible with the proposed improvements and existing facilities.

SR-11 Otay Mesa East Port of Entry Phase 1 Project, San Diego, CA | The SR-11 Otay Mesa East Port of Entry Phase 1 Project prepares the site for the future port of entry construction. This includes site grading, construction of drainage systems, and utility infrastructure. Ms. Addenbrooke is assisting with coordination of the SDG&E and Calpine gas main relocations. She is responsible for preparing and maintaining utility relocation schedules, reviewing proposed designs and cost estimates, and providing support for applicable right of way and permitting requirements. Ms. Addenbrooke is also coordinating service requests for new power, gas, telephone, and communication services to feed the new port of entry. She is responsible for coordinating with the various utility representatives in identifying potential service routes and points of connection, preparing, and submitting for service requests, assisting in development of designs, and maintaining new service schedules from design through construction.

East Palomar Street Transit Station, Park & Ride and DAR at I-805, Chula Vista, CA
The East Palomar Street Transit Station, Park & Ride and Direct Access Ramp at I-805 is the southern terminus of the larger I-805 South Express Lane corridor project and connection point to the South Bay Bus Rapid Transit system that connects bus transit from the international border crossing. Ms. Addenbrooke assisted in utility coordination during the design phase of the I-805 Palomar DAR project. She identified potential utility conflicts, prepared pothole plans, monitored potholing activities in the field, and verified utility conflicts for the project. She developed improvement plans for the new 10" recycled water main in accordance with Otay Water District design standards. Clearances to overhead SDG&E transmission lines and underground gas mains were a concern during construction and design. In order to protect in place these high-risk facilities, coordination meetings with SDG&E were held to ensure minimum clearances were maintained during construction and in the final condition. Ms. Addenbrooke coordinated with utility companies, construction managers, and design representatives to ensure conflicts were identified and relocation designs were completed for Caltrans utility certification.

DOKKEN ENGINEERING

ASHLEY ORSABA-FINDERS, PE, QSD/P, MBA

STORMWATER

EDUCATION

2012, MBA
Drexel University

2007, BS Civil Engineering
CSU Sacramento

REGISTRATION

California Professional Civil Engineer, #C77894

California Qualified SWPPP Developer/Practicioner, #21380

LEED AP

Envision SP

EXPERIENCE

17 Years

AFFILIATIONS

American Public Works Association (APWA)

Water for People

Water Education Foundation

Ms. Ashley Orsaba-Finders is a Senior Engineer with 17 years of experience in water resources and transportation engineering, project management, site development, planning, and GIS analysis. She is experienced in the design of water resources and transportation projects including hydraulic modeling, alternatives analysis, and utility coordination. She is experienced in civil engineer design, hydraulic modeling, planning, drafting and design of civil engineering projects including drainage, utility design, site design, and pump stations. She also has extensive experience with modeling and analysis of water and drainage systems using HEC-RAS, CulvertMaster, StormCAD, CivilStorm, Flow Master, WaterCAD, InfoWater and other software programs.

EXPERIENCE

San Diego Naval Base Improvements, San Diego, CA | This project improved bachelors enlisted quarters (BEQ) and parking garage on the San Diego Naval Base. The 4 story parking garage and 7 story BEQ infill development was constructed on existing parking lots located between a number of buildings. The site footprint was very limited, topography very flat, and the proposed BEQ was going to be located in an area of the 100-year flood plain. In order to resolve water quality and flood drainage concerns, Ms. Orsaba-Finders used StormCAD to provide a design that assisted in the development of a site design in coordination with the landscape architect to construct a linear biofiltration basin to collect all of the site drainage. Perforated low flow pipes were constructed in gravel trenches located under the soil filtration media to accommodate low flow storm events, while the cross-section of the biofiltration basin was designed to accommodate and safely convey the 100-yr storm event across the property with no net negative impacts upstream.

SANDAG South Bay BRT East Palomar Street Improvements, Chula Vista, CA | This project constructed several miles of transit guideway in the Chula Vista area including extensive LID drainage features include bioswales, underground detention vaults, and stormwater treatment BMPs. Ms. Orsaba-Finders performed engineering design, report writing, and drafting in support of the project.

SANDAG Otay Mesa Transit Center, San Diego, CA | This project constructed a new transit center at the Otay Mesa Port of Entry connecting transit riders from Mexico to San Diego via the San Diego Metropolitan Transit System. She performed engineering design, report writing, and drafting in support of the project.

San Diego Airport Rental Car Center, San Diego, CA | This project constructed a new parking structure and rental car facility at the San Diego International Airport. Ms. Orsaba-Finders performed hydraulic analysis of fire water systems for the new parking structure and rental car facility at the San Diego International Airport using WaterCAD. Ms. Orsaba-Finders also assisted with site grading and drainage design including the design of stormwater bioswales.

Recreation Facility Development Improvements, Coronado Naval Base, Coronado, CA | This project was an infrastructure and facility improvement project for a new recreational facility at the Coronado Naval Base in San Diego. Ms. Orsaba-Finders was responsible for the modeling and design of new water, sewer, and storm drain pipelines serving the facility.

I-80 Auxiliary Lanes Project, Placer County, CA | This project will construct new lanes on Interstate 80 in the cities of Roseville and Rocklin. The project includes the widening of a bridge to accommodate the additional lane. Ms. Orsaba-Finders was responsible for the bridge hydraulics analysis, preparation of Bridge Design Hydraulic Report, Drainage Report, and Caltrans Storm Water Data Report.

DOKKEN ENGINEERING

VANESSA COTHRAN, SR/WA
RIGHT OF WAY

EDUCATION
2011, BA Sociology, CSU Sacramento

Completed Course: Eminent Domain Law Basics for the Right of Way Professional (IRWA)

REGISTRATION
CA Licensed Real Estate Salesperson, #01788740

CA Licensed Notary

Senior Right of Way Designation (SR/WA)

EXPERIENCE
19 Years

AFFILIATIONS
International Right of Way Association (IRWA)

American Public Works Association (APWA)

Ms. Cothran has worked in the right of way industry on a variety of public projects. She communicates and relates well with people to solve problems and accomplish her professional tasks on time. Vanessa has demonstrated expertise in providing acquisition and relocation assistance services in a timely and cost-effective manner and is knowledgeable regarding the requirements of the Uniform Act and Caltrans policies and procedures.

EXPERIENCE

Iris Rapid, San Diego Metropolitan Transit System, CA | The project includes BRT station improvements at 12 locations and a 4-bay transit center at the intersection of Iris Avenue and 30th. Transit Signal Priority improvements and Real Time Message Board installations will be included in the project. Once completed, the Iris Rapid project will be the first BRT route in San Diego County to run on all electric battery buses. Vanessa was responsible for obtaining permanent and temporary easements from 2 parcels, and obtaining temporary construction easement extensions from both parcels to accommodate the construction schedule.

Autrey Lane, Monte Vista Avenue, Lower Wyandotte Road Safe Routes To School, Butte County, CA | The purpose of this Project is to install bike lanes and pedestrian sidewalks to close gaps between existing active transportation improvements. Additional public right of way is required to accommodate these facilities. Vanessa is responsible for acquisition documentation preparation, right of way negotiations and escrow coordination for 18 parcels (all including temporary construction easements), and Caltrans right of way certification coordination.

North Indio Flood Control, Coachella Valley Water District, CA | Senior Relocation Agent responsible for providing relocation assistance to 4 residential displacees and 2 nonresidential displacees. She also provided escrow coordination for services for 19 parcels. This project will accept stormwater flows from Sun City Palm Desert, convey those flows to Sun City Shadow Hills, and ultimately convey them to the Coachella Valley Stormwater Channel.

Randall Avenue Widening, City of Rialto, CA | Senior Right of Way Agent responsible for acquisition services for 12 parcels and escrow coordination for 32 parcels. The project proposed to widen the segment of Randall Avenue between Cactus Avenue and Riverside Avenue. The 88' widening would accommodate planned growth and bring this segment of Randall Avenue to the City's standards for a Secondary Arterial, matching existing improvements along the corridor.

E Palm Canyon Drive Over Palm Canyon Wash Bridge Rehabilitation, City of Palm Springs, CA | Senior Right of Way Agent responsible for obtaining an encroachment permit from the Riverside County Flood Control and Water Conservation District, coordination with BIA for acquisition of right of way on 1 property, and acquisitions from 2 private property owners. The purpose of the project is to widen the existing East Palm Canyon Drive Bridge to provide a facility consistent with the City's standard for a "major thoroughfare" and to better conform to the approach roadways.

Additional Right of Way Management Experience

- Indian Canyon Drive and Bridge Replacement at UPRR, Palm Springs
- Avenue 416/El Monte Way, Dinuba
- Yucca Loma Bridge and Roadway Widening, Apple Valley
- El Camino Real Roadway Widening, Carlsbad
- Avenue 416/El Monte Way. Dinuba
- Green Tree Boulevard Extension, Victorville

DOKKEN ENGINEERING

MICKEY AGUIRRE, PE

SURVEY

EDUCATION

1973, BS Civil Engineering
Stanford University

1975, MS Civil Engineering
Stanford University

REGISTRATION

California Professional Civil Engineer, #C 27648

EXPERIENCE

50 Years

AFFILIATIONS

American Public Works Association (APWA)

Mr. Aguirre has 50 years of experience in managing, directing and performing civil engineering and land surveying tasks. His experience includes 10 years in the municipal sector prior to founding Aguirre & Associates in 1986. Both municipal and private survey and mapping experience includes a broad range of projects, including rail and light rail, public works, residential, commercial, churches, schools and other institutional projects. Mr. Aguirre has extensive surveying and mapping experience under contracts for local agencies in San Diego County including MTS for rail and light rail projects.

EXPERIENCE

NCTD Contract 16041-02 Bus Stop Improvements TO 5, Oceanside/Escondido/Vista, CA | Perform topographic surveys for 18 bus stops, prepare DTM and topographic mapping for each site, plot street rights-of-way and centerlines, prepare survey control plan sheet.

MTS Contract G2075.0-18 Iris Rapid, San Diego and Imperial Beach, CA | Perform topographic and design survey for 12 bus stop sites, prepare DTM and topographic mapping for each site, perform land net survey and prepare land net base mapping for each site.

SANDAG Contract 5001903, South Bay BRT-Palomar Street, Chula Vista, CA | Aguirre & Associates was the survey, mapping and right-of-way sub-consultant to SANDAG for a 2.5 mile portion of this BRT project along E. Palomar Street. Duties included aerial and ground control surveys, aerial mapping, land net surveys and mapping, design surveys and the preparation of right-of-way documents. Mr. Aguirre's duties included managing and administering the survey requests that were received from the prime consultant, QA/QC and assisting with the preparation of legal descriptions and plats.

SANDAG Contract 5000922, Inland Rail Trail Phases II & III, San Marcos and Vista, CA | Aguirre & Associates was the survey, mapping and right-of-way sub-consultant to SANDAG for over 7 miles of bike trail along the Sprinter Rail line in San Marcos and Vista. Mr. Aguirre's duties included managing and administering the survey requests that were received from the prime consultant, QA/QC and assisting with the preparation of legal descriptions and plats for the right-of-way acquisitions to support the proposed project.

SANDAG Contract 5001903, Southeast to Downtown Bike Corridor, San Diego, CA | Aguirre & Associates was the survey and mapping sub-consultant to SANDAG for this 4-mile bike corridor project. Duties have included aerial control surveys and aerial mapping of the entire corridor, land net mapping of portions of the alignment, and limited ground surveys for design purposes. Mr. Aguirre's duties included managing and administering the survey requests that were received from the prime consultant, performing QA/QC.

SANDAG Contract 5001907, Trolley Station ADA Review, San Diego, CA | Aguirre & Associates was the survey sub-consultant to SANDAG for this ADA compliance review project. Mr. Aguirre's duties included managing and administering the survey requests that were received from the prime consultant, and scheduling staff to meet the needs of the prime consultant.

ATTACHMENT B
NEGOTIATED FEE PROPOSAL

Work Order Estimate Summary

MTS Doc. No.	**PWL353.0-22**
Work Order No.	**WOA353-AE-34**
Attachment:	**B**

Work Order Title: **SELT Bus Stop Shelter Upgrades**

Project No:

Table 1 - Cost Codes Summary (Costs & Hours)

Item	Cost Codes	Cost Codes Description	Total Costs
1	Labor	Total Direct Labor	$688,221.76
2	ODCs	Total Other Direct Costs	
		Totals =	**$688,221.76**

Table 2 - TASKS/WBS Summary (Costs & Hours)

Item	TASKS/WBS	TASKS/WBS Description	Labor Hrs	Total Costs
1	Task 1	Project Management and Coordination	235.0	$54,625.80
2	Task 2	Field Investigation	849.0	$165,945.14
3	Task 3	Records Research	90.0	$15,398.60
4	Task 4	Plan Preparation and Bus Stop Design	1,416.0	$242,312.80
5	Task 5	Facilitate Plan Review and Permit Assistance	826.0	$146,604.72
6	Task 6	Engineer's Cost Estimate	103.0	$18,686.90
7	Task 7	Design Support During Construction	230.0	$44,647.80
		Totals =	**3,749.0**	**$688,221.76**

Table 3 - Consultant/Subconsultant Summary (Costs & Hours)

(If Applicable, Select One)				Consultant	Labor Hrs	Total Costs
DBE	DVBE	SBE	Other			
				Dokken	3,021.0	$543,813.48
				Aguirre	728.0	$144,408.28
				Totals =	**3,749.0**	**$688,221.76**

Work Order Estimate Summary

Total Hours = **3,021**

Total Costs = **$543,813.48**

Consultant/Subconsultant: **Dokken**

Work Order Title: **SELT Bus Stop Shelter Upgrades**

Item	TASKS/WBS	TASKS/WBS Description		ODCs (See Attachment)	Mark Contract Manager $ 325.90	Frank Task Manager $ 231.06	Kimberly QA/QC Manager (Engineer - Senior) $ 220.66	Ashley / Joe / Justin / Jena Engineer - Senior $ 220.66	Christian Engineer - 3 $ 185.07	Christian Engineer - 2 $ 163.60	Christian Engineer - 1 $ 121.06	KD/Merja CADD - Senior $ 208.58	Mark D CADD - 3 $ 141.77	Total Hours	Totals
1	**Task 1**	**Project Management and Coordination**													
1.1		Invoicing, quality assurance, and administration of the Consultant's team			2	30								32	$7,583.60
1.2		Provide quality control as part of the development of the deliverable			10	20	80							110	$25,533.00
1.3		Provide coordination with outside agencies for review and approval of the plans			SEE TASK 5										
1.4		Facilitate plan review, and address review comments and design related issues			2	20								22	$5,273.00
1.5		Monthly PDT meetings			16	30				25				71	$16,236.20
		Task 1 ODCs													
			Subtotals (Hours) =	N/A	30	100	80			25				235	$54,625.80
			Subtotals (Costs) =		$9,777.00	$23,106.00	$17,652.80			$4,090.00				**235**	**$54,625.80**
2	**Task 2**	**Field Investigation**													
2.1		Record measurements			1	12				80				93	$16,186.62
2.2		Photo log locations				6				18				24	$4,331.16
2.3		Provide licensed surveyor to inspect each applicable site			1	3								4	$1,019.08
		Task 2 ODCs													
			Subtotals (Hours) =	N/A	2	21				98				121	$21,536.86
			Subtotals (Costs) =		$651.80	$4,852.26				$16,032.80				**121**	**$21,536.86**
3	**Task 3**	**Records Research**													
3.1		Records research of as-built street improvement plans				10				80				90	$15,398.60
		Task 3 ODCs													
			Subtotals (Hours) =	N/A		10				80				90	$15,398.60
			Subtotals (Costs) =			$2,310.60				$13,088.00				**90**	**$15,398.60**
4	**Task 4**	**Plan Preparation and Bus Stop Design**													
4.1		Existing layout for each bus stop location			1	30				100		60		191	$36,132.50
4.1.1		Encroachment Maintenance and Removal Agreement			1	20				40				61	$11,491.10
4.2		Base Map			1	10				40	40	10		101	$16,108.70
4.3		Traffic control plans for bus stops in San Diego			1	30				80	80	150		341	$61,317.50
4.4		ADA criteria, standard drawings and technical specification			1	20				80				101	$18,035.10
4.5		95% design plans			1	40		40		240	240	60		621	$99,227.90
		Task 4 ODCs													
			Subtotals (Hours) =	N/A	6	150		40		580	360	280		1,416	$242,312.80
			Subtotals (Costs) =		$1,955.40	$34,659.00		$8,826.40		$94,888.00	$43,581.60	$58,402.40		**1,416**	**$242,312.80**
5	**Task 5**	**Facilitate Plan Review and Permit Assistance**													
5.1		Coordination with all outside agencies for review and approval of plans			2	30		80		57				169	$34,561.60
5.2		Permits required for construction within City right-of-way			1	30				133				164	$29,016.50
5.3		Plan review processes to address review comments and design related issues			1	30				142	142	76		391	$63,531.50
5.4		Record log to track all City review comments and design revisions			1	7				38				46	$8,160.12
5.5		Assist the Contractor with City permit processing required during construction			2	7				19				28	$5,377.62
5.6		Provide updates when the permit is submitted and notify of acceptance/revision within 7 days			1	18				9				28	$5,957.38
		Task 5 ODCs													
			Subtotals (Hours) =	N/A	8	122		80		398	142	76		826	$146,604.72
			Subtotals (Costs) =		$2,607.20	$28,189.32		$17,652.80		$65,112.80	$17,190.52	$15,852.08		**826**	**$146,604.72**
6	**Task 6**	**Engineer's Cost Estimate**													
6.1		Prepare Draft 95% and the Final engineer's cost estimate			3	20				80				103	$18,686.90
6.1.1		Cost estimate shall include a list of construction bid items													
6.1.2		Unit costs for each bid items will be developed based on recent construction bid data													
		Task 6 ODCs													
			Subtotals (Hours) =	N/A	3	20				80				103	$18,686.90
			Subtotals (Costs) =		$977.70	$4,621.20				$13,088.00				**103**	**$18,686.90**
7	**Task 7**	**Design Support During Construction**													
7.1		Design support during construction			10	80				140				230	$44,647.80
7.1.1		Assist with potential in-field design changes and to provide direction to the contractor													
7.1.2		Respond to RFI's and issue necessary clarifications/interpretations of the Contract Documents													
		Task 7 ODCs													
			Subtotals (Hours) =	N/A	10	80				140				230	$44,647.80
			Subtotals (Costs) =		$3,259.00	$18,484.80				$22,904.00				**230**	**$44,647.80**
		Totals (Summary) =												**3,021**	**$543,813.48**
		Total (Hours) =		N/A	59	503	80	120		1401	502	356		3021	
		Total (Costs) =			$19,228.10	$116,223.18	$17,652.80	$26,479.20		$229,203.60	$60,772.12	$74,254.48			$543,813.48
		Percentage of Total (Hours) =		N/A	2%	17%	3%			46%	17%	12%		96%	
		Percentage of Total (Costs) =			4%	21%	3%			42%	11%	14%			95%

Work Order Estimate Summary

Consultant/ Subconsultant: **Dokken**

Work Order Title: **SELT Bus Stop Shelter Upgrades**

TASKS/WBS (1-5)

ODC Item	Description	Unit	Unit Cost	Task 1		Task 2		Task 3		Task 4		Task 5	
				Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
				Subtotal =		Subtotal =		Subtotal =		Subtotal =		Subtotal =	

TASKS/WBS (6-10)

ODC Item	Description	Task 6		Task 7								Totals	
		Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
		Subtotal =		Subtotal =		Subtotal =		Subtotal =		Subtotal =		**Totals =**	

Work Order Estimate Summary

Total Hours = **728**

Total Costs = **$144,408.28**

Consultant/Subconsultant: **Aguirre**

Work Order Title: **SELT Bus Stop Shelter Upgrades**

Item	TASKS/WBS	TASKS/WBS Description	ODCs (See Attachment)	Surveyor - Senior	Surveyor - 3	Party Chief	Chainman		Total Hours	Totals
				$ 177.48	$ 122.36	$ 247.22	$ 242.98	$ -		
1	**Task 1**	**Project Management and Coordination**								
1.1		Invoicing, quality assurance, and administration of the Consultant's team								
1.2		Provide quality control as part of the development of the deliverable								
1.3		Provide coordination with outside agencies for review and approval of the plans								
1.4		Facilitate plan review, and address review comments and design related issues								
1.5		Monthly PDT meetings								
		Task 1 ODCs								
		Subtotals (Hours) =	N/A							
		Subtotals (Costs) =								
2	**Task 2**	**Field Investigation**								
2.1		Record measurements								
2.2		Photo log locations								
2.3		Provide licensed surveyor to inspect each applicable site		205	183	170	170		728	$142,109.28
		Task 2 ODCs	$2,299.00							$2,299.00
		Subtotals (Hours) =	N/A	205	183	170	170		728	$144,408.28
		Subtotals (Costs) =	$2,299.00	$36,383.40	$22,391.88	$42,027.40	$41,306.60		**728**	**$144,408.28**
3	**Task 3**	**Records Research**								
3.1		Records research of as-built street improvement plans								
		Task 3 ODCs								
		Subtotals (Hours) =	N/A							
		Subtotals (Costs) =								
4	**Task 4**	**Plan Preparation and Bus Stop Design**								
4.1		Existing layout for each bus stop location								
4.1.1		Encroachment Maintenance and Removal Agreement								
4.2		Base Map								
4.3		Traffic control plans for bus stops in San Diego								
4.4		ADA criteria, standard drawings and technical specification								
4.5		95% design plans								
		Task 4 ODCs								
		Subtotals (Hours) =	N/A							
		Subtotals (Costs) =								
5	**Task 5**	**Facilitate Plan Review and Permit Assistance**								
5.1		Coordination with all outside agencies for review and approval of plans								
5.2		Permits required for construction within City right-of-way								
5.3		Plan review processes to address review comments and design related issues								
5.4		Record log to track all City review comments and design revisions								
5.5		Assist the Contractor with City permit processing required during construction								
5.6		Provide updates when the permit is submitted and notify of acceptance/revision within 7 days								
		Task 5 ODCs								
		Subtotals (Hours) =	N/A							
		Subtotals (Costs) =								
6	**Task 6**	**Engineer's Cost Estimate**								
6.1		Prepare Draft 95% and the Final engineer's cost estimate								
6.1.1		Cost estimate shall include a list of construction bid items								
6.1.2		Unit costs for each bid items will be developed based on recent construction bid data								
		Task 6 ODCs								
		Subtotals (Hours) =	N/A							
		Subtotals (Costs) =								
7	**Task 7**	**Design Support During Construction**								
7.1		Design support during construction								
7.1.1		Assist with potential in-field design changes and to provide direction to the contractor								
7.1.2		Respond to RFI's and issue necessary clarifications/interpretations of the Contract Documents								
		Task 7 ODCs								
		Subtotals (Hours) =	N/A							
		Subtotals (Costs) =								
		Totals (Summary) =							**728**	**$144,408.28**
		Total (Hours) =	N/A	205	183	170	170		728	
		Total (Costs) =	$2,299.00	$36,383.40	$22,391.88	$42,027.40	$41,306.60			$144,408.28
		Percentage of Total (Hours) =	N/A	28%	25%	23%			77%	
		Percentage of Total (Costs) =	2%	25%	16%	29%				71%

Work Order Estimate Summary

Consultant/ Subconsultant: **Aguirre**

Work Order Title: **SELT Bus Stop Shelter Upgrades**

TASKS/WBS (1-5)

ODC Item	Description	Unit	Unit Cost	Task 1		Task 2		Task 3		Task 4		Task 5	
				Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
				Subtotal =		Subtotal =		Subtotal =		Subtotal =		Subtotal =	

TASKS/WBS (6-10)

ODC Item	Description	Task 6		Task 7								Totals	
		Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total	Quantity	Total
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
		Subtotal =		Subtotal =		Subtotal =		Subtotal =		Subtotal =		**Totals =**	

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 9

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

On-Board Video Surveillance System (OBVSS) Services for San Diego Metropolitan Transit System Bus Fleet – Contract Amendment

RECOMMENDATION:

That the San Diego Metropolitan Transit System (MTS) Board of Directors authorize the Chief Executive Officer (CEO) to execute Amendment No. 2 to MTS Doc. No. B0733.0-21 (in substantially the same format as Attachment A), with Luminator Technology Group (LTG), for a sole source amendment for the migration from the current Vehicle Information Management (VIM) software to the Managing Safety Efficiency in Transit (mSET) software for a total cost of $623,436.00.

Budget Impact

The total cost of this amendment is estimated to be $623,436.00 (Attachment B), and the total contract cost of this project is estimated to be $4,910,186.60. The project will be funded by the MTS General Operating Budget account 902010-110030.

DISCUSSION:

The MTS fleet is equipped with a camera system (also called OBVSS). This system is extremely helpful in securing video footage for resolving questions about service delivery, allegations of assault or other crimes against MTS employees or passengers, driver conduct, and accidents.

On September 16, 2021 (Agenda Item (AI) 19), the MTS Board approved a sole source contract with the camera manufacturer, LTG, for a Transit OBVSS Post Warranty, Maintenance, Repair, and Support Services.

MTS is looking to transition the system from VIM software to mSET software. Some of the benefits for this change include the following:

- Software provides continuous accessibility to video and fleet information, even when vehicles are not connected.

- Video and fleet information is available, even when vehicles are outside of network range.
- Instant video playback enables users to easily identify clips of interest by previewing the video and metadata.
- Easily obtain critical footage from events, even when a specific time or vehicle number is unknown (video clips can be requested by a mapped location across the entire fleet).
- Additional search parameters include vehicle number, event, and vehicle speed.

The migration from VIM to mSET is to be performed in stages, and will include all buses currently operated by MTS. The initial migration will be done to the Imperial Avenue Division (IAD) and Kearny Mesa Division (KMD) buses, followed by those at South Bay Division (SBD), East County Division (ECD), and lastly, Copley Park Division (CPD). The entire migration should be completed by the end of Quarter 1 in 2025.

All new vehicles will be added to the mSET server license as it is a one-time fee specific to the server. Individual vehicle licenses will be transferred from the vehicle being replaced to the new vehicle. LTG provided pricing in accordance with General Services Administration (GSA) Contract No. GS-07F-0776X valid through September 29, 2026. Staff deemed the cost to fair and reasonable based on MTS's initial Independent Cost Estimate (ICE) of $763,250.00.

Therefore, staff recommends that the MTS Board of Directors authorize the CEO to execute MTS Doc. No. B0733.2-21 (in substantially the same format as Attachment A), with LTG, for a sole source amendment for the migration from the current VIM software to the mSET software for a total cost of $623,436.00.

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachments: A. Draft Agreement MTS Doc. No. B0733.2-21
B. LTG Quote dated 9/17/24

Metropolitan Transit System

Amendment 2

November 14, 2024 MTS Doc No. B0733.2-21

ON-BOARD VIDEO SURVEILLANCE SYSTEMS (OBVSS) SERVICES FOR MTS BUS FLEET

Luminator Technology Group
Derek White
Sales Director
24000 35th Avenue, SE
Bothell, WA, 98021

This shall serve as Amendment No.2 to the original agreement B0733.0-21 as further described below.

SCOPE

Pursuant to the Scope of Work of the San Diego Metropolitan Transit System (MTS) contractor shall migrate from the existing VIM software to mSET. The migration from VIM to mSET is to be performed in stages, and will include all buses currently operated by MTS. The initial migration will be done to the Imperial Avenue Division (IAD) and Kearny Mesa Division (KMD) buses, followed by those at South Bay Division (SBD), East County Division (ECD), and lastly Copley Park Division (CPD). The entire migration should be completed by the end of Q1 2025.

SCHEDULE

There shall be no changes to the schedule provision of the agreement. The base term end date remains September 30, 2026.

PAYMENT

This contract amendment adds the software license and maintenance needed for the migration. The additional costs shall exceed $623,436.00. The total value of this contract including this amendment shall be in the amount of $4,910,186.60. This amount shall not be exceeded without prior written approval from MTS.

Please sign and return the copy to the Contract Specialist at MTS. All other terms and conditions shall remain the same and in effect. Retain the other copies for your records.

Sincerely,

Sharon Cooney, Chief Executive Officer

Agreed:

Derek White, Sales Director
Luminator Technology Group

Date: _____

Attachment: A – LTG Quote #A-0164935B dated 9/17/24

LUMINATOR TECHNOLOGY GROUP

Quotation Number: A-0164935B

Date: 9/17/2024
Payment Terms: Net 30 w/ Signed PO
Shipping Terms: FOB Origin
End User: San Diego Metropolitan Transit System
Project: mSET Fleet Migration East County
Customer Account Number: M032507

Sales Manager: Miles Beran
Sales Email: mberan@transitmarketinggroup.com

Bill To: San Diego Metropolitan Transit System
Wesley Wells
1255 Imperial Avenue Suite 1000 San Diego, California 92101-9492
United States

Tel: (619) 238-0100
Fax / Email: wesley.wells@sdmts.com

Line	Qty	Model	Description	Unit Price	Ext. Price
mSET Software					
Streaming Video Vehicle Licenses					
1	1	mSET-SV	mSET Software, Streaming Video Single-Server License (Includes 3-Years of Software Maintenance)	$6,670.00	$6,670.00
2	92	mSET-SV-L	mSET Software, Streaming Video Single-Vehicle License	$334.00	$30,728.00
				Subotal:	$37,398.00
Year 1 Software Maintenance, mSET Base, Health, Smartclip, Location					
3	4	mSET-M-100	mSET Software Maintenance for Fleets of 100 Vehicles or Less, 12 Months (requires purchase for mSET Base and each additional module)	$5,320.00	$21,280.00
				Subtotal:	$21,280.00
Year 2 Software Maintenance, mSET Base, Health, Smartclip, Location					
4	4	mSET-M-100	mSET Software Maintenance for Fleets of 100 Vehicles or Less, 12 Months (requires purchase for mSET Base and each additional module)	$5,320.00	$21,280.00
				Subtotal:	$21,280.00
				Total:	$ 79,958.00

Please submit orders to order.na@luminator.com, referencing the quotation number provided.
All prices are in US dollars; prices and terms are valid for 30 days. Freight charges, installation charges and taxes (if applicable) are additional and may not be included in this quotation.
All returns are subject to a 20% re-stocking fee.

Standard Terms and Conditions of Sale: https://luminator.com/images/Supplier_Documents_-_North_America/GENERAL_T_C_SALE_V1.1_2021.pdf
Warranty and Repair Service Information: https://luminator.com/images/Supplier_Documents_-_North_America/LUMINATOR_WARRANTY_V1.2_2021.pdf

LUMINATOR TECHNOLOGY GROUP

Quotation Number: A-0164934B

Date: 9/17/2024
Payment Terms: Net 30 w/ Signed PO
Shipping Terms: FOB Origin
End User: San Diego Metropolitan Transit System
Project: mSET Fleet Migration Copley
Customer Account Number: M032507

Sales Manager: Miles Beran
Sales Email: mberan@transitmarketinggroup.com

Bill To: San Diego Metropolitan Transit System
Wesley Wells
1255 Imperial Avenue Suite 1000 San Diego, California 92101-9492
United States

Tel: (619) 238-0100
Fax / Email: wesley.wells@sdmts.com

Line	Qty	Model	Description	Unit Price	Ext. Price
mSET Software					
Streaming Video Vehicle Licenses					
1	1	mSET-SV	mSET Software, Streaming Video Single-Server License (Includes 3-Years of Software Maintenance)	$6,670.00	$6,670.00
2	157	mSET-SV-L	mSET Software, Streaming Video Single-Vehicle License	$334.00	$52,438.00
				Subotal:	$59,108.00
Year 1 Software Maintenance, mSET Base, Health, Smartclip, Location					
3	4	mSET-M-200	mSET Software Maintenance for Fleets of 200 Vehicles or Less, 12 Months (requires purchase for mSET Base and each additional module)	$9,520.00	$38,080.00
				Subtotal:	$38,080.00
Year 2 Software Maintenance, mSET Base, Health, Smartclip, Location					
4	4	mSET-M-200	mSET Software Maintenance for Fleets of 200 Vehicles or Less, 12 Months (requires purchase for mSET Base and each additional module)	$9,520.00	$38,080.00
				Subtotal:	$38,080.00
				Total:	$ 135,268.00

Please submit orders to order.na@luminator.com, referencing the quotation number provided.
All prices are in US dollars; prices and terms are valid for 30 days. Freight charges, installation charges and taxes (if applicable) are additional and may not be included in this quotation.
All returns are subject to a 20% re-stocking fee.

Standard Terms and Conditions of Sale: https://luminator.com/images/Supplier_Documents_-_North_America/GENERAL_T_C_SALE_V1.1_2021.pdf
Warranty and Repair Service Information: https://luminator.com/images/Supplier_Documents_-_North_America/LUMINATOR_WARRANTY_V1.2_2021.pdf

LUMINATOR TECHNOLOGY GROUP

Quotation Number: A-0164936B

Date: 9/17/2024
Payment Terms: Net 30 w/ Signed PO
Shipping Terms: FOB Origin
End User: San Diego Metropolitan Transit System
Project: mSET Fleet Migration IAD KMD
Customer Account Number: M032507

Sales Manager: Miles Beran
Sales Email: mberan@transitmarketinggroup.com

Bill To: San Diego Metropolitan Transit System
Wesley Wells
1255 Imperial Avenue Suite 1000 San Diego, California 92101-9492
United States

Tel: (619) 238-0100
Fax / Email: wesley.wells@sdmts.com

Line	Qty	Model	Description	Unit Price	Ext. Price
mSET Software					
Streaming Video Vehicle Licenses					
1	1	mSET-SV	mSET Software, Streaming Video Single-Server License (Includes 3-Years of Software Maintenance)	$6,670.00	$6,670.00
2	269	mSET-SV-L	mSET Software, Streaming Video Single-Vehicle License	$334.00	$89,846.00
				Subotal:	$96,516.00
Year 1 Software Maintenance, mSET Base, Health, Smartclip, Location					
3	4	mSET-M-300	mSET Software Maintenance for Fleets of 300 Vehicles or Less, 12 Months (requires purchase for mSET Base and each additional module)	$13,720.00	$54,880.00
				Subtotal:	$54,880.00
Year 2 Software Maintenance, mSET Base, Health, Smartclip, Location					
4	4	mSET-M-300	mSET Software Maintenance for Fleets of 300 Vehicles or Less, 12 Months (requires purchase for mSET Base and each additional module)	$13,720.00	$54,880.00
				Subtotal:	$54,880.00
				Total:	$ 206,276.00

Please submit orders to order.na@luminator.com, referencing the quotation number provided.
All prices are in US dollars; prices and terms are valid for 30 days. Freight charges, installation charges and taxes (if applicable) are additional and may not be included in this quotation.
All returns are subject to a 20% re-stocking fee.

Standard Terms and Conditions of Sale: https://luminator.com/images/Supplier_Documents_-_North_America/GENERAL_T_C_SALE_V1.1_2021.pdf
Warranty and Repair Service Information: https://luminator.com/images/Supplier_Documents_-_North_America/LUMINATOR_WARRANTY_V1.2_2021.pdf

LUMINATOR TECHNOLOGY GROUP

Quotation Number: A-0164931B

Date: 9/17/2024
Payment Terms: Net 30 w/ Signed PO
Shipping Terms: FOB Origin
End User: San Diego Metropolitan Transit System
Project: mSET Fleet Migration South Bay
Customer Account Number: M032507

Sales Manager: Miles Beran
Sales Email: mberan@transitmarketinggroup.com

Bill To: San Diego Metropolitan Transit System
Wesley Wells
1255 Imperial Avenue Suite 1000 San Diego, California 92101-9492
United States

Tel: (619) 238-0100
Fax / Email: wesley.wells@sdmts.com

Line	Qty	Model	Description	Unit Price	Ext. Price
mSET Software					
Streaming Video Vehicle Licenses					
1	1	mSET-SV	mSET Software, Streaming Video Single-Server License (Includes 3-Years of Software Maintenance)	$6,670.00	$6,670.00
2	256	mSET-SV-L	mSET Software, Streaming Video Single-Vehicle License	$334.00	$85,504.00
				Subotal:	$92,174.00
Year 1 Software Maintenance, mSET Base, Health, Smartclip, Location					
3	4	mSET-M-300	mSET Software Maintenance for Fleets of 300 Vehicles or Less, 12 Months (requires purchase for mSET Base and each additional module)	$13,720.00	$54,880.00
				Subtotal:	$54,880.00
Year 2 Software Maintenance, mSET Base, Health, Smartclip, Location					
4	4	mSET-M-300	mSET Software Maintenance for Fleets of 300 Vehicles or Less, 12 Months (requires purchase for mSET Base and each additional module)	$13,720.00	$54,880.00
				Subtotal:	$54,880.00
				Total:	$ 201,934.00

Please submit orders to order.na@luminator.com, referencing the quotation number provided.
All prices are in US dollars; prices and terms are valid for 30 days. Freight charges, installation charges and taxes (if applicable) are additional and may not be included in this quotation.
All returns are subject to a 20% re-stocking fee.

Standard Terms and Conditions of Sale: https://luminator.com/images/Supplier_Documents_-_North_America/GENERAL_T_C_SALE_V1.1_2021.pdf
Warranty and Repair Service Information: https://luminator.com/images/Supplier_Documents_-_North_America/LUMINATOR_WARRANTY_V1.2_2021.pdf

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 10

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

San Diego and Arizona Eastern Railway Company (SD&AE) – Quarterly Reports from the SD&AE Board of Directors Meeting on October 8, 2024

RECOMMENDATION:

That the San Diego Metropolitan Transit System (MTS) Board of Directors receive the reports to the SD&AE Board of Directors at its meeting on October 8, 2024 for the San Diego and Imperial Valley Railroad (SD&IV), Pacific Southwest Railway Museum Association (Museum), and Desert Line (Attachment A) activities for information.

Budget Impact

None.

DISCUSSION:

Pursuant to the Agreement for Operation of Freight Rail Services, SD&IV and PSRM provided operations quarterly reports to the SD&AE Board of Directors at its meeting on October 8, 2024 (Attachment A). At that meeting, there were no actions taken for ratification by the MTS Board of Directors. This is an informational item.

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachment: A. Final Meeting Materials for the October 8, 2024 SD&AE Board of Directors Meeting

REVISED AGENDA

San Diego and Arizona Eastern (SD&AE)
Railway Company
Board of Directors Meeting

October 8, 2024
9:00 a.m.

In-Person Participation: James R. Mills Building, 1255 Imperial Avenue
10th Floor Executive Committee Room, San Diego, CA 92101
Teleconference Participation: 1 (669) 254-5252; Webinar ID: 161 268 5182
https://www.zoomgov.com/j/1612685182

This information will be made available in alternative formats upon request. To request an agenda in an alternative format, please call the Clerk of the Board at least five working days prior to the meeting to ensure availability. Assistive Listening Devices (ALDs) are available from the Clerk of the Board prior to the meeting and are to be returned at the end of the meeting. Meeting Zoom/teleconference instructions can be accessed at the following link: https://www.sdmts.com/about-mts-meetings-and-agendas/sdae

ACTION RECOMMENDED

1. **Approval of the Minutes of October 17, 2023** — Approve
   Action would approve the SD&AE Railway Company Minutes of October 17, 2023.
2. **Statement of Railway Finances (Erin Dunn)** — Informational
3. **Report on San Diego and Imperial Valley (SD&IV) Railroad Operations (Matt Domen)** — Informational
4. **Report on Pacific Southwest Railway Museum (Stephen Hager)** — Informational
5. **Report on the Desert Line (Karen Landers)** — Informational
6. **Real Property Matters (Sean Myott)** — Informational
   Summary of SD&AE Documents Issued Since October 17, 2023.
7. Board Member Communications
8. Public Comments
9. Next Meeting Date: Tuesday, October 14, 2025 at 9:00 a.m.
10. Adjournment

SAN DIEGO & ARIZONA EASTERN RAILWAY COMPANY

A Nevada Nonprofit Corporation

1255 Imperial Avenue
Suite 1000
San Diego, CA
92101-7490
619.231.1466

MINUTES

BOARD OF DIRECTORS MEETING OF THE
SAN DIEGO & ARIZONA EASTERN RAILWAY COMPANY

October 17, 2023

[Clerk's note: Except if noted, public, staff and board member comments are paraphrased.]

A meeting of the Board of Directors of the San Diego & Arizona Eastern (SD&AE) Railway Company, a Nevada corporation, was held at 1255 Imperial Avenue, Suite 1000, San Diego, California 92101, on October 17, 2023, at 10:00 a.m. via Zoom and in person.

The following persons, constituting the Board of Directors, were present: Brian Riley and Matt Domen (David Franklin, Jr. was absent). Others in attendance were members from:

San Diego Metropolitan Transit System:	Erin Dunn, Karen Landers, Sean Myott
Pacific Southwest Railway Museum:	Stephen Hager

1. Approval of Minutes

Mr. Domen moved to approve the Minutes of the October 27, 2022, SD&AE Railway Board of Directors meeting. Mr. Riley seconded the motion, and it was unanimously approved.

2. Statement of Railway Finances

Ms. Dunn reviewed the Statement of Railway Finances for the year ending June 30, 2023 (attached to the agenda item). The fiscal year financials have not yet been published to the MTS Board of Directors—they will go to the MTS Board of Directors in November 2023. The financials are not yet final; however, no changes are anticipated. Revenue and expenses are favorable to budget. The net income of $89,000 is being added to the reserves balance, which now totals $975,532.

Action Taken

Informational item only. No action taken.

3. Report on San Diego & Imperial Valley Railroad (SD&IV) Operations

Mr. Domen reviewed the SD&IV Periodic Report for activities (attached to the agenda item). The report addressed labor, marketing, reportable injuries/environmental, and a summary of freight.

Action Taken

Informational item only. No action taken.

4. Report on Pacific Southwest Railway Museum Operations (Stephen Hager)

Mr. Hager submitted the Pacific Southwest Railway Museum (PSRM) reports for the last four quarters (attached to the agenda item). Ridership has generally continued to increase since the pandemic. There have been no Federal Railroad Administration (FRA) reportable injuries or accidents. Preparations are being made for the special holiday trains.

Mr. Hager stated that PSRM has a proposed track project for the Desert Line to run from Campo west toward the turnaround point and then extend service westbound to Division. Mr. Hager provided two quotes for the project (attached).

Action Taken

Informational item only. No action taken.

5. Report on the Desert Line (Karen Landers)

Ms. Landers reported that Caltrans got a grant in January 2022 to complete a planning and feasibility study on a Desert Line project. Caltrans was working with the San Diego Association of Governments (SANDAG) to do the study—however, that was not allowed in the grant's rules so it was changed so that Caltrans is the lead agency on the project. The last update that Ms. Landers had was that Caltrans was trying to narrow the scope and then identify an appropriate consultant. Ms. Landers is not sure if the start date will be in 2024, and she will be checking back with Caltrans on the status. Ms. Landers stated that there will be nothing happening on the Desert Line until the study is completed, and there is coordination with Caltrans, SANDAG, and MTS.

Action Taken

Informational item only. No action taken.

6. Real Property Matters (Sean Myott)

Summary of SD&AE Documents Issued Since October 27, 2022

Mr. Myott stated that since the October 27, 2022, SD&AE Railway Company Board of Directors meeting, the documents described in the agenda item have been processed by staff. Mr. Myott noted that there has been significant interest from fiber-optic companies to cross MTS right-of-way—particularly in the southern region and border areas. Having fiber optics running through an active rail line has largely been discouraged by MTS—instead MTS has suggested that fiber-optics companies request access on public streets and that has been successful so far.

Ms. Landers added that MTS is working on a Transit-Oriented Development (TOD) project at Beyer Blvd. Station. The original site plan included using the existing parking lot—a portion of which was considered to be in the railroad corridor. The project was then redesigned to exclude that area. Mr. Myott added that rail access is always considered during TOD projects to ensure that there are no issues with transit access in the future.

- L1560.1-21: Right of Entry Permit Amendment (Time Extension) to Palm Engineering Construction Company, Inc. to install a new water main and perform street improvements adjacent to MTS railroad right of way and Euclid Transit Center.

- L1637.0-23: Right of Entry Permit to C Below for potholing along Commercial St. via hydro vacuum to expose & confirm utilities.

- S200-21-766.1: Right of Entry Permit Amendment (Time Extension) to HMS Construction, Inc. to install conduit at various locations (I-5 Civic Center Dr Bridge, I-5 Palm City Bridge, Beyer Blvd and 905) for the California Department of Transportation.

- S200-22-775.1: Right of Entry Permit Amendment (Time Extension) to Albus-Keefe & Associates for exploratory drilling and soil sampling at the Palm Avenue Station parking lot and right of way (2340 Palm Ave, Chula Vista, CA).

- S200-23-791.1: Right of Entry Permit Amendment (Time Extension) to Transtelco to replace existing fiber cable in an existing duct from Sigsbee Street and Harbor Boulevard to San Ysidro.

- S200-23-791: Right of Entry Permit Amendment to Transtelco Inc. to replace existing fiber cable in an existing duct from Sigsbee Street and Harbor Boulevard to San Ysidro.
- S200-23-792: Right of Entry Permit to Man General Engineering to access two above ground Cox Communications pedestals to pull fiber through existing conduit at Beyer Boulevard.

- S200-23-795: Right of Entry Permit to Griffith Company to install bridge falsework to protect the MTS tracks and appurtenances during the El Cajon Bridge demolition and reconstruction.

- S200-23-796: Right of Entry Permit to Fordyce Construction, Inc. for street and curb improvement work on the east side of Howard Ave between Iris Ave and Village Pine.

- S200-23-797: Right of Entry Permit to Coastal Communications, Inc. to install conduit and fiber optic cable via boring methods on Civic Center Drive.

- S200-23-798: Right of Entry Permit to AirX Utility to perform utility locating and mark-outs, potholing and documentation in the parking lot of the El Cajon Transit Center.

- S200-23-799: Right of Entry Permit to AirX Utility to perform utility locating and mark-outs, potholing and documentation Harbor Drive and Sampson Street.

- S200-23-800: Right of Entry Permit to Wyyerd Fiber to conducting fiber investigation at the 24th Street Transit Center and Civic Center Drive.

- S200-23-801: Right of Entry Permit to Wyyerd Fiber to conduct field investigation for fiber installation at the San Ysidro Station.

- S200-23-802: Right of Entry Permit to RedZone Robotics, Inc. to conduct field investigation of the trunk sewer pipeline along the trolley's Orange Line utilizing manholes for equipment access.

- S200-23-806: Right of Entry Permit to Life Sports Foundation allowing participants of the 2023 Campagnolo Gran Fondo San Diego bike event to cross over railroad tracks at 8th

Street, Palomar Street and Gunpowder Point Drive in Chula Vista, CA on Sunday, April 23, 2023.

- S200-23-808: Right of Entry Permit to SANDAG to access the Iris Ave. Transit Center on March 15, 2023 from 2:30pm - 5:00pm and El Cajon Transit Center on March 6, 2023 from 2:30pm-5:00pm for the purpose of encouraging participation in SANDAG's Youth Opportunity Pass Impact Survey.

- S200-23-808.1: Right of Entry Permit Amendment (Time Extension) to SANDAG Right of Entry Permit to SANDAG to access the Iris Ave. Transit Center for the purpose of encouraging participation in SANDAG's Youth Opportunity Pass Impact Survey. Extend to April 30, 2023.

- S200-23-809: License Agreement to MCImetro Access Transmission Services LLC Access for construction, use, operation, maintenance, repair and ownership of an underground fiber optic conduit that crosses within MTS/SDAE right of way at Civic Center Drive.
- S200-23-811: Right of Entry Permit to KTA Construction Inc. to replace sewer and water mains along 26th St and Commercial St for the City of San Diego.

- S200-23-812: Right of Entry Permit to the Navy Region Southwest Morale, Welfare and Recreation Department to Allowing event participants of the Navy's Annual Bay Bridge Run/Walk to cross over tracks on Sunday, May 21, 2023 at the Cesar Chavez Parkway railroad crossing and Harbor Drive.

- S200-23-813: Right of Entry Permit Right to GC Fence Corporation to install a fence near the Spring Street and Nebo Drive crossing as requested by the CPUC.

- S200-23-814: Right of Entry Permit to SANDAG to conduct outreach regarding the proposed Rapid 625 Bus Route Project at the Palomar Street Transit Center on April 19, 2023 from 2:30pm - 6:30pm or another date if weather does not permit up until May 31, 2023 as approved by MTS staff.

- S200-23-816: Right of Entry Permit to John Donaldson Construction, Inc. to install a pipe lining in the current sewer line near the building located at 1225 N Marshall Avenue, El Cajon.

- S200-23-817: Right of Entry Permit to Orion Construction to perform a GPR survey and investigative potholing at the 32nd Street crossing for the development of construction design plans for Naval Base San Diego NAVFAC's Water Line Repair Project.

- S200-23-818: Right of Entry Permit to Ramona Paving & Construction Corp, Inc. to replace asphalt along Imperial Avenue from 60th Street to 65th Street, San Diego.

- S200-23-819: Lease Agreement to West Coast General Group for temporary staging and storage of construction equipment, construction materials and supplies at property situated south of Palomar Street in the City of Chula Vista (APN 622-081-28-01).

- S200-23-820: Right of Entry Permit to City of La Mesa allowing participants of the City of La Mesa Flag Day Parade to cross over tracks on June 3, 2023 at La Mesa Boulevard railroad crossing.

- S200-23-824: Right of Entry Permit to Wyyerd Fiber to intercept Wyyerd owned fibers with MTS fiber at 24th Street Station/Mile of Cars Way.

- S200-24-828: Right of Entry Permit to RDZ Plumbing & Drains the purpose of replacing a sewer pipe located at the San Ysidro Station, for street address 727 E. San Ysidro Blvd.

- S200-24-830: Right of Entry Permit to Sweetwater Authority to the purpose of repairing a 16" underground water valve at F Street, Chula Vista.

Action Taken

Informational item only. No action taken.

7. Board Member Communications

There were no Board member communications.

8. Public Comments

- Manuel Hernandez representing Baja California Railroad (BJRR)

  Mr. Hernandez reported that BJRR has been looking to work with SD&IV to export by rail from Mexico into the U.S. and build a new border infrastructure facility. BJRR has been meeting with companies (such as Hyundai) about the growing demand for exports from Tijuana to the U.S. He discussed the issues finding funding for infrastructure on the U.S. side of San Ysidro and the multiple entities that BJRR has been working with in the U.S. and Mexico to try to get the project moving forward.

  Ms. Landers asked why there were no exports historically. Mr. Domen responded that the challenges have included train-car inspection locations, train storage locations, employee infrastructure, and other considerations, such as shades, coverings, docks, equipment (depending upon the commodities), etc.

  Ms. Landers asked if enough space was added to accommodate a new facility when SANDAG did the San Ysidro Yard Expansion Project. Mr. Domen responded that tracks and drainage were built, but there is no extra room for a new building or another track without purchasing additional property.

  Discussion ensued regarding different types of potential exports. Mr. Domen added that the only export historically was sand, and U.S. Customs required that all of the sand be unloaded into a pile through a screen and one agent stood there all day and inspected it. Ms. Landers suggested that BJRR representatives talk with SANDAG and Caltrans about expansion at the San Ysidro Yard. She stated that to expand the San Ysidro Yard, private property east of the San Ysidro Yard would have to be purchased prior to seeking funding, and the property would have to pass all federal environmental clearances. She added that MTS could not as a public agency purchase property unless there was an official project and all of the federal clearances passed. Ms. Landers' last contact with the private property owner's attorney was to let her know they were getting ready to sell their property and she is unaware of the current status of the property

ownership. Ms. Landers will provide the name of the property owner's lawyer to BJRR if they want to inquire about the plans for the private property.

Discussion ensued regarding the potential for a new infrastructure facility at the border. Ms. Landers suggested that BJRR find a sponsor at SANDAG or Caltrans.

- Jim Lundquist representing PSRM – virtual question submitted:

  Can the abandoned property at Campo, left behind by CZRY, be removed by the Railway Museum? We have a new home for the old office trailer in Tecate, and the other equipment there appears to be scrapped.

  Ms. Landers responded that the answer most likely is yes—and she will have Mr. Myott follow up. A formal legal process was done a few years ago notifying people about MTS clearing the abandoned property and, if they wanted to claim any of the property, they needed to take action to remove it. Mr. Myott can double-check the records to make sure that no one ever claimed the property. Mr. Hager added that after a meeting in March, he sent a list to Mr. Myott noting the items that PSRM would like to dispose of or keep.

9. Next Meeting Date

The next meeting of the SD&AE Railway Company Board of Directors is on Tuesday, October 8, 2024 at 9:00 a.m.

10. Adjournment

The meeting was adjourned at 10:27 a.m.

Chairperson

General Counsel

2023-10-17 DRAFT MINUTES-SDAE.doc

Attachment: PSRM Project Quotes (2)

RailWorks Track Services LLC
12740 Lakeland Road – Unit B
Santa Fe Springs, CA 90670

October 9, 2023

James Caestecker
C/O Pacific Southwest Railway Museum
San Diego & Arizona Railway
750 Depot Street
Campo, CA 91906-3180
jcaestecker@psrm.org

Subject: RailWorks Proposal 431-23-113

Re: ***Track repair proposal***

Mr. Caestecker,

RailWorks Track Services LLC (**RailWorks**) is pleased to provide this proposal based on our site visit and collaborative meetings. This pricing is based on providing a track crew and the identified equipment below to perform the work identified during our site visit.

Scope of Work

- Track ditching:
  - Furnish equipment and manpower to ditch 3000TF on both field sides to remove rocks and overburden causing drainage issues and causing tracks to be submerged for long periods of time causing tie deterioration.
- Crossing approach and exit repairs:
  - Furnish equipment and manpower to correct reverse elevation and alignment issues on the approach and exit of the mainline road crossing. This work includes installation of new ballast material in shallow cribs and to allow the surfacing of the approach and exit to the crossing.
- Furnish and distribute ballast:
  - Furnish equipment and manpower to furnish and distribute 500 tons of AREMA 4 ballast material in various locations where shallow cribs and missing ballast have been found.
- Tie change:
  - Furnish and install (500) IG Common ties where poor tie condition has been found in various locations. Ties to be furnished with new spikes throughout using a pattern to match neighboring ties. Ties to be tamped using customer existing ballast material using a hydraulic tamping gun.

RailWorks Pricing: ***$284,347.00***

RailWorks pricing based on mutually acceptable terms and conditions.

Thank you for the opportunity to offer this proposal. If you have any questions, please contact me at (562) 783-9132 or via email sent to cdeater@railworks.com.

RailWorks Track Services LLC
12740 Lakeland Road – Unit B
Santa Fe Springs, CA 90670

Thank you,

Chris Deater

Chris Deater
Estimator

RailWorks Track Services LLC
12740 Lakeland Road – Unit B
Santa Fe Springs, CA 90670

October 9, 2023

James Caestecker
C/O Pacific Southwest Railway Museum
San Diego & Arizona Railway
750 Depot Street
Campo, CA 91906-3180
jcaestecker@psrm.org

Subject: RailWorks Proposal 431-23-113

Re: ***Track repair proposal***

Mr. Caestecker,

RailWorks Track Services LLC (**RailWorks**) is pleased to provide this proposal based on our site visit and collaborative meetings. This pricing is based on providing a track crew and the identified equipment below to perform the work identified during our site visit.

Scope of Work

- Tie change:
  - Furnish and install (1200) IG Common ties where poor tie condition has been found in various locations over the last 1.5 miles of track between the redflag and the tunnel at the end of the track. This is a 25% tie change using a pattern of every 4th tie to be changed. Ties to be furnished with new spikes throughout using a pattern to match neighboring ties. Ties to be tamped using customer existing ballast material using a hydraulic tamping gun.

RailWorks Pricing: $341,991

RailWorks pricing based on mutually acceptable terms and conditions.
Pricing is based on a single mobilization in and out.
Pricing includes all materials and mobilizations associated with the work above.

Thank you for the opportunity to offer this proposal. If you have any questions, please contact me at (562) 783-9132 or via email sent to cdeater@railworks.com.

Thank you,

Chris Deater

Chris Deater
Estimator

Agenda Item No. 2

San Diego and Arizona Eastern (SD&AE)
Railway Company
Board of Directors Meeting

October 8, 2024

SUBJECT:

Statement of Railway Finances

RECOMMENDATION:

That the SD&AE Railway Company Board of Directors receive a financial report for the fiscal year ending June 30, 2024.

Budget Impact

None.

DISCUSSION:

Attached are SD&AE's financial results for the fiscal year ending June 30, 2024.

As of June 30, 2024, revenue is favorable to budget by $4,000.00 and has increased by $40,000.00 from the Fiscal Year (FY) ending June 30, 2023 primarily due to the new billboard contracts.

Expenses are $87,000.00 favorable to budget primarily due to positive variances in both Outside Services and Risk Management costs. Compared to the FY ending June 30, 2023, expenses have decreased $42,000.00 primarily due a decrease in Risk Management costs related to a $25,000.00 claim settlement with the City of National City in FY 2023.

The Net Income as of June 30, 2024, was $171,000.00.

Attachment: SD&AE Operating Statement for year ending June 30, 2024

SD&AE Operating Statement FY2024

	FY 2024			FY 2023	
	Actuals	Budget	Variance	Actuals	Variance
Revenues					
Right of Entry Permits	$ 38,057	$ 30,000	$ 8,057	$ 56,319	$ (18,262)
Lease Income	157,072	163,000	(5,928)	98,183.00	58,889
Operator Income - SD&IV 1% Freight Fee	42,000	40,000	2,000	42,544	(544)
Total Revenues	$ 237,128	$ 233,000	$ 4,128	$ 197,046	$ 40,082
Expenses					
Personnel Costs	$ 2,641	5,351	$ 2,710	$ 2,519	$ (122)
Outside Services	-	35,000	35,000	13,185	13,185
Risk Management	40,373	80,000	39,627	62,675	22,302
Misc. Operating Expenses	22,966	33,000	10,034	29,654	6,688
Total Expenses	$ 65,980	$ 153,351	$ 87,371	$ 108,033	$ 42,053
Net Income/(Loss)	$ 171,148	$ 79,649	$ 91,499	$ 89,013	$ 82,135

Reserve Balance as of June 30, 2023	**$ 975,532**
GASB 87 Lease True Up to Cash Basis	$ 191
Allocated Interest Earnings	82,739
Operating Profit/(Loss) - YTD	171,148
Reserve Balance as of June 30, 2024	**$ 1,229,610**

Agenda Item No. 3

San Diego and Arizona Eastern (SD&AE)
Railway Company
Board of Directors Meeting

October 8, 2024

SUBJECT:

REPORT ON SAN DIEGO AND IMPERIAL VALLEY (SD&IV) RAILROAD OPERATIONS

RECOMMENDATION:

That the SD&AE Board of Directors receive a report for information.

Budget Impact

None.

DISCUSSION:

An oral report will be given during the meeting.

Attachments: Periodic Reports for the 4th Quarter of 2023 & 1st Quarter of 2024

SD&AE Board
C/O MTS
1255 Imperial Avenue, Suite 1000
San Diego, California 92101

October 8, 2024

Periodic Report

In accordance with Section 20 of the Agreement for Operational Freight Service and Control through Management of the San Diego and Arizona Eastern Railway Company activities of interest for the prior year are listed as follows:

1. Labor

The San Diego & Imperial Railroad has 9 employees as listed below:

1 General Manager

1 Manager - Marketing & Sales

1 Office Manager

1 Mechanical Manager

1 Maintenance of Way Employee

4 Train Service Employees

2. Marketing

Volume in the 3rd Quarter had an 11% increase as compared to the same quarter in 2023. Traffic terminating on SDIY increased 13%, consisting of ethanol, E85, aviation gas, renewable diesel, lumber and plastics. Ethanol and E85 growth in San Diego have weakened with lower gas prices and the growth of electric vehicles. Traffic into Mexico increased 10%, mainly driven by increased LPG finding a home in Mexico coming off a milder winder in the U.S. Midwest region. Dairy feed, brewery malt and pulp and paper shipments make up the remainder of the traffic.

3. Reportable Injuries/Environmental

Days through year to date there were ***no*** FRA Reportable injuries or Environmental incidents on the SDIV Railroad.

Days FRA Reportable Injury Free: **9588**

4. Summary of Freight

	2024	2023	2022
Total rail carloads that moved by SDIY Rail Service in the quarter.	**922**	**830**	**857**
Total railroad carloads Terminating/Originating Mexico in the quarter.	**644**	**584**	**498**
Total railroad carloads Terminating/Originating El Cajon, San Diego, National City, San Ysidro, California in the quarter.	**278**	**246**	**359**
Total customers directly served by SDIY in the quarter	**9**	**10**	**10**
Regional Truck trips that SDIY Railroad Service replaced in the quarter	**2766**	**2490**	**2577**

Respectfully,

Matt Domen

General Manager

Agenda Item No. 4

San Diego and Arizona Eastern (SD&AE)
Railway Company
Board of Directors Meeting

October 8, 2024

SUBJECT:

REPORT ON PACIFIC SOUTHWEST RAILWAY MUSEUM

RECOMMENDATION:

That the SD&AE Board of Directors receive a report for information.

Budget Impact

None.

DISCUSSION:

A report will be presented during the meeting.

Attachments: Quarterly Reports

Pacific Southwest Railway Museum

La Mesa Depot 4695 Nebo Drive La Mesa, CA 91941 619-465-7776

February 2, 2024

SD&AE Board
c/o Metropolitan Transit System
1255 Imperial Avenue, Suite 1000
San Diego, CA 92101

Re: Fourth Quarter, 2023

Dear SD&AE Board:

During the fourth quarter of 2023 the Pacific Southwest Railway Museum operated 3 Golden State trains, 32 Pumpkin Express trains, and 16 North Pole Limited trains carrying a total of 6,069 passengers. The museum was open seventeen days during the fourth quarter. There were no FRA reportable accidents or injuries during the fourth quarter, 2023. Earned revenue from SD&AE property was $269,379.76; our check for $5,387.60 is enclosed.

Passenger ridership during the fourth quarter as compared to the past ten years:

6,069 passengers during the fourth quarter 2023
6,476 passengers during the fourth quarter 2022
5,792 passengers during the fourth quarter 2021
2,253 passengers during the fourth quarter 2020
7,559 passengers during the fourth quarter 2019
7,698 passengers during the fourth quarter 2018
7,153 passengers during the fourth quarter 2017
6,736 passengers during the fourth quarter 2016
7,110 passengers during the fourth quarter 2015
6,765 passengers during the fourth quarter 2014

The fourth quarter of the year is PSRM's busiest time of year. We operated our popular Halloween-themed Pumpkin Express trains in October and our largest annual event, the North Pole Limited trains, in late November and December.

A Federal Tax Exempt 501 (C) 3 California Non-Profit Corporation FEIN #95-2374478 www.psrm.org

PSRM continues to perform track maintenance and weed abatement and maintains both signalized railroad crossings within our right-of-way limits. PSRM signal maintainers perform the monthly, quarterly and annual inspections regularly. During the fourth quarter, PSRM kicked off the largest contracted track rehabilitation project on the Desert Line in our organization's history. PSRM contracted with RailWorks to rehabilitate five miles of the Desert Line between Canyon (Milepost 61.6) and the Cow Creek Trestle (Milepost 66.76) with a total contract value of $284,347. RailWorks' scope of services included replacing 500 ties, placing 500 tons of crushed rock ballast, surfacing and lining track, and cutting ditches along 3,000 feet of track in two cuts.

The track rehabilitation project was necessary to address defects in the track structure that had arisen due to regular wear and tear and from natural deterioration over time. The project also addressed drainage issues in several locations that further threatened the integrity of the track structure. These defects forced PSRM to truncate its train ride earlier in 2023 and had to be addressed prior to the North Pole Limited train season to avoid losing out on over 50% of our annual income. The project progressed sufficiently for PSRM to resume operations between Campo and Canyon in time for the North Pole Limited season. PSRM is of the opinion that large-scale track projects of this magnitude will be required on a recurrent basis every five to ten years in order to maintain our section of the Desert Line in a state of good repair. PSRM will continue seeking funding in the form of grants and donations in order to further rehabilitate other sections of the Desert Line within our fourteen miles of operating limits.

As always, thank you to the San Diego & Arizona Eastern board and staff, as well as the Metropolitan Transit System board and staff for entrusting the care of fourteen miles of the SD&AE Desert Line to the Pacific Southwest Railway Museum. Our offer remains open to host an MTS/SD&AE visit to our museum in Campo. Please email me at hager@psrm.org for arrangements.

Sincerely,

Stephen Hager

Stephen Hager
President

Pacific Southwest Railway Museum

La Mesa Depot 4695 Nebo Drive La Mesa, CA 91941 619-465-7776

June 5, 2024

SD&AE Board
c/o Metropolitan Transit System
1255 Imperial Avenue, Suite 1000
San Diego, CA 92101

Re: First Quarter, 2024

Dear SD&AE Board:

During the first quarter of 2024 the Pacific Southwest Railway Museum operated 30 Golden State trains, 1 School train, and 18 Bunny Trains carrying a total of 2,863 passengers. The museum was open twenty-six days during the first quarter. There were no FRA reportable accidents or injuries during the first quarter, 2024. Earned revenue from SD&AE property was $68,885.49; our check for $1,377.71 is enclosed.

Passenger ridership during the first quarter as compared to the past ten years:

2,863 passengers during the first quarter 2024
1,535 passengers during the first quarter 2023
1,793 passengers during the first quarter 2022
1,087 passengers during the first quarter 2021
1,305 passengers during the first quarter 2020
1,665 passengers during the first quarter 2019
2,728 passengers during the first quarter 2018
1,185 passengers during the first quarter 2017
2,380 passengers during the first quarter 2016
2,334 passengers during the first quarter 2015

We operated our Easter-themed Bunny train special event during the first quarter.

A Federal Tax Exempt 501 (C) 3 California Non-Profit Corporation FEIN #95-2374478 www.psrm.org

PSRM continues to perform track maintenance and weed abatement and maintains both signalized railroad crossings within our right-of-way limits. PSRM signal maintainers perform the monthly, quarterly and annual inspections regularly. During the first quarter, PSRM completed the largest contracted track rehabilitation project on the Desert Line in our organization's history. PSRM contracted with RailWorks to rehabilitate five miles of the Desert Line between Canyon (Milepost 61.6) and the Cow Creek Trestle (Milepost 66.76) with a total contract value of $284,347. RailWorks' scope of services included replacing 500 ties, placing 500 tons of crushed rock ballast, surfacing and lining track, and cutting ditches along 3,000 feet of track in two cuts. PSRM's contracted engineering firm, RailPros, is scheduled to perform the annual bridge inspections at mileposts 60.08, 60.93, and 65.27 late in the second quarter or early in the third quarter of this year.

As always, thank you to the San Diego & Arizona Eastern board and staff, as well as the Metropolitan Transit System board and staff for entrusting the care of fourteen miles of the SD&AE Desert Line to the Pacific Southwest Railway Museum. We are always happy to host an MTS/SD&AE visit to our museum in Campo. Please email me at hager@psrm.org for arrangements.

Sincerely,

Stephen Hager

Stephen Hager
President

Agenda Item No. 5

San Diego and Arizona Eastern (SD&AE)
Railway Company
Board of Directors Meeting

October 8, 2024

SUBJECT:

REPORT ON THE DESERT LINE

RECOMMENDATION:

That the SD&AE Board of Directors receive a report for information.

Budget Impact

None.

DISCUSSION:

A report will be presented during the meeting.

Agenda Item No. 6

San Diego and Arizona Eastern (SD&AE)
Railway Company
Board of Directors Meeting

October 8, 2024

SUBJECT:

SUMMARY OF SD&AE DOCUMENTS ISSUED SINCE OCTOBER 17, 2023

RECOMMENDATION:

That the SD&AE Railway Company Board of Directors receive a report for information.

Budget Impact

None.

DISCUSSION:

Since the October 17, 2023, SD&AE Railway Company Board of Directors meeting, the documents described below have been processed by staff.

- S200-22-771.1 and S200-22-771.2: Ortiz Corporation Right of Entry Permit Amendment (Time Extensions) to install water pipe beneath the tracks, installation of an additional pipes by cut and cover trenching, and the abandonment of existing pipe beneath tracks at the 69th St crossing.

- S200-22-771.3: Ortiz Corporation Right of Entry Permit Amendment (Time Extension & Additional Scope) to install water pipe beneath the tracks, installation of an additional pipes by cut and cover trenching, and the abandonment of existing pipe beneath tracks at the 69th Street crossing and additionally perform curb improvements.

- S200-23-791.2: Transtelco Inc. Right of Entry Permit Amendment (Time Extension) to repair potholing related to the replacement of existing fiber from Sigsbee Street and Harbor Boulevard to San Ysidro.

- S200-23-795.1: Griffith Company Right of Entry Permit Amendment (Time Extension) to install bridge falsework to protect the MTS tracks and appurtenances during the Caltrans El Cajon Bridge demolition and reconstruction.

- S200-23-803: Affirmed Housing Group, Inc. Exclusive Negotiating Agreement (ENA) for a Transit-Oriented Development at Spring Street Station.

- S200-23-825: West Coast General Group Right of Entry Permit to perform street and curb improvement work as part of the new bike pathways along Beyer Blvd. as part of SANDAG's Border to Bayshore Bikeway project.

- S200-23-825.1: West Coast General Group Right of Entry Permit Amendment (Additional Scope) to perform street and curb improvement work as part of the new bike pathways along Beyer Blvd. as part of SANDAG's Border to Bayshore Bikeway project and additionally to remove and replace MTS ROW chain-link fence, asphalt, concrete, and curb on Beyer Blvd. near Precision Park Lane.

- S200-24-829: Peregrine Energy Storage, LLC License for an underground transmission line at Sampson Street for the right to construct, install, inspect, use, operate, maintain, repair, replace, modify, and remove one 230kV generator tie transmission line.

- S200-24-830: Sweetwater Authority Right of Entry Permit to repair a 16" underground water valve at F Street.

- S200-24-834: The Fishel Company Right of Entry Permit to perform asphalt trenching to place conduit for fiber in the public right of way along Hollister Street adjacent to the Palm Street crossing.

- S200-24-836: GC Fence Corporation Right of Entry Permit to install a guardrail near the Spring Street and University Avenue crossing.

- S200-24-839: KTA Construction Inc. Right of Entry Permit to replace a sewer and water main along 19th Street and Commercial Street.

- S200-24-840: Railworks Track Services, LLC Right of Entry Permit to perform track maintenance on behalf of the PSRMA on the Desert Line between MP 66.7 and MP 61.6 in Campo, CA.

- S200-24-841: NOVA Services, Inc. Right of Entry Permit to perform geotechnical borings at Spring Street Station on behalf of Affirmed Housing L.P.

- S200-24-842: EPC Services Right of Entry Permit to construct an underground transmission line at the Sampson Street crossing.

- S200-24-842.1: EPC Services Right of Entry Permit Amendment (Time Extension) to construct an underground transmission line at the Sampson Street crossing.

- S200-24-843: Pacific Drilling Company Right of Entry Permit to perform drilling of boreholes as part of a slope and drainage improvements project located north of the San Ysidro railyard on the southwest facing embankment of the rail line located east of Beyer Boulevard.

- S200-24-844: SANDAG Right of Entry Permit to perform outreach regarding for the Transit Subsidy Survey at various transit centers.

- S200-24-846: Caltrans Right of Entry Permit to conduct in person and aerial drone site investigations of the Sweetwater Marsh and Marisma de Nacional Marsh for the Federal Fish and Wildlife Service.

- S200-24-847: San Diego & Arizona Eastern Railroad Grant Deed transferring four SD&AE parcels to MTS to facilitate a DDA with National CORE for the Plam Avenue Trolley Station Transit-Oriented Development.

- S200-24-848: Blue Pacific Engineering & Construction Inc. Right of Entry Permit to perform civil improvements that include sidewalk construction, lighting improvements, and landscaping improvements as part of the City of Lemon Grove's Connect Main Street Project.

- S200-24-849: San Diego Unified Port District Right of Entry Permit to temporarily install traffic sensors onto MTS catenary poles (approx. 4 months) at the 28th Street and Harbor Drive and Cesar Chavez and Harbor Drive crossings as part of a vehicle route enforcement pilot program for semi-trucks leaving the Tenth Avenue Marine Terminal.

- S200-24-851: Nu Line Technologies Right of Entry Permit to perform sewer-line cleaning and manhole rehabilitation activities at Campo Rd. and Forest Gate Rd.

- S200-24-852: Cox Communications Right of Entry Permit to replace underground equipment located near Beyer Blvd. and Dairy Mart Rd.

- S200-24-853: SANDAG Right of Entry Permit to perform outreach for the planned improvements to the San Ysidro Transit Center.

- S200-24-854: Commander, Navy Region Southwest, Morale, Welfare and Recreation (MWR) Right of Entry Permit for Navy's Annual Bay Bridge Run/Walk to cross over MTS Trolley tracks at Harbor Drive and Cesar Chavez Boulevard.

- S200-24-857: Life Sports Foundation Right of Entry Permit for the 2024 Campagnolo Gran Fondo San Diego bike event to cross over railroad tracks at 8th Street, Palomar Street, and Gunpowder Point Drive.

- S200-24-859: Wyyerd Group Right of Entry Permit to install a new aerial fiber line from an existing utility pole near F Street west over the MTS tracks and Interstate 5 to an existing pole near Bay Blvd.

- S200-24-861: Blue Pacific Engineering & Construction Inc. Right of Entry Permit to install a curb ramp and foundation for a pedestrian crossing at the El Cajon Transit Center.

- S200-24-863: Aguirre & Associates Right of Entry Permit to obtain survey data for the existing OCS cables and SDG&E transmission wire for the 24th Street Trolley Pedestrian Bridge Feasibility Study for the City of National City at the 24th Street Trolley Station.

- S200-24-864: San Diego Bicycle Coalition Right of Entry Permit to allow participants of the Bike the Bay bike event to cross over railroad tracks at various locations on the Blue Line (south line) and Coronado Branch (located throughout the Bayshore Bikeway).

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 11

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

Kearny Mesa Division (KMD) Chassis Wash Lift Replacement – Contract Award

RECOMMENDATION:

That the San Diego Metropolitan Transit System (MTS) Board of Directors authorize the Chief Executive Officer (CEO) to execute MTS Doc No. PWB402.0-24 (in substantially the same format as Attachment A), with Southwest Lift & Equipment, Inc., in the amount of $356,908.00 for the replacement of the existing chassis wash lift for KMD.

Budget Impact

The total cost of this contract is estimated to be $356,908.00 (Attachment C). This project will be funded by the Capital Improvement Program (CIP) account 3008124301 – KMD Chassis Wash Hoist Replacement.

DISCUSSION:

KMD is an MTS-operated facility that maintains and stages the agency's fixed route revenue buses. KMD has an outdoor and covered chassis wash area with a drive-on lift allowing staff to wash the underside of buses and maintain their serviceability. The existing KMD chassis wash lift is past its useful service life and is no longer in a state of good repair. KMD staff have experienced repeated service outages of the existing lift and difficulty maintaining it with increasingly antiquated replacement parts.

On August 13, 2024, MTS issued an Invitation for Bids (IFB) seeking a contractor to provide lift replacement services. The scope of work for this project includes a full removal and replacement of the existing lift with a new lift of equal size and improved function as referenced in Attachment B. Additionally, within the chassis wash area, the contractor will remove peeled epoxy flooring and replace damaged floor drainage covers and berms.

Four (4) bids were received on September 20, 2024, from the following firms:

Firm	Firm Certification	Grand Total
MTS – Independent Cost Estimate (ICE)		$713,858.00
Southwest Lift & Equipment Inc.	**Small Business (SB)**	**$356,908.00**
Air and Lube Systems Inc.	Disadvantaged Business Enterprise (DBE)	$417,109.00
DLG Contractors Inc.	SB	$614,775.00
Metro Builders & Engineers Group, Ltd.	N/A	$790,486.00

Southwest Lift & Equipment Inc. has designated subcontractor PG Cutting Services, Inc. to perform a portion of the work:

Subcontractor	Firm Certification
PG Cutting Services	DBE and SB

Based on the bids received, and in comparison, to MTS's Independent Cost Estimate at $713,858.00, MTS staff determined Southwest Lift & Equipment Inc.'s bid to be fair and reasonable. Work is expected to be completed within two hundred and ten (210) days of issuance of the notice to proceed.

Therefore, staff recommends that the MTS Board of Directors authorize the CEO to execute Contract No. PWB402.0-24 (in substantially the same format as Attachment A), with Southwest Lift & Equipment Inc., in the amount of $356,908.00 for the replacement of the existing chassis wash lift at KMD.

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachments: A. Draft Agreement, MTS Doc. No. PWB402.0-24
B. Scope of Work
C. Cost Form

Metropolitan Transit System

STANDARD CONSTRUCTION AGREEMENT

FOR

MTS DOC. NO. PWB402.0-24

KMD CHASSIS WASH LIFT REPLACEMENT

THIS AGREEMENT is entered into this _____ day of _____ 2024, in the State of California by and between San Diego Metropolitan Transit System ("MTS"), a California public agency, and the following, hereinafter referred to as "Contractor":

Name: Southwest Lift & Equipment, Inc Address: 254 E Valley Street

San Bernadino, CA 92408

Form of Business: Corporation
(Corporation, Partnership, Sole Proprietor, etc.)

Email: jana@southwestlift.com

Telephone: _____

Authorized person to sign contracts Jana Wingenfeld (Name) Treasurer (Title)

The specified Contract Documents are part of this Agreement. The Contractor agrees to furnish to MTS services and materials, as follows:

Contractor shall furnish all necessary management, supervision, labor, materials, tools, supplies, equipment, plant, services, engineering, testing and/or any other act or thing required to diligently and fully perform and complete the Project as specified in accordance with the Standard Agreement and General Conditions (Exhibit A), Scope of Work, Special Conditions and Attachments (Exhibit B), Bid Price Form (Exhibit C) and Forms (Exhibit D).

SCOPE OF WORK.

Contractor, for and in consideration of the payment to be made to Contractor as hereinafter provided, shall furnish all plant, labor, technical and professional services, supervision, materials and equipment, other than such materials and equipment as may be specified to be furnished by MTS, and perform all operations necessary to complete the Work in strict conformance with the Contract Documents (defined below) for the following public work of improvement:

KMD CHASSIS WASH LIFT REPLACEMENT

Contractor is an independent contractor and not an agent of MTS. The Contractor and its surety shall be liable to MTS for any damages arising as a result of the Contractor's failure to comply with this obligation.

CONTRACT TIME.

Time is of the essence in the performance of the Work. The Work shall be commenced by the date stated in MTS's Notice to Proceed. The Contractor shall complete all Work required by the Contract Documents within **210 calendar days, 5 months of lead time and 1 month of construction per special conditions** from the commencement date stated in the Notice to Proceed. By its signature hereunder, Contractor agrees the Contract Time is adequate and reasonable to complete the Work.

CONTRACT PRICE.

MTS shall pay the Contractor as full compensation for the performance of the Contract, subject to any additions or deductions as provided in the Contract Documents, and including all applicable taxes and costs, the sum of three hundred fifty-six thousand nine hundred eight Dollars ($356,908.00). Payment shall be made as set forth in the General Conditions.

PROVISIONS REQUIRED BY LAW.

Each and every provision of law required to be included in these Contract Documents shall be deemed to be included in these Contract Documents. The Contractor shall comply with all requirements of the California Labor Code applicable to this Project.

INDEMNIFICATION.

Contractor shall provide indemnification as set forth in the General Conditions.

PREVAILING WAGES.

Contractor shall be required to pay the prevailing rate of wages in accordance with the Labor Code which such rates shall be made available at MTS's Administrative Office or may be obtained online at http://www.dir.ca.gov and which must be posted at the job site.

SAN DIEGO METROPOLITAN TRANSIT SYSTEM	SOUTHWEST LIFT & EQUIPMENT, INC
By: _____	
Sharon Cooney, Chief Executive Officer	**By:** _____
Approved as to form:	
By: _____	**Title:** _____
Karen Landers, General Counsel	

PWB402.0-24

SCOPE OF WORK/MINIMUM TECHNICAL SPECIFICATIONS

SECTION 4-1 GENERAL

The Kearny Mesa Division ("KMD") Chassis Wash Lift Replacement project generally consists of the removal of an existing drive-on parallelogram including all appurtenances, existing epoxy flooring removal, berm replacement, sediment grate replacement, cleaning, and installation of a new drive-on lift with related appurtenances.

All work is to occur at the Kearny Mesa Division ("KMD") located at 4630 Ruffner Street, San Diego 92111. Work is to occur during normal working hours approximately 7:00AM-4:00PM.

SECTION 4-2 STAGING

Contractor is to keep and store all materials within a predesignated laydown area. Size and location of the laydown area is to be coordinated with the MTS Project Manager. All property stored onsite is the responsibility of the contractor and MTS shall not be held liable for any and all equipment, material, tools, etc. All deliveries to the site shall be coordinated through the MTS Project Manager. Only vehicles necessary for that day's controlling activities may be parked onsite adjacent to the work area. All materials stored outside, must be covered in suitable combination of tarp, straw waddle, and gravel bags, to prevent any rain water from coming into contact with them, and prevent any sediment being tracked off the stored materials.

SECTION 4-3 TEMP FACILITIES

The contractor may use adjacent MTS toilet facilities throughout the duration of the project. Contractor may use convenience outlets if available onsite for minor temp power used in relation to the construction. All other needs for construction water are the responsibility of the contractor.

SECTION 4-4 SAFETY

Diligent caution must be taken during the undertaking of this work. Due to the 24-hour nature of operations at KMD, any openings left overnight must be covered with a trench plate and/or appropriately marked off with a suitable combination of reflective delineators, cones, warning lights, caution tape, and/or A-frames.

SECTION 4-5 WASTE

The contractor is responsible for legally disposing of any and all waste in relation to the work, including but not limited to all components of the lift to be replaced with its control console, hydraulic tubing and fluid, existing sediment grates, and rubber curb. The contractor shall not use any MTS receptacles to dispose of material generated during the performance of this contract. During the contract period, the contractor must also fully cover all sediment traps to prevent any and all material from entering. Contractor is responsible for general cleanup at the end of each work day.

SECTION 4-6 STRIPING

The contractor is responsible for re-striping all striped lines removed or damaged as part of this project. The striping shall be re-striped with two coats of white or yellow water based paint in conformance with the Caltrans Standard Specifications, 2023 edition Section 84-2.03. Any new striping shall match the existing layout. Color is to be selected by MTS Project Manager.

SECTION 4-7 SUBMITTALS

The contractor shall provide a submittal showing product data, details, and necessary information for the proposed replacement drive-on lift, lift console, and new non-slip epoxy flooring. Submittals must have a suitable transmittal cover page, be numbered and have a clear title.

SECTION 4-8 DRAWINGS

The Kearny Mesa Division As-Built plans dated 1/23/1987 can be transmitted in their entirety, and as part of the bidding process, relevant plans to the area are incorporated for reference as Drawings 1. MTS shall not accept any responsibility for the inaccuracy of the plans and the plans are provided to aid the potential bidders with underground and above ground existing site conditions. As stated in Sections 3.10 and 3.23 the contractor shall verify all existing site conditions and familiarize themselves with the Contract Documents and existing site conditions.

SECTION 4-9 EXISTING LIFT REMOVAL AND REPLACEMENT

There is an ongoing maintenance issue with the drive-on platform lift at the Kearny Mesa Division. The existing lift is to be removed and replaced with a new drive-on lift. The intent of the removal is to remove and dispose of all appurtenances associated with the existing lift system and procure and install a new above-ground drive-on lift.

Any hydraulic fluid in the existing piping is to be thoroughly cleaned, removed and properly disposed of. All oil removed from the lifts is to be properly removed and legally disposed of. The power unit is to be removed in its entirety and disposed of. All above ground related appurtenances not related to the new lift system are to be removed and disposed of such as: the hydraulic fluid tanks, lift controller, power unit, air hoses, electrical, related hoses, piping and tubing. All related hydraulic fluid and oil is to be removed and properly disposed of offsite. Existing drainage system shall be protected in place.

After removal of the existing lift, replacement of epoxy flooring and all other related work, a new above-ground drive-on lift is to be installed. The drive-on lift is to be a Stertil-Koni SKY.780 SKYLIFT – PLATFORM LIFT or equal. All related labor and materials incorporated with the new drive-on lift shall be included as well as all necessary electrical, hydraulic lines, and piping to ensure a fully functional lift system. Contractor may use existing electrical subpanel and breaker space from the existing lift.

SPECIFICATIONS FOR DRIVE-ON LIFT:

Surface mounted
Galvanized wash bay model
Full drive through lift

Minimum 10’ long drive-on ramp on both ends of platform
78,000 lb capacity
48’ platform length
29” wide platform
102” overall width
43” between platforms
69” lifting height
18HP motor
4 total legs
Include a wash bay kit with a stainless steel controller or suitable components necessary for the wet and corrosive environment
Be anchored with stainless steel anchor bolts
Full plate stainless steel plate shims are to be used
Include LED platform lights
Paint is to have marine coating, paint color is to be red or approved color
Include stainless steel control console

Exact location of drive-on lift is to be coordinated with the MTS Project Manager prior to install; it is anticipated that the new lift will assume the same location and positioning of the existing lift. Contractor is responsible for all related electrical and hydraulic connections. Existing conduit and underground pathway can be utilized. Any new electrical or hydraulic underground conduit is to be at least 24” below finish grade to the top of pipe and be covered with new 12” of concrete and minimum 8” of base. All concrete is to be 4000psi. All work performed must not invalidate manufacturer’s warranty.

Contractor to submit engineer-stamped shop drawings for footings and baseplate anchoring for approval by the MTS Project Manager prior to procurement and install. Contractor is responsible for taking all prior field measurements and verifying site conditions as needed.

A submittal of the proposed above-ground lift with standard manufacturer warranty is to be submitted and approved by the MTS Project Manager prior to procurement and install. Start up and testing of the new lift is to occur. Training and Operations and Maintenance Manuals are to be provided. Minimum of 4 hours of training is to be provided. Two hard copies in suitably labeled binders are to be provided as well as a PDF file(s) of all information in the Operation and Maintenance Manuals.

SECTION 4-10 FLOORING, GRATES, AND BERM

The existing non-slip epoxy flooring surrounding the lift platform has nearly entirely peeled. Remove and legally dispose of all existing epoxy flooring in its entirety while protecting existing equipment to remain in place.

Close spaces to traffic during epoxy flooring removal. After removal of the epoxy flooring, lift installation may occur with proper flooring and curb protection. Any damage to the concrete during installation or related work must be repaired by contractor per manufacturer’s standards.

The rubber berm in the chassis wash bay is past its useful life and allows water to pass underneath it (pictured below for reference only). Contractor is to remove and dispose of the berms and replace with a concrete berm in the same location. The new concrete berm

is to extend 19 feet past the curb and have an additional 2-foot leg angled towards the floor drainage with a 5” height and trapezoidal profile. Contractor to submit berm design with plan view, cross section, and connection detail to MTS Project Manager for Approval prior to procurement and install.

In the chassis wash bay, there are four (4) circular sediment trap covers roughly 39” in diameter that are damaged. Example shown below for reference only. Contractor is to replace these four (4) with a steel cover of equal size, appearance and function.

Contractor to perform a final clean of the area (flooring and all walls up to full ceiling height) including removal of all existing dirt, grease, and grime in the chassis wash area.


MTS

KMD Chassis Wash Lift Replace IFB - PWB402.0-24
Costs

Item #	Item Description	UOM	Qty	Southwest Lift & Equipment Inc
1	Mobilization / Demobilization	LS	1	$ 5,950.00
2	General Conditions	LS	1	$ 36,268.00
3	Submittals	LS	1	$ 200.00
4	Demolition	LS	1	$ 4,179.00
5	Existing Lift Disposal	LS	1	$ 5,900.00
6	New Lift	LS	1	$ 247,606.00
7	Curb and Grate Replacement	LS	1	$ 14,000.00
8	Epoxy Removal and Disposal	LS	1	$ 42,805.00
	Overall Total (Basis for Award)			**$ 356,908.00**

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 12

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

Light Rail Vehicle (LRV) Digital Monitor Display Program – Contract Award

RECOMMENDATION:

That the San Diego Metropolitan Transit System (MTS) Board of Directors authorize the Chief Executive Officer (CEO) to:

1) Execute MTS Doc. No. G2899.0-24 (in substantially the same format as Attachment A), with Maestronic USA Inc. (Maestronic), for a LRV Digital Monitor Display Program for a two (2) year base period with three (3) 1-year options, for a total of five (5) years, at a cost of $1,708,591.05 (inclusive of CA 7.750% tax); and

2) Exercise the option years at the CEO's discretion.

Budget Impact

The total contract cost is estimated to be $1,708,591.05 (inclusive of CA 7.750% tax); (Attachment C). The project will be funded by the Marketing Operating Budget account 551010-545400.

Contract Term	Amount	Spare Parts	7.75% CA Sales Tax	Total Amount
Base Years 1 and 2 (PILOT)	$82,459.28	$10,746.40	$4,741.43	$97,947.11
Option Year 1 (YR 3)	$463,120.50	$23,987.50	$26,287.65	$513,395.65
Option Year 2 (YR 4)	$488,120.50	$23,987.50	$26,287.65	$538,395.65
Option Year 3 (YR 5)	$513,120.50	$19,771.25	$25,960.89	$558,852.64
			Total	**$1,708,591.05**

DISCUSSION:

MTS is looking to launch a pilot program for digital monitors onboard its Trolley LRV fleet. The program will first pilot the product on eight (8) LRVs for approximately one-year in order to test for reliability, durability, and customer experience. Should the agency elect to move forward with the program, monitors would be installed on the rest of the fleet over a three-year period. The

monitors are expected to be used for customer information, service alerts and next stop information, with the possibility for advertising revenue in the future.

The contractor will be responsible for the manufacturing and installation of the monitors on Siemens S700 LRVs, as well as providing ongoing technical support for software maintenance, troubleshooting and replacement of units, as needed or requested by MTS.

On April 23, 2024, MTS issued a Request for Proposals (RFP) for a LRV Digital Monitor Display Program. MTS received a total of seven (7) proposals from the following firms:

Proposer	Firm Disadvantage Business Enterprise (DBE) or Small Business (SB) Certification
Clever Devices Ltd.	N/A
Dropsz Inc.	N/A
eHunus Inc.	N/A
ISC Applied Systems	N/A
Maestronic	N/A
Piper Networks Inc.	N/A
Televic US Corp	N/A

Dropsz and Piper Networks were both deemed non-responsive as they did not submit the required forms and a technical proposal. The remaining proposals were deemed responsive and responsible and were forwarded to the evaluation committee. The evaluation committee was comprised of representatives from the MTS Marketing, LRV Maintenance, Information Technology (IT) and Finance Departments. The proposals were evaluated on the following:

1. Qualifications of the Firm or Individual 35%
2. Staffing, Organization, and Management Plan 15%
2. Work Plan 25%
3. Cost and Price 25%

Total 100%

The following tables illustrates the initial scores of the proposers:

PROPOSER	TOTAL COST	COST SCORE	AVG TECH SCORE	TOTAL AVG TOTAL SCORE (TOTAL POSSIBLE: 100)	RANKING
Clever Devices	$3,998,846.00	20.00	61.20	81.20	1
Maestronic	$1,303,035.50	19.50	56.80	76.30	2
ISC Applied Systems	$4,515,596.00	15.00	58.50	73.50	3
Televic	$9,348,999.22	10.50	50.90	61.40	4
eHunus	$3,059,725.00	6.50	22.50	29.00	5

As a result of the initial review, Clever Devices, Maestronic, and ISC Applied Systems were deemed within the competitive range. All three (3) firms were invited for an in-person interview, which were held on August 23 and 26, 2024. During the interview, proposers provided a demo

on the monitors and software. Staff also learned more about the production timelines, warranties on equipment, and installation services. After interviews, staff re-scored as follows:

PROPOSER	TOTAL COST	COST SCORE	AVG TECH SCORE	TOTAL AVG TOTAL SCORE (TOTAL POSSIBLE: 100)	RANKING
Maestronic	$1,303,035.50	19.50	59.90	79.40	1
Clever Devices	$3,998,846.00	20.00	51.70	71.70	2
ISC Applied Systems	$4,515,596.00	15.00	55.50	70.50	3

After the interviews, staff determined Clever Devices was no longer within the competitive range as they were not able to provide a wireless solution as requested in the solicitation.

Staff continued negotiations with both Maestronic and ISC Applied Systems. MTS was able to negotiate an increase in warranty from a two (2) year to a five (5) year warranty, increase in the size of monitor displays, and add funds for spare parts. With these changes, Maestronic's cost proposal increased by $405,555.55 and ISC Applied System's cost proposal decreased by $114,013.40.

Maestronic initially received a lower cost score based on staff's concern of its proposed pricing being significantly lower in comparison to MTS's Independent Cost Estimate (ICE) and other proposals. However, during the interview process and negotiations, staff learned Maestronic is the sole manufacturer of their own equipment. The other proposers work with outside manufacturers which leads to higher costs and longer lead times. After learning why Maestronic's cost was lower staff, increased their cost score. After negotiations, the final scores are as follows:

PROPOSER	TOTAL COST	COST SCORE	AVG TECH SCORE	TOTAL AVG TOTAL SCORE (TOTAL POSSIBLE: 100)	RANKING
Maestronic	$1,708,591.05	23.00	59.90	82.90	1
ISC Applied Systems	$4,401,582.60	15.50	55.50	71.00	2

Based on the objectives of this procurement, consideration of the evaluation criteria and Maestronic's technical and cost proposals, the evaluation committee determined that Maestronic presented the best overall value to MTS. Based on the proposals received and in comparison, to MTS's ICE ($3,033,019.57), staff deemed Maestronic's pricing to be fair and reasonable

Therefore, staff recommends that the MTS Board of Directors authorize the CEO to:

1) Execute MTS Doc. No. G2899.0-24 (in substantially the same format as Attachment A), with Maestronic, for a LRV Digital Monitor Display Program for a two (2) year base period with three (3) 1-year options, for a total of five (5) years, at a cost of $1,708,591.05 (inclusive of CA 7.750% tax); and

2) Exercise the option years at the CEO's discretion.

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachments: A. Draft Agreement MTS Doc. No. G2899.0-24
B. Scope of Work
C. Cost Form

Metropolitan Transit System

STANDARD AGREEMENT

FOR

MTS DOC. NO. G2899.0-24

LRV DIGITAL MONITOR DISPLAY PROGRAM

THIS AGREEMENT is entered into this _____ day of _____, 2024 in the State of California by and between San Diego Metropolitan Transit System ("MTS"), a California public agency, and the following, hereinafter referred to as "Contractor":

Name: Maestronic USA Inc.

Address: 700 North Saint Mary's Street, Suite 1400

San Antonio (City) TX (State) 78205 (Zip)

Form of Business: Corporation
(Corporation, Partnership, Sole Proprietor, etc.)

Email: marcel.maes@maestronic.com

Telephone: 604-922-1008

Authorized person to sign contracts: Marcel Maes (Name) CEO (Title)

The Contractor agrees to provide services with goods as specified in the conformed Scope of Work/Technical Specification (Exhibit A), Contractor's Cost/Pricing Form (Exhibit B), and in accordance with the Standard Agreement, including Standard Conditions (Exhibit C), Forms (Exhibit D).

The contract term is for a two (2) year base period with three (3) 1-year options, exercisable at MTS's sole discretion, for a total of five (5) years. Base period shall be effective December 1, 2024 through November 30, 2026 and Option years shall be effective December 1, 2026 through November 30, 2029, if exercised by MTS.

Payment terms shall be net 30 days from invoice date. The total cost of this contract shall not exceed $97,947.11 for the base years and $1,610,643.94 for the option years, for a contract total not to exceed $1,708,591.05 (inclusive of 7.75% CA sales tax) without the express written consent of MTS.

SAN DIEGO METROPOLITAN TRANSIT SYSTEM	MAESTRONIC USA INC.
By: _____ Sharon Cooney, Chief Executive Officer	By _____
Approved as to form:	
By: _____ Karen Landers, General Counsel	Title: _____

5. SCOPE OF WORK/TECHNICAL SPECIFICATIONS

5.1 BACKGROUND

The San Diego Metropolitan Transit System (MTS) is looking to launch a pilot program for digital monitors onboard its Trolley (light rail vehicle) fleet. The monitors are expected to be used for customer information, advertising and next stop information.

The selected contractor will be responsible for the manufacture and installation of twenty-four (24) monitors on eight (8) Siemens S700 light rail vehicles (LRV), as well as providing ongoing technical support for software maintenance, troubleshooting and replacement of units, as needed or requested by MTS. The selected contractor will not be responsible for providing advertising services.

Contract shall be effective for two (2) base years with three (3) 1-year options, exercisable at MTS' sole discretion. The initial pilot is expected to run for up to one (1) year effective one calendar year from date of installation, with three (3) optional extension years thereafter at a rate of up to one hundred fifty (150) units on fifty (50) vehicles per year.

5.2 SCOPE OF WORK

5.2.1 Project Kick-Off and Onsite Visit

a. Upon contract award, the Contractor shall attend a kick-off meeting with staff members of the MTS Information Technology (IT), Light Rail Vehicle Maintenance, Marketing and Procurement teams to establish a timeline and work plan for the pilot project.
b. The Contractor will also be required to travel to MTS for a minimum of a one-day onsite visit, within one (1) month once the Notice to Proceed (NTP) has been issued, in order to view the LRV vehicles in person, take necessary specs, and/or test monitor installation.

5.2.2 Monitor Manufacturing

a. Two (2) styles of monitors will be needed for installation on vehicles.
    i. End Cap Monitors: Sixteen (16) monitors (two per vehicle) measuring approximately 8" h x 48" w x 7" d. These monitors may need to be angled so as to fit against the bulkhead of the vehicle, and not block the view of the security CCTV cameras on board. See Exhibit A for reference.
    ii. Center Monitors: Eight (8) monitors (one per vehicle) measuring approximately 7.5" h x 35" w x 2.5" d. These monitors shall be flat against the center window of the vehicle. See Exhibit A for reference.

5.2.3 Monitor Installation

a. Prior to full deployment of the pilot monitors, the Contractor will be required to install three (3) monitors on one (1) LRV vehicle for testing period (minimum of two weeks, maximum of one month). Electrical and wiring services must be

performed by an electrician licensed in the State of California. Contractor to provide MTS a copy of license upon request.

b. Upon completion of the test period and approval by MTS of the pilot monitors, the Contractor will install the remaining pilot project monitors.
c. Wiring needs to meet NFPA130 Fire-Smoke requirements
d. Installation shall not interfere mechanically or electronically with any existing onboard systems
e. Network Connection:
    i. The monitors will be required to have Wi-Fi capabilities.
    ii. The monitors will connect to existing MTS cradlepoints on the light rail vehicles; no additional equipment is expected to be needed from the Contractor.

5.2.4 Monitor Software / Programming

a. Display: MTS will require a split screen display on all monitors. See Exhibit B for examples.
    i. One side of the screen shall have dynamic next arrival information, displaying a map schematic of approaching stations, as well as available transfers.
    ii. The second side shall have a space for rotating advertisements or system information.
b. Audio: Audio integration for future deployment is preferred, though not required.
c. Software: The Contractor shall provide the necessary software for managing monitor content.
    i. The Contractor will be required to provide training and a written training guide to members of the MTS Trolley Operations, IT and Marketing staff, who shall have administrative access to manage the content. Training and account access shall be provided a minimum of two weeks prior to the launch of the full pilot program. Training can be provided in-person or virtually.
    ii. MTS Information Technology and/or Trolley Operations staff should have access to do a remote reboot of the monitors when needed.
    iii. MTS requests the selected vendor provide Technical Support as needed for the life of the product.

5.2.5 Maintenance

a. Tamper Resistant Materials: The proposed product should include materials that prevent or limit the amount of vandalism/damage to the screen and/or unit.
b. Replacement: The vendor shall provide information on:
    i. The lowest replaceable unit.
    ii. Process for requesting and/or implementing fixes as needed, including expected turnaround times and how readily available replacement parts will be.
    iii. Monitor warranty: A minimum 2-year warranty is requested, with an extended 5-year warranty preferred.

c. Training: The selected vendor shall be required to provide training to LRV Maintenance staff for in-house replacement and maintenance of units.

5.2.6 Spare Parts

Proposer shall provide a price list for spare parts as specified on the attached proposal forms. Proposer shall submit information on how to purchase spare parts after the contract term has expired and a separate price list including an escalation factor, if applicable.

Metropolitan Transit System

LRV DIGITAL MONITOR DISPLAY PROGRAM - COST/PRICING FORM REV II (SEP 13, 2024)

MTS Doc. No. G2899.0-24

Bidder Name: MAESTRONIC USA INC. GOLD SLA AND 5 YEAR WARRANTY

(PILOT) - December 1, 2024 through November 30, 2026

Item #	Description	Quantity	EOM	Unit Price	Total Price
1	Display Monitor kit Vancouver 37" 5Y warranty	16	ea	$ 2,198.52	$ 35,176.32
2	Installation Per Monitor (End cap)	16	ea	$ 792.75	$ 12,684.00
3	Display Monitor kit Vancouver 29" 5Y warranty	8	ea	$ 1,907.12	$ 15,256.96
4	Installation Per Monitor (Middle)	8	ea	$ 792.75	$ 6,342.00
5	Software Licensing LRVs SLA GOLD	1	ea	$ 8,000.00	$ 8,000.00
6	Project Management Fee	1	ea	$ 4,000.00	$ 4,000.00
8	Training	1	ea	$ 1,000.00	$ 1,000.00
				GRAND TOTAL (PILOT)	**$ 82,459.28**

Option Year 1 - December 1, 2026 through November 30, 2027

Item #	Description	Quantity	EOM	Unit Price	Total Price
1	Display Monitor kit Vancouver 37" 5Y warranty	100	ea	$ 2,198.52	$ 219,852.00
2	Installation Per Monitor (End cap)	100	ea	$ 792.75	$ 79,275.00
3	Display Monitor kit Vancouver 29" 5Y warranty	50	ea	$ 1,907.12	$ 95,356.00
4	Installation Per Monitor (Middle)	50	ea	$ 792.75	$ 39,637.50
5	Software Licensing 50 LRVs SLA GOLD	1	ea	$ 25,000.00	$ 25,000.00
6	Software Licensing first 8 LRVs SLA GOLD	1	ea	$ 4,000.00	$ 4,000.00
				GRAND TOTAL (OPTION YEAR 1)	**$ 463,120.50**

Option Year 2 - December 1, 2027 through November 30, 2028

Item #	Description	Quantity	EOM	Unit Price	Total Price
1	Display Monitor kit Vancouver 37" 5Y warranty	100	ea	$ 2,198.52	$ 219,852.00
2	Installation Per Monitor (End cap)	100	ea	$ 792.75	$ 79,275.00
3	Display Monitor kit Vancouver 29" 5Y warranty	50	ea	$ 1,907.12	$ 95,356.00
4	Installation Per Monitor (Middle)	50	ea	$ 792.75	$ 39,637.50
5	Software Licensing 50 LRVs SLA GOLD	1	ea	$ 25,000.00	$ 25,000.00
6	Software Licensing 50 LRVs SLA GOLD 2026-2027	1	ea	$ 25,000.00	$ 25,000.00
7	Software Licensing first 8 LRVs SLA GOLD	1	**ea**	$ 4,000.00	$ 4,000.00
				GRAND TOTAL (OPTION YEAR 2)	**$ 488,120.50**

Option Year 3 - December 1, 2028 through November 30, 2029

Item #	Description	Quantity	EOM	Unit Price	Total Price
1	Display Monitor kit Vancouver 37" 5Y warranty	100	ea	$ 2,198.52	$ 219,852.00
2	Installation Per Monitor (End cap)	100	ea	$ 792.75	$ 79,275.00
3	Display Monitor kit Vancouver 29" 5Y warranty	50	ea	$ 1,907.12	$ 95,356.00
4	Installation Per Monitor (Middle)	50	ea	$ 792.75	$ 39,637.50
5	Software Licensing 50 LRVs SLA GOLD	1	ea	$ 25,000.00	$ 25,000.00
6	Software Licensing 50 LRVs SLA GOLD 2026-2027	1	ea	$ 25,000.00	$ 25,000.00
7	Software Licensing 50 LRVs SLA GOLD 2027-2028	1	ea	$ 25,000.00	$ 25,000.00
8	Software Licensing first 8 LRVs SLA GOLD	1	ea	$ 4,000.00	$ 4,000.00
				GRAND TOTAL (OPTION YEAR 3)	**$ 513,120.50**

Note: **The licence and GOLD SLA support fee above is 500 USD per LRV per year. (3 displays per train)**

Spares: **Free 5% Z1D DEM computer modules, 2% DPM display modules and 1% cables and brackets**

Terms and conditions.

The prices do not include US and CA sales tax.

LRVs must be available according contract.

Prices on this cost form are firmed fixed prices.

LRV DIGITAL MONITOR DISPLAY PROGRAM - SPAREPARTS / VOLUME PRICELIST		
MTS Doc. No. G2899.0-24		
Bidder Name: MAESTRONIC USA INC.		
	MOQ50	
29" Vancouver Display Panel Module DPM		**$ 765.00**
37" Vancouver Display Panel Module DPM		**$ 900.00**
Display Electronics Module DEM Z1D WIFI+ AUDIO		**$ 548.00**
Type #1 Ceiling brackets		**$ 250.00**
Type #2 Window bracket		**$ 150.00**
Type #1 and #2 Power cable		**$ 75.00**

Terms and conditions.

Minimum order quantity: 50

The prices do not include US and CA sales tax.

Small quantity surcharges:

1-4 Units: +40%

5-25 Units: +25%

26-49 Units: +10%

LRV DIGITAL MONITOR DISPLAY RFP - G2899.0-24
VENDOR: MAESTRONIC

(PILOT) - December 1, 2024 through November 30, 2026					
Item #	**Description**	**Quantity**	**EOM**	**Unit Price**	**Total Price**
1	Display Monitor kit Vancouver 37" 5Y warranty	16	ea	$ 2,198.52	$ 35,176.32
2	Installation Per Monitor (End cap)	16	ea	$ 792.75	$ 12,684.00
3	Display Monitor kit Vancouver 29" 5Y warranty	8	ea	$ 1,907.12	$ 15,256.96
4	Installation Per Monitor (Middle)	8	ea	$ 792.75	$ 6,342.00
5	Software Licensing LRVs SLA GOLD	1	ea	$ 8,000.00	$ 8,000.00
6	Project Management Fee	1	ea	$ 4,000.00	$ 4,000.00
7	Training	1	ea	$ 1,000.00	$ 1,000.00
				Subtotal	$ 82,459.28
				Tax 7.750%	$ 3,908.58
SPARE PARTS					
1	29" Vancouver Display Panel Module DPM	2	ea	$ 1,071.00	$ 2,142.00
2	37" Vancouver Display Panel Module DPM	4	ea	$ 1,260.00	$ 5,040.00
3	Display Electronics Module DEM Z1D WIFI+ AUDIO	2	ea	$ 767.20	$ 1,534.40
4	Type #1 Ceiling brackets	4	ea	$ 350.00	$ 1,400.00
5	Type #2 Window bracket	2	ea	$ 210.00	$ 420.00
6	Type #1 and #2 Power cable	2	ea	$ 105.00	$ 210.00
				Subtotal	$ 10,746.40
				Tax 7.750%	$ 832.85
				GRAND TOTAL (PILOT)	**$ 97,947.11**

OPTION YEAR 1 - December 1, 2026 through November 30, 2027					
Item #	**Description**	**Quantity**	**EOM**	**Unit Price**	**Total Price**
1	Display Monitor kit Vancouver 37" 5Y warranty	100	ea	$ 2,198.52	$ 219,852.00
2	Installation Per Monitor (End cap)	100	ea	$ 792.75	$ 79,275.00
3	Display Monitor kit Vancouver 29" 5Y warranty	50	ea	$ 1,907.12	$ 95,356.00
4	Installation Per Monitor (Middle)	50	ea	$ 792.75	$ 39,637.50
5	Software Licensing 50 LRVs SLA GOLD	1	ea	$ 25,000.00	$ 25,000.00
6	Software Licensing first 8 LRVs SLA GOLD	1	ea	$ 4,000.00	$ 4,000.00
				Subtotal	$ 463,120.50

				Tax 7.750%	$ 24,428.62
SPARE PARTS					
1	29" Vancouver Display Panel Module DPM	5	ea	$ 956.25	$ 4,781.25
2	37" Vancouver Display Panel Module DPM	10	ea	$ 1,125.00	$ 11,250.00
3	Display Electronics Module DEM Z1D WIFI+ AUDIO	5	ea	$ 685.00	$ 3,425.00
4	Type #1 Ceiling brackets	10	ea	$ 312.50	$ 3,125.00
5	Type #2 Window bracket	5	ea	$ 187.50	$ 937.50
6	Type #1 and #2 Power cable	5	ea	$ 93.75	$ 468.75
				Subtotal	$ 23,987.50
				Tax 7.750%	$ 1,859.03
				GRAND TOTAL (OPTION YEAR 1)	**$ 513,395.65**

OPTION YEAR 2 - December 1, 2027 through November 30, 2028					
Item #	**Description**	**Quantity**	**EOM**	**Unit Price**	**Total Price**
1	Display Monitor kit Vancouver 37" 5Y warranty	100	ea	$ 2,198.52	$ 219,852.00
2	Installation Per Monitor (End cap)	100	ea	$ 792.75	$ 79,275.00
3	Display Monitor kit Vancouver 29" 5Y warranty	50	ea	$ 1,907.12	$ 95,356.00
4	Installation Per Monitor (Middle)	50	ea	$ 792.75	$ 39,637.50
5	Software Licensing 50 LRVs SLA GOLD	1	ea	$ 25,000.00	$ 25,000.00
6	Software Licensing 50 LRVs SLA GOLD 2026-2027	1	ea	$ 25,000.00	$ 25,000.00
7	Software Licensing first 8 LRVs SLA GOLD	1	ea	$ 4,000.00	$ 4,000.00
				Subtotal	$ 488,120.50
				Tax 7.750%	$ 24,428.62
SPARE PARTS					
1	29" Vancouver Display Panel Module DPM	5	ea	$ 956.25	$ 4,781.25
2	37" Vancouver Display Panel Module DPM	10	ea	$ 1,125.00	$ 11,250.00
3	Display Electronics Module DEM Z1D WIFI+ AUDIO	5	ea	$ 685.00	$ 3,425.00
4	Type #1 Ceiling brackets	10	ea	$ 312.50	$ 3,125.00
5	Type #2 Window bracket	5	ea	$ 187.50	$ 937.50
6	Type #1 and #2 Power cable	5	ea	$ 93.75	$ 468.75
				Subtotal	$ 23,987.50
				Tax 7.750%	$ 1,859.03
				GRAND TOTAL (OPTION YEAR 2)	**$ 538,395.65**

OPTION YEAR 3 - December 1, 2028 through November 30, 2029					
Item #	**Description**	**Quantity**	**EOM**	**Unit Price**	**Total Price**
1	Display Monitor kit Vancouver 37" 5Y warranty	100	ea	$ 2,198.52	$ 219,852.00
2	Installation Per Monitor (End cap)	100	ea	$ 792.75	$ 79,275.00
3	Display Monitor kit Vancouver 29" 5Y warranty	50	ea	$ 1,907.12	$ 95,356.00
4	Installation Per Monitor (Middle)	50	ea	$ 792.75	$ 39,637.50
5	Software Licensing 50 LRVs SLA GOLD	1	ea	$ 25,000.00	$ 25,000.00
6	Software Licensing 50 LRVs SLA GOLD 2026-2027	1	ea	$ 25,000.00	$ 25,000.00
7	Software Licensing 50 LRVs SLA GOLD 2027-2028	1	ea	$ 25,000.00	$ 25,000.00
8	Software Licensing first 8 LRVs SLA GOLD	1	ea	$ 4,000.00	$ 4,000.00
				Subtotal	$ 513,120.50
				Tax 7.750%	$ 24,428.62
SPARE PARTS					
1	29" Vancouver Display Panel Module DPM	5	ea	$ 956.25	$ 4,781.25
2	37" Vancouver Display Panel Module DPM	10	ea	$ 1,125.00	$ 11,250.00
3	Display Electronics Module DEM Z1D WIFI+ AUDIO	5	ea	$ 685.00	$ 3,425.00
4	Type #1 Ceiling brackets	0	ea	$ -	$ -
5	Type #2 Window bracket	0	ea	$ -	$ -
6	Type #1 and #2 Power cable	3	ea	$ 105.00	$ 315.00
				Subtotal	$ 19,771.25
				Tax 7.750%	$ 1,532.27
				GRAND TOTAL (OPTION YEAR 3)	**$ 558,852.64**

Description	Total
Pilot (Novembe 1, 2024 through October 31, 2026	$ 97,947.11
Option Year 1 (November 1, 2026 through October 31, 2027	$ 513,395.65
Option Year 2 (November 1, 2027 through October 31, 2028	$ 538,395.65
Option Year 3 (November 1, 2028 through October 31, 2029	$ 558,852.64
TOTAL CONTRACT AMOUNT	**$ 1,708,591.05**

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/24

Agenda Item No. 13

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

Investment Report – Quarter Ending September 30, 2024

INFORMATIONAL ONLY

Budget Impact

None.

DISCUSSION:

Attachment A comprises a report of the San Diego Metropolitan Transit System (MTS) investments as of September 30, 2024. The combined total of all investments has increased quarter to quarter from $294.2M to $491.1M. This $196.9M increase is primarily attributable to $135.8M in Senate Bill (SB) 125 Formula-Based Transit and Intercity Rail Capital Program (TIRCP) and Zero-Emission Transit Capital Program (SB125) funding and $69.3 million in Federal Transit Administration (FTA) funding, partially offset by $20.7 million in capital expenditures, as well as normal timing differences between other payments and receipts.

The first column provides details about investments restricted for Capital Improvement Projects (CIP), SB125 funded operations and PRONTO Stored Value.

The second column, unrestricted investments, reports the working capital for MTS operations allowing payments for employee payroll and vendors' goods and services.

MTS remains in compliance with MTS Board Policy No. 30 and is able to meet expenditure requirements for a minimum of the next six months as required.

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachment: A. Investment Report for the Quarter Ending September 30, 2024

San Diego Metropolitan Transit System
Investment Report
September 30, 2024

Institution / Issuer	Function	Investment Type	Restricted	Unrestricted	Total	Avg. Rate of Return		Benchmark
J.P. Morgan Chase	Operating Funds	Depository Bank	31,281,106	111,167,025	142,448,131	2.47%	*	0.450% WSJ Money Market
U.S. Bank - Retention Trust Account	Restricted for Capital Support	Depository Bank	1,882,754	-	1,882,754	N/A	**	-
Local Agency Investment Fund (LAIF)	Restricted (Stored Value)	Investment Pool	9,256,291	-	9,256,291	4.575%		5.038% S&P US T-Bill 0-3 Mth Index
San Diego County Treasurer's Office	State Grant Funds	Investment Pool	127,626,922	5,272,017	132,898,939	3.610%		5.038% S&P US T-Bill 0-3 Mth Index
Subtotal: Restricted for Capital Support / Stored Value			**138,765,968**	**5,272,017**	**144,037,985**			
Local Agency Investment Fund (LAIF)	Investment of Surplus Funds	Investment Pool	-	49,177,859	49,177,859	4.575%		5.038% S&P US T-Bill 0-3 Mth Index
San Diego County Treasurer's Office	Investment of Surplus Funds	Investment Pool	-	124,141,290	124,141,290	3.610%		5.038% S&P US T-Bill 0-3 Mth Index
Subtotal: Investment Surplus Funds			-	**173,319,149**	**173,319,149**			
Grand Total Cash and Investments			**$ 170,047,074**	**$ 289,758,191**	**$ 459,805,265**			

*-The 2.47% is an annual percentage yield on the average daily balance that exceeds $3 million
** - Per trust agreements, interest earned on retention account is allocated to trust beneficiary (contractor)

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 14

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

On-Call Card Access Reader Services – Amendment

RECOMMENDATION:

That the San Diego Metropolitan Transit System (MTS) Board of Directors authorize the Chief Executive Officer (CEO) to:

1) Ratify Amendment No. 1 to MTS Doc. PWG340.0-22 (Attachment A), with Electro Specialty Systems (ESS), for additional new installations (contract years 1-3) and maintenance funding (all contract years) in the amount of $82,478.76; and

2) Execute Amendment No. 2 to MTS Doc. No. PWG340.0-22 (in substantially the same format as Attachment B), with ESS, in the amount of $240,000.00 for estimated new installation funding and maintenance for the remainder of the contract.

Budget Impact

The total cost of these amendments is estimated to be $322,478.76, and the total contract cost for the services is estimated to be $641,434.76. This project will be funded by the Information Technology (IT) Operations Budget account 661010-571250.

Contract Term	Original Annual Cost	AM 1 Additional Funding	AM 2 Additional Funding	New Total Annual Cost
Base Year 1 Card Access	$50,336.00	$21,478.76	-	$71,814.76
Base Year 2 Card Access	$52,016.00	$32,200.00	-	$84,216.00
Base Year 3 Card Access	$52,596.00	$7,200.00	$60,000.00	$119,796.00
Subtotal (Base Years 1-3)	**$154,948.00**	**$60,878.76**	**$60,000.00**	**$275,826.76**
Option Year 1 (Year 4) Card Access	$53,736.00	$7,200.00	$60,000.00	$120,936.00
Option Year 2 (Year 5) Card Access	$54,856.00	$7,200.00	$60,000.00	$122,056.00
Option Year 3 (Year 6) Card Access	$55,416.00	$7,200.00	$60,000.00	$122,616.00
Subtotal (Option Years 1-3)	**$164,008.00**	**$21,600.00**	**$180,000.00**	**$365,608.00**
TOTAL (Base and Options)	**$318,956.00**	**$82,478.76**	**$240,000.00**	**$641,434.76**

DISCUSSION:

To control access and security various MTS facilities and offices, MTS uses an access reader system at various gates, doors, and elevators. On March 10, 2022 (Agenda Item (AI) 7), the Board approved a six-year contract with ESS for the provision of on-call card access reader services.

At the start of the ESS contract, MTS had 240 card access readers with controllers at various locations throughout San Diego County. This amount has grown to 320 card access readers and is expected to pass 400 card access readers by the end of the contract term. Each card assigned to an employee or contractor has an internal chip that allows the individual to pass through doors and gates. When swiped, the card readers relay the information from the card to MTS's card access system that triggers a signal to open the door or gate. Maintaining these card readers allows MTS to secure access to buildings and property.

Under Amendment 1, staff determined the immediate and foreseeable new installation needs for contract years 1-2 and reassessed the maintenance needs for the growth of the access network. This amendment was approved by the Chief Executive Officer under the authority delegated by MTS Board Policy No. 41 (Signature Authority). After further review of historical card access reader service needs, staff has determined the need for an increase in the funding for this contract to meet MTS needs. Amendment 2 estimates the new installation and maintenance needs for the remainder of the contract, years 3-6.

Therefore, staff recommends that the MTS Board of Directors authorize the CEO to:

1) Ratify Amendment No. 1 to MTS Doc. PWG340.0-22 (Attachment A), with ESS, for additional new installations (contract year 1-3) and maintenance funding (all contract years) in the amount of $82,478.76; and

2) Execute Amendment No. 2 to MTS Doc. No. PWG340.0-22 (in substantially the same format as Attachment B), with ESS, in the amount of $240,000.00 for estimated new installation funding and maintenance for the remainder of the contract.

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachments: A. Executed Agreement MTS Doc. No. PWG340.1-22
B. Draft Agreement MTS Doc. No. PWG340.2-22

Metropolitan Transit System

Amendment 1

Date: January 3, 2023 MTS Doc No. PWG340.1-22

ON-CALL CARD ACCESS READER SERVICES ADD FUNDING

Electro Specialty Systems (ESS)
Daniel Brault
President
7940 Convoy Court
San Diego CA 92111

This shall serve as Amendment No.1 to the original agreement PWG340.0-22 as further described below.

SCOPE

Based on this amendment there shall be no change to the scope of this agreement.

SCHEDULE

Based on this amendment there shall be no change to the term of this agreement.

PAYMENT

This contract amendment shall authorize an additional $60,878.76 (base years) to the overall contract value as reflected below.

Contract Term	Current Annual Cost	Additional Funding	New Total Annual Cost
Base Year 1 Card Access (All inclusive)	$50,336.00	$21,478.76	$71,814.76
Base Year 2 Card Access (All inclusive)	$52,016.00	$32,200.00	$84,216.00
Base Year 3 Card Access (All inclusive)	$52,596.00	$7,200.00	$59,796.00
Subtotal (Base Years 1-3)	**$154,948.00**	**$60,878.76**	**$215,826.76**
Option Year 1 (Year 4) Card Access (All inclusive)	$53,736.00	$7,200.00	$60,936.00
Option Year 2 (Year 5) Card Access (All inclusive)	$54,856.00	$7,200.00	$62,056.00
Option Year 3 (Year 6) Card Access (All inclusive)	$55,416.00	$7,200.00	$62,616.00
Subtotal (Option Years 1-3)	**$164,008.00**	**$21,600.00**	**$185,608.00**
TOTAL (Base and Options)	**$318,956.00**	**$82,478.76**	**$401,434.76**

The total cost of this contract, including this amendment, shall be $215,826.76 for the base years and $185,608.00 for the option years (if exercised), for a contract total in the amount of $401,434.76. This amount shall not be exceeded without prior written approval from MTS.

Please sign and return a copy to the Contract Specialist at MTS. Retain a copy for your records.

Sincerely,

Sharon Cooney, Chief Executive Officer

Agreed:

Daniel Brault, President
Electro Specialty Systems (ESS)

Date: 01/23/2023

Metropolitan Transit System

Amendment 2

Date: November 14, 2024 MTS Doc No. PWG340.2-22

ON-CALL CARD ACCESS READER SERVICES

Electro Specialty Systems (ESS)
Daniel Brault
President
7940 Convoy Court
San Diego CA 92111

This shall serve as Amendment No.2 to the original agreement PWG340.0-22 as further described below.

SCOPE

Based on this amendment MTS shall exercise Option Years 1-3 (contract years 4-6) and add additional funding for the remainder of the agreement.

SCHEDULE

The term of this agreement shall be extended from April 1, 2025, to March 31, 2028.

PAYMENT

This amendment shall be in the amount of $425,608.00 ($185,608.00 for the option years and $240,000.00 of additional funding) as reflected below.

Contract Term	Current (Original + AM1) Annual Cost	AM 2 Additional Funding	New Total Annual Cost
Base Year 1 Card Access (All inclusive)	$71,814.76	-	$71,814.76
Base Year 2 Card Access (All inclusive)	$84,216.00	-	$84,216.00
Base Year 3 Card Access (All inclusive)	$59,796.00	$60,000.00	$119,796.00
Subtotal (Base Years 1-3)	**$215,826.76**	**$60,000.00**	**$275,826.76**
Option Year 1 (Year 4) Card Access (All inclusive)	$60,936.00	$60,000.00	$120,936.00
Option Year 2 (Year 5) Card Access (All inclusive)	$62,056.00	$60,000.00	$122,056.00
Option Year 3 (Year 6) Card Access (All inclusive)	$62,616.00	$60,000.00	$122,616.00
Subtotal (Option Years 1-3)	**$185,608.00**	**$180,000.00**	**$365,608.00**
TOTAL (Base and Options)	**$401,434.76**	**$240,000.00**	**$641,434.76**

The total cost of this contract, including this amendment, shall be $641,434.76. This amount shall not be exceeded without prior written approval from MTS.

Please sign and return a copy to the Contract Specialist at MTS. Retain a copy for your records.

Sincerely,

Sharon Cooney, Chief Executive Officer

Agreed:

Daniel Brault, President
Electro Specialty Systems (ESS)

Date: _____

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 15

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

Board Policy No. 30 (Investment Policy) – Policy Revision

RECOMMENDATION:

That the San Diego Metropolitan Transit System (MTS) Board of Directors approve and adopt the updated Board Policy No. 30 (Investment Policy) (Attachment A).

Budget Impact

None.

DISCUSSION:

MTS Board Policy No. 30 (Investment Policy) governs the process for investment policies, procedures, and appropriate vehicles of investment for the cash management of MTS's surplus operating funds. On an annual basis, the Investment Policy is reviewed by staff and updated for the Board's approval based upon the principles of capital preservation (safety), liquidity and investment return.

A review of the State of California Government Code and discussions with the County Treasurer resulted in recommendations that the Board approve minor changes to the existing policy. The proposed modifications to the policy include:

- Section 30.8: Updated the year (2022 to 2024) due to latest "Local Agency Investment Guidelines" publication.
- Section 30.8.16: Updated this Investment Policy subdivision due to changes in the California Government Code relative to additional term requirements for privately held non-guaranteed securities.
- Updated Figure 1, Added footnote S to provide information consistent with the changes proposed in 30.8.16 and the corresponding California Government Code requirements.
- Update to Glossary of Investment Terms and Instruments description of CalTrust, as indicated by the CalTrust website.

Therefore, staff recommends that the MTS Board of Directors approve and adopt the updated MTS Board Policy No. 30 (Investment Policy) (Attachment A).

/S/ Sharon Cooney
Sharon Cooney
Chief Executive Officer

Key Staff Contact: Julia Tuer, 619.557.4515, Julia.Tuer@sdmts.com

Attachments: A. Updated Board Policy No. 30 (Investment Policy)
B. Updated Board Policy No. 30 (Investment Policy) (redlined)

Metropolitan Transit System

Policies and Procedures No. 30

Board Approval: 11/14/2024

SUBJECT:

INVESTMENT POLICY

PURPOSE:

The purpose of this Investment Policy for the San Diego Metropolitan Transit System (MTS) is to provide guidance and direction for the prudent investment of MTS funds, and to foster the creation of a systematic and controlled investment process. The ultimate goal is to maximize the efficiency of MTS's cash management system, and to enhance the economic status of MTS while protecting the principal of its pooled cash. The initial step toward a prudent investment policy is to set out a clear statement of fundamental investment direction.

POLICY:

MTS's policy is to invest public funds in a prudent manner, providing capital preservation, adequate liquidity, and a market rate of return consistent with the constraints imposed by safety objectives and cash flow considerations. Also, MTS's policy is to conform to all applicable federal, state and local statutes governing the investment of public funds.

30.1 SCOPE

This Investment Policy applies to all surplus assets of MTS. Surplus funds are defined as those funds not required for the immediate necessities of MTS; such funds do not include pension/retirement trust funds. Bond proceeds will be governed by relevant bond documents.

30.2 PRUDENCE

The standard of prudence to be used for managing the MTS investment program is California Government Code Section 53600.3, the prudent investor standard, which states, "When investing, reinvesting, purchasing, acquiring, exchanging, selling, or managing public funds, a trustee shall act with care, skill, prudence, and diligence under the circumstances then prevailing, including, but not limited to, the general economic conditions and the anticipated needs of the agency, that a prudent person acting in a like capacity and familiarity with those matters would use in the conduct of funds of a like character and with like aims, to safeguard the principal and maintain the liquidity needs of the agency. Within the limitations of this section and considering individual

investments as part of an overall strategy, investments may be acquired as authorized by law."

MTS investment officers acting in accordance with written procedures and this Investment Policy, and exercising due diligence, shall be relieved of personal responsibility for an individual security's credit risk or market risk, provided deviations from expectations are reported in a timely fashion and appropriate action is taken to control adverse developments. All participants in the investment process shall act reasonably as custodians of the public trust.

30.3 RISK TOLERANCE

MTS recognizes that investment risks can result from issuer defaults, or various technical complications leading to temporary illiquidity.

1. Credit risk, defined as the risk of loss due to failure of the issuer of a security, shall be mitigated by investing in high grade securities and through issuer diversification.

2. Market risk, defined as market value fluctuations due to overall changes in market price and yield, shall be mitigated by maintaining appropriate asset diversification.

3. Interest rate risk, defined as bond market value fluctuations due to changes in interest rates, interest rate spreads, or the shape of the yield curve, shall be mitigated by maintaining an appropriate duration strategy and diversification of maturities.

4. Custodial credit risk, defined as the risk of loss due to the failure of the custodian, shall be mitigated by prudent custodian selection procedures and requirements, as described in Section 30.13 of this Policy.

30.4 OBJECTIVES

MTS strives to maintain in its investment portfolio 100% of all surplus funds, given daily and forecasted near-term cash flow needs. MTS funds shall be invested in accordance with all applicable policies and codes, State statutes, and Federal regulations, and in a manner designed to accomplish the following objectives, which are listed in priority order:

1. SAFETY. The safety and risk associated with an investment refers to the potential loss of principal, interest or a combination of those amounts. Safety of principal is the foremost objective of MTS's investment program, followed by liquidity and yield. Investments by MTS shall be undertaken in a manner that seeks to ensure the preservation of capital in the overall portfolio. MTS only operates in those investments that are considered very safe. Also, safety is ensured by diversification, which is required in order that potential losses on individual securities do not exceed income from the remainder of the portfolio.

2. LIQUIDITY. Liquidity refers to the ability to sell an investment at any given moment with a minimal chance of losing some portion of principal or interest. MTS's investment portfolio shall remain sufficiently liquid to meet all operating requirements that might be reasonably anticipated. MTS will maintain an adequate percentage of the portfolio in liquid short-term securities that can be converted to cash, if necessary, to meet disbursement requirements.

3. YIELD/RETURN. The portfolio shall be designed to attain a market rate of return throughout budgetary and economic cycles, taking into account the investment risk constraints and the cash flow characteristics of the portfolio, and State and local laws, regulations and resolutions that restrict the investment of short-term funds.

30.5 DELEGATION OF AUTHORITY

Management and oversight responsibility for MTS's investment program is delegated by the MTS Board of Directors (MTS Board) to the Chief Financial Officer, who shall establish procedures for the operation of the investment program, consistent with this Investment Policy. Such procedures will include appropriate delegation of authority to persons responsible for investment transactions. No person may engage in investment transactions except as provided under the terms of this Investment Policy and the procedures established by the Chief Financial Officer. The Chief Financial Officer is hereby delegated the authority from the MTS Board to:

1. Enter into agreements with MTS's financial depository in order to enable the Chief Financial Officer, or his/her designee, to execute investment transactions that will involve charges and credits to MTS's bank accounts.

2. Enter into banking arrangements with a third party bank trust department to facilitate the third-party safekeeping of MTS investments.

3. Establish operating procedures as deemed appropriate to operate an investment program consistent with this Investment Policy.

Upon the recommendation of the Chief Financial Officer, the MTS Board may engage the support services of outside investment advisors with respect to MTS's investment program, so long as it can be demonstrated that these services are expected to produce a net financial advantage or necessary financial protection of MTS's financial resources. Any investment advisor utilized by MTS should be registered with the Securities and Exchange Commission under the Investment Advisors Act of 1940, and shall operate in a manner consistent with this Investment Policy and other written instructions as provided.

30.6 ETHICS AND CONFLICT OF INTEREST

1. The Chief Financial Officer and all personnel involved in the investment process shall refrain from personal business activities that could conflict with proper execution of the investment program and/or which could impair their ability to make impartial investment decisions. MTS officers and employees involved in

the investment process shall abide by MTS's Conflict of Interest Code, California Government Code Section 1090 et seq., and the California Political Reform Act (California Government Code Section 81000 et seq.). The Chief Financial Officer and all responsible personnel shall disclose to the MTS Board any material financial interests in any financial institutions that conduct business with MTS that could be related in a conflicting manner to MTS's investment portfolio performance.

2. MTS officers and employees involved in the investment process shall disclose to the MTS Board any material financial interests in any financial institutions that conduct business with MTS which could be related in a conflicting manner to the performance of MTS's investment portfolio. Additionally, the Chief Financial Officer and all investment personnel designated by the Chief Financial Officer shall file a Statement of Economic Interests each year as required by California Government Code Section 87203 and regulations of the Fair Political Practices Commission.

30.7 AUTHORIZED BROKER/DEALERS

1. It is expected, though not required, that most of MTS's investments will be made through pooled investment funds provided by a California State and/or County entity. Allowable pools are detailed in Sections 30.8.9 – 30.8.11, of this Investment Policy Statement. When/if direct security investments are made by MTS, MTS's procedures shall be designed to encourage multiple bids and offers on investment transactions from an approved list of broker/dealers in order to provide for the optimum yield in MTS's portfolio.

When/if making direct security investments, the Chief Financial Officer (or the Corporate Controller or the Director of Financial Planning and Analysis, if delegated) shall utilize a list of broker/dealers approved for investment purposes by the San Diego County Treasurer-Tax Collector's office. Purchases of investments through brokers, dealers, and financial institutions shall be permitted as stated in California Government Code Section 53635.5. Each approved broker/dealer must possess an authorizing certificate from the California Commissioner of Corporations as required by Section 25210 of the California Corporations Code. The firms they represent must:

(a) be recognized as a Primary Dealer by the Federal Reserve Bank of New York or have a primary dealer within its holding company structure, or;

(b) Report voluntarily to the Federal Reserve Bank of New York, or

(c) Qualify under Securities and Exchange Commission (SEC) Rule 15c3-1 (Uniform Net Capital Rule).

2. If MTS utilizes an external investment advisor, the Chief Financial Officer may approve a list of authorized broker/dealers provided by the investment advisor.

30.8 AUTHORIZED AND SUITABLE INVESTMENTS

All investments and deposits of MTS assets shall be made in accordance with California Government Code Sections 16429.1, 53600-53609 and 53630-53686. Although the following includes authorized investments, the Chief Financial Officer shall determine the extent to which they are suitable based upon this Investment Policy and the resources used by the Chief Financial Officer in implementing it. This suitability determination shall include an examination of the Investment Policy Statements of utilized pooled investment funds to ensure that they are consistent with MTS's Policy.

Limitations identified in the following sections shall be adhered to and the percentage limits and credit criteria shall be measured against portfolio value on the date the investment is purchased. In the event of a credit downgrade below the minimum acceptable credit rating, MTS shall require investment advisors engaged in the investing of MTS funds to notify MTS staff of the downgrade, and provide a plan of action to address the downgrade.

The list of authorized investments, and the limitations associated with those investments are detailed in Figure 1 attached to this Investment Policy Statement; Figure 1 is taken from the 2024 version of "Local Agency Investment Guidelines," published by the California Debt and Investment Advisory Commission. The authorized investments and associated limitations are as follows:

1. United States Treasury bills, notes, bonds, or strips with a final maturity not exceeding five years from the date of trade settlement.

2. Federal Agency or U.S. government-sponsored enterprise obligations, participations, or other instruments, including those issued by or fully guaranteed as to principal and interest by Federal agencies or U.S. government-sponsored enterprises with maturities not exceeding five years from the date of trade settlement. There is no limit on the percentage of U.S. Treasury, Federal Agency, or U.S. government-sponsored enterprise obligations that may be held in MTS's portfolio.

3. Eligible Banker's Acceptances with a maturity not exceeding 180 days from the date of trade settlement, drawn on or accepted by a FDIC insured commercial bank with combined capital and surplus of at least $250 million, rated in a rating category of A-1, its equivalent, or higher by a nationally recognized statistical rating organization (NRSRO) at the time of purchase and whose senior long-term debt is rated in a rating category of "A", its equivalent, or higher by a NRSRO at the time of purchase. No more than 5% of MTS's total portfolio shall be invested in banker's acceptances of any one issuer, and the aggregate investment in banker's acceptances shall not exceed 40% of MTS's total portfolio.

4. Prime Commercial Paper (CP) with a maturity not exceeding 270 days from the date of trade settlement with the highest ranking or of the highest letter and number rating as provided for by a NRSRO. The entity issuing the commercial

paper shall meet all of the following conditions in either sub-paragraph A. or sub-paragraph B. below:

(a) The entity shall (1) be organized and operating in the United States as a general corporation, (2) have total assets in excess of $500,000,000 and (3) have debt other than commercial paper, if any, that is rated in a rating category of “A”, its equivalent, or higher by a NRSRO.

(b) The entity shall (1) be organized within the United States as a special purpose corporation, trust, or limited liability company, (2) have program wide credit enhancements, including, but not limited to, over collateralization, letters of credit or surety bond and (3) have commercial paper that is rated in a rating category of A-1, its equivalent, or higher, by a NRSRO.

No more than 5% of MTS’s total portfolio shall be invested in the commercial paper of any one issuer, the maximum exposure to a single issuer shall be 10% of total portfolio value inclusive of any other non-CP investments with said issuer, and MTS shall not purchase more than 10% of the outstanding commercial paper of any single issuer. The aggregate non-pooled fund investment in commercial paper shall not exceed 25% of MTS’s total portfolio. Pooled fund commercial paper investments shall not exceed 40% of MTS’s total portfolio, and the combined pooled fund and non-pooled fund investment in commercial paper shall also not exceed 40% of MTS’ total portfolio.

5. Non-negotiable certificates of deposit (CD) with a final maturity not exceeding five years and meeting the conditions in either paragraph (a) or paragraph (b) below:

(a) Certificates of deposit shall meet the requirements for deposit under California Government Code Section 53630 et seq. To be eligible to receive MTS deposits, the financial institution must meet the requirements of California Government Code Section 53635.2. Deposits are required to be collateralized as specified under California Government Code Section 53630 et seq. The Chief Financial Officer, at his or her discretion, may waive the collateralization requirements for any portion that is covered by federal deposit insurance. MTS shall also have a signed agreement with the depository per California Government Code Section 53649.

(b) Certificates of deposit placed through a deposit placement service shall meet the requirements of Government Code Section 53601.8. The full amount of the principal and the interest that may be accrued during the maximum term of each certificate of deposit shall at all times be insured by federal deposit insurance.

No more than 5% of the portfolio shall be held in any one non-negotiable certificate of deposit or allocated to any one issuer, the maximum exposure to a single issuer shall be 10% of total portfolio value inclusive of any other non-CD

investments with said issuer, and the aggregate investment in non-negotiable certificates of deposit and negotiable certificates of deposit shall not exceed 30% of MTS's total portfolio.

6. Negotiable Certificates of Deposit with a final maturity not exceeding five years issued by a nationally or state-chartered bank, a savings association or a federal association (as defined by Section 5102 of the Financial Code), a state or federal credit union, or by a federally- or state-licensed branch of a foreign bank. Negotiable CD issuers must be rated in a rating category of "A", its equivalent, or higher by two NRSROs.

   No more than 10% of the portfolio shall be held in any one negotiable certificate of deposit or allocated to any one issuer, the maximum exposure to a single issuer shall be 10% of total portfolio value inclusive of any other non-CD investments with said issuer, and the aggregate investment in non-negotiable certificates of deposit and negotiable certificates of deposit shall not exceed 30% of MTS's total portfolio.

7. Repurchase Agreements with a final termination date not exceeding 1 year collateralized by U.S. Treasury obligations, Federal Agency securities, or Federal Instrumentality securities listed in Sections 30.8.1 and 30.8.2 above with the maturity of the collateral not exceeding ten years. For the purpose of this section, the term collateral shall mean purchased securities under the terms of MTS's approved Master Repurchase Agreement. The purchased securities shall have a minimum market value including accrued interest of 102% of the dollar value of the funds borrowed. Collateral shall be held in MTS's custodian bank, as safekeeping agent, and the market value of the collateral securities shall be marked-to-market daily.

   Repurchase Agreements shall be entered into only with broker/dealers who are recognized as Primary Dealers with the Federal Reserve Bank of New York or with firms that have a primary dealer within their holding company structure. Repurchase agreement counterparties shall execute an MTS-approved Master Repurchase Agreement with MTS. The Chief Financial Officer shall maintain a copy of MTS's approved Master Repurchase Agreement along with a list of the broker/dealers who have executed such an agreement.

   The Repurchase Agreement exposure to a single broker/dealer shall not exceed 10% of MTS's total portfolio when the dollar-weighted average Repurchase Agreement maturity is greater than 5 days, or 15% of MTS's total portfolio when the dollar-weighted average Repurchase Agreement maturity is 5 days or less. Maximum Repurchase Agreement exposure shall not exceed 40% of MTS's total portfolio.

8. Reverse Repurchase Agreements may only be directly utilized after prior approval by the MTS Board, or indirectly utilized as a permitted investment by the California Local Agency Investment Fund, the San Diego County Treasurer's Pooled Money Fund, or a Joint Powers Authority Pool.

If an MTS Reverse Repurchase Agreement is authorized by the MTS Board, it may only be utilized if: 1) the security to be sold has been owned and fully paid for by MTS for a minimum of 30 days prior to the sale; 2) the total of all Reverse Repurchase Agreements does not exceed 20% of the value of the total MTS portfolio; and 3) the agreement does not exceed a term of 92 days unless the agreement includes a written codicil guaranteeing a minimum earning or spread for the entire period between the sale of the security using a Reverse Repurchase Agreement and the final maturity of the same security. The proceeds of the Reverse Repurchase Agreement may not be invested in securities whose maturity exceeds the term of the Reverse Repurchase Agreement.

Reverse Repurchase Agreements shall be entered into only with broker/dealers who are recognized as Primary Dealers with the Federal Reserve Bank of New York or with firms that have a primary dealer within their holding company structure. Reverse Repurchase Agreement counterparties shall execute an MTS-approved Master Repurchase Agreement with MTS. The Chief Financial Officer shall maintain a copy of MTS's approved Master Repurchase Agreement along with a list of the broker/dealers who have executed such an agreement.

The Reverse Repurchase Agreement exposure to a single broker-dealer shall not exceed 10% of MTS's total portfolio.

9. State of California's Local Agency Investment Fund (LAIF), pursuant to California Government Code Section 16429.1. There is no limit on the percentage of MTS's portfolio that may be invested in LAIF, though LAIF may impose statutory limits.

10. The San Diego County Treasurer's Pooled Money Fund (SDPMF). There is no limit on the percentage of MTS's total portfolio that may be invested in SDPMF.

11. A Joint Powers Authority Pool (JPAP), pursuant to California Government Code Section 53601(p) as long as the portfolio is rated among the top two rating categories by a NRSRO. Such a pool must retain an investment advisor who is registered with the SEC (or exempt from registration), has assets under management of at least $500,000,000, and has at least five years of experience investing in instruments authorized by Section 53601(a-o). Examples of such pools include, but are not limited to, those offered by the California Asset Management Program (CAMP) and the Investment Trust of California (CalTrust). There is no limit on the percentage of JPAPs which offer daily (same-day) liquidity that may be held in MTS's portfolio; however, the aggregate investment in any JPAPs which do not offer daily liquidity shall not exceed 2.5% of MTS's total portfolio.

12. Medium Term Notes (MTN) issued by corporations organized and operating within the United States or by depository institutions licensed by the United States or any state and operating within the United States with a final maturity not exceeding five years from the date of trade settlement. These notes must be rated in a rating category of "A", its equivalent, or higher by a NRSRO.

No more than 10% of MTS's total portfolio shall be invested in medium term notes of any one issuer, the maximum exposure to a single issuer shall be 10% of total portfolio value inclusive of any other non-MTN investments with said issuer, and the aggregate investment in medium term notes shall not exceed 30% of MTS's total portfolio.

13. Money Market Funds registered under the Investment Company Act of 1940 that 1) are "no-load" (meaning no commission or fee shall be charged on purchases or sales of shares); 2) have a constant net asset value per share of $1.00; 3) invest only in the securities and obligations authorized by State statute and 4) have attained the highest ranking or the highest letter and numerical rating provided by at least two NRSROs, or retained an investment advisor registered or exempt from registration (such as a bank holding company regulated by the Federal Deposit Insurance Corporation) with the Securities and Exchange Commission with not less than five years' experience managing money market mutual funds with assets under management in excess of $500,000,000.

    No more than 10% of MTS's total portfolio shall be invested in money market funds of any one issuer, and the aggregate investment in money market funds shall not exceed 20% of MTS's total portfolio.

14. Municipal bonds that are listed below with a final maturity not exceeding five years from the date of trade settlement and that must be rated in a rating category of "A," its equivalent, or higher by a NRSRO at the time of purchase. No more than 5% of MTS's total portfolio shall be invested in any single issuer, and the aggregate investment in municipal bonds shall not exceed 30% of MTS's total portfolio.

    (a) Bonds issued by MTS, including bonds payable solely out of the revenues from a revenue-producing property owned, controlled, or operated by MTS or by a department, board, agency, or authority of MTS.

    (b) Registered State warrants or treasury notes or bonds of the State of California, including bonds payable solely out of the revenues from a revenue-producing property owned, controlled, or operated by the State or by a department, board, agency, or authority of the State.

    (c) Bonds, notes, warrants, or other evidences of indebtedness of a local agency within California, including bonds payable solely out of the revenues from a revenue-producing property owned, controlled, or operated by the local agency, or by a department, board, agency, or authority of the local agency.

    (d) Registered treasury notes or bonds of any of the other 49 states in addition to California, including bonds payable solely out of the revenues from a revenue-producing property owned, controlled, or operated by a state or by a department, board, agency, or authority of any of the other 49 states, in addition to California.

15. Supranationals, which are United States dollar denominated senior unsecured unsubordinated obligations issued or unconditionally guaranteed by the International Bank for Reconstruction and Development (IBRD), International Finance Corporation (IFC), or Inter-American Development Bank (IADB), with a maximum remaining maturity of five years or less, and eligible for purchase and sale within the United States.

    Investments under this subdivision shall be rated in the rating category of "AA," its equivalent, or better by at least one NRSRO. Purchases of supranational shall not exceed 30% of the investment portfolio of MTS, and the exposure to a single supranational issuer shall not exceed 10% of the investment portfolio of MTS.

16. Mortgage pass-through securities, collateralized mortgage obligations, mortgage-backed or other pay-through bonds, equipment lease-backed certificates, consumer receivable pass-through certificates, or consumer receivable-backed bonds. For securities eligible for investment under this subdivision not issued or guaranteed by an agency or issuer identified in Sections 53601(b) or 53601(f) of the California Government Code, the following limitations apply: the individual security must be rated in a category of "AA," its equivalent, or better by at least one NRSRO and have a maximum remaining maturity of five years or less; and purchases of securities authorized by this subdivision may not exceed 20% of MTS's total portfolio.

17. Commercial paper, debt securities, or other obligations of a public bank, as defined in Section 57600 of the California Government Code.

30.9 PROHIBITED INVESTMENTS

In accordance with Section 53601.6 of the California Government Code, MTS shall not invest any funds in inverse floaters, range notes or mortgage-derived interest-only strips, or in any security that could result in zero-interest accrual if held to maturity, with the following exception: in accordance with Section 53601.6(b)(2), MTS may invest in securities issued by, or backed by, the United States government that could result in zero- or negative-interest accrual if held to maturity, in the event of, and for the duration of, a period of negative market interest rates.

30.10 INVESTMENT POOLS

MTS allows investments in public agency investment pools (per Sections 30.8.9 – 30.8.11). Although many of these pools are long-standing, the Chief Financial Officer will annually obtain operating information from each utilized pool which includes the information detailed in Section 30.15 of this Investment Policy Statement.

30.11 MATURITY

MTS will not invest in instruments whose maturities exceed five years at the time of trade settlement unless the MTS Board has provided approval for a specific purpose at least three months before the investment is made. The Chief Financial Officer shall be

responsible for determining and monitoring an average maturity which meets MTS's projected cash flow requirements and shall be reported to the MTS Board as required under State Law. The average duration of any externally managed fund utilized by MTS shall not exceed 150 percent of the duration of the appropriate benchmark for that fund.

30.12. SELECTION OF DEPOSITORIES

The Chief Financial Officer shall only utilize FDIC insured banks eligible to provide depository and other banking services for MTS. To be eligible, a bank must qualify as a depository of public funds in the State of California as defined in California Government Code Section 53630.5 and shall secure deposits in excess of FDIC insurance coverage in accordance with California Government Code Section 53652.

30.13. SAFEKEEPING & CUSTODY

The Chief Financial Officer may select one or more banks to provide third-party safekeeping and custodial services for MTS, in accordance with the provisions of Section 53608 of the California Government Code. A Safekeeping Agreement approved by MTS shall be executed with each custodian bank prior to utilizing that bank's safekeeping services. Custodian banks will be selected on the basis of their ability to provide services for MTS's account and the competitive pricing of their safekeeping related services.

The purchase and sale of securities and repurchase agreement transactions shall be settled on a delivery versus payment basis. All securities shall be held in the name of MTS, with sufficient evidence to title consistent with modern investment, banking and commercial practices.

All investment securities, except non-negotiable certificates of deposit, money market funds, and public agency investment pools, purchased by MTS will be delivered by book entry and will be held in third-party safekeeping by an MTS-approved custodian bank or its Depository Trust Company (DTC) participant account.

All Fed wireable book entry securities owned by MTS shall be held in the Federal Reserve System in a customer account for the custodian bank which will name MTS as "customer."

All DTC eligible securities shall be held in the custodian bank's DTC participant account and the custodian bank shall provide evidence that the securities are held for MTS as "customer."

30.14. DIVERSIFICATION

MTS shall diversify its investments to avoid incurring unreasonable risks inherent in over investing in specific instruments, individual financial institutions or maturities. Nevertheless, the asset allocation in the portfolio should be managed depending upon the outlook for the economy, the securities markets, and MTS's anticipated cash flow needs.

30.15. REPORTING

Quarterly, the Chief Financial Officer shall submit to the MTS Board a report of the investment earnings and performance results of MTS's investment portfolio. The report shall be submitted within 60 days following the end of the quarter, and shall include the following information for each individual investment:

1. Investment type, issuer, purchase date (trade and settlement), date of maturity, par value, purchase price and dollar amount invested in all securities, and investments and monies held by MTS;

2. A description of the funds, investments and programs;

3. A market value as of the date of the report (or the most recent valuation as to assets not valued monthly) and the source of the valuation;

4. Current period yield (based on cost) and rates of return for short-term and mid-term investments, including comparison to established benchmarks;

5. A statement of compliance with this Investment Policy or an explanation for non-compliance; and

6. A statement of MTS's ability to meet expenditure requirements for six months, and an explanation of why money will not be available if that is the case.

For investments in authorized investment pools, the most recent statement received from these pools may be used in lieu of the information listed above.

30.16 INTERNAL CONTROLS

The Chief Financial Officer (or the Corporate Controller, or the Director of Financial Planning and Analysis, if delegated) shall establish a system of internal controls, which shall be documented in writing. The internal controls will be reviewed with both the outside independent auditor and MTS's internal auditor. The controls shall be designed to prevent loss of public funds arising from fraud, employee error, or misrepresentation by third parties, unanticipated changes in financial markets or imprudent actions by employees and officers of MTS. Controls deemed most important include: control of collusion, segregation of duties, separating transaction authority from accounting and record keeping, custodial safekeeping, clear delegation of authority, written (email or faxed allowable) confirmation of telephone transactions, documentation of transactions and strategies and code of ethical standards.

30.17 PERFORMANCE STANDARDS

The investment portfolio shall be designed to attain a market rate of return throughout budgetary and economic cycles, taking into account prevailing market conditions, risk constraints for eligible securities, and cash flow requirements. The performance of MTS's portfolio and any external investment managers shall be compared to appropriate benchmark indices.

30.18 REVIEW, ADOPTION & AMENDMENTS

This Investment Policy shall be reviewed biennially by the MTS Board. Such review shall include review of the "Summary of Statutory Changes" and Figure 1 (Allowable Investment Instruments per State Government Code) in the Local Agency Investment Guidelines. The MTS Investment Policy may not be altered, amended or changed in any particular way, except by formal approval of the MTS Board.

Attachments: Figure 1: Summary of California Code and MTS Policy
Table of Notes for Figure 1
Glossary of Investment Terms and Instruments

Original Policy accepted on 10/23/86.
Policy revised on 9/23/93.
Policy repealed and readopted 6/13/96.
Policy revised on 12/11/97.
Policy revised on 8/12/99.
Policy revised on 8/10/00.
Policy revised on 9/13/01.
Policy revised on 3/11/04.
Policy revised on 6/14/07.
Policy revised on 10/11/18.
Policy revised on 05/14/2020.
Policy revised on 12/16/2021.
Policy revised on 11/10/2022.
Policy Revised on 11/14/2024

Figure 1: Summary of California Code and MTS Policy

INVESTMENT TYPE	CA CODE MAXIMUM MATURITY[C]	CA CODE MAXIMUM SPECIFIED % OF PORTFOLIO[D]	CA CODE MINIMUM QUALITY REQUIREMENTS	MTS POLICY MAXIMUM SPECIFIED % OF PORTFOLIO[D]	MTS POLICY MINIMUM QUALITY REQUIREMENTS
Local Agency Bonds	5 years	None	None	**30%**	**"A" rating category or its equivalent or better**
U.S. Treasury Obligations	5 years	None	None	Same as CA Code	Same as CA Code
State Obligations—CA And Others	5 years	None	None	**30%**	**"A" rating category or its equivalent or better**
CA Local Agency Obligations	5 years	None	None	**30%**	**"A" rating category or its equivalent or better**
U.S Agency Obligations	5 years	None	None	Same as CA Code	Same as CA Code
Bankers' Acceptances	180 days	40%[E]	None	Same as CA Code	**"A-1" rating category or its equivalent or better**
Commercial Paper—Pooled Funds[I]	270 days	40% of the agency's money[G]	Highest letter and number rating by an NRSRO[H]	Same as CA Code	Same as CA Code
Commercial Paper—Non-Pooled Funds[F]	270 days	If investment assets <$100 million, 25% of the agency's money; if investment assets >$100 million, 40% of the agency's money[G]	Highest letter and number rating by an NRSRO[H]	**25%**	Same as CA Code
Negotiable Certificates of Deposit	5 years	30%J	None	Same as CA Code	**"A" rating category or its equivalent or better**
Non-negotiable Certificates of Deposit	5 years	None	None	**30%**	Same as CA Code
Placement Service Deposits	5 years	50%	None	**30%**	Same as CA Code
Placement Service Certificates of Deposit	5 years	50%	None	**30%**	Same as CA Code
Repurchase Agreements	1 year	None	None	**40%**	Same as CA Code
Reverse Repurchase Agreements & Securities Lending Agreements	92 days[L]	20% of the base value of the portfolio	None[M]	Same as CA Code	Same as CA Code
Medium-Term Notes[N]	5 years	30%	"A" rating category or its equivalent or better	Same as CA Code	Same as CA Code
Mutual Funds And Money Market Mutual Funds	N/A	20%	Multiple[P,Q]	Same as CA Code	Same as CA Code
Collateralized Bank DepositsR	5 years	None	None	Same as CA Code	Same as CA Code
Mortgage Pass–Through and Asset-Backed Securities[S]	5 years	20%	"AA" rating category or its equivalent or better[S]	Same as CA Code	Same as CA Code
County Pooled Investment Funds	N/A	None	None	Same as CA Code	Same as CA Code
Joint Powers Authority Pool	N/A	None	Multiple[T]	**2.5% on Pools not offering daily liquidity**	Same as CA Code
Local Agency Investment Fund (LAIF)	N/A	None	None	Same as CA Code	Same as CA Code
Voluntary Investment Program Fund[U]	N/A	None	None	Same as CA Code	Same as CA Code.
Supranational Obligations[V]	5 years	30%	"AA" rating category or its equivalent or better	Same as CA Code	Same as CA Code
Public Bank Obligations	5 years	None	None	Same as CA Code	Same as CA Code

TABLE OF NOTES FOR FIGURE 1

A. *Sources: Sections 16340, 16429.1, 27133, 53601, 53601.6, 53601.8, 53630 et seq., 53635, 53635.8, and 57603.*

B. *Municipal Utilities Districts have the authority under the Public Utilities Code Section 12871 to invest in certain securities not addressed here.*

C. *Section 53601 provides that the maximum term of any investment authorized under this section, unless otherwise stated, is five years. However, the legislative body may grant express authority to make investments either specifically or as a part of an investment program approved by the legislative body that exceeds this five year maturity limit. Such approval must be issued no less than three months prior to the purchase of any security exceeding the five-year limit.*

D. *Percentages apply to all portfolio investments regardless of source of funds. For instance, cash from a reverse repurchase agreement would be subject to the restrictions.*

E. *No more than 30 percent of the agency's money may be in bankers' acceptances of any one commercial bank.*

F. *Includes agencies defined as a "city, a district, or other local agency that do[es] not pool money in deposits or investment with other local agencies, other than local agencies that have the same governing body.*

G. *Local agencies, other than counties or a city and county, may purchase no more than 10 percent of the outstanding commercial paper and medium-term notes of any single issuer.*

H. *Issuing corporation must be organized and operating within the U.S., have assets in excess of $500 million, and debt other than commercial paper must be in a rating category of "A" or its equivalent or higher by a nationally recognized statistical rating organization, or the issuing corporation must be organized within the U.S. as a special purpose corporation, trust, or LLC, have program wide credit enhancements, and have commercial paper that is rated "A-1" or higher, or the equivalent, by a nationally recognized statistical rating agency.*

I. *Includes agencies defined as a county, a city and county, or other local agency "that pools money in deposits or investments with other local agencies, including local agencies that have the same governing body." Local agencies that pool exclusively with other local agencies that have the same governing body must adhere to the limits set forth in Section 53601(h)(2)(C).*

J. *No more than 30 percent of the agency's money may be in negotiable certificates of deposit that are authorized under Section 53601(i).*

K. *Effective January 1, 2020, no more than 50 percent of the agency's money may be invested in deposits, including certificates of deposit, through a placement service as authorized under 53601.8 (excludes negotiable certificates of deposit authorized under Section 53601(i)). On January 1, 2026, the maximum percentage of the portfolio reverts back to 30 percent. Investment made pursuant to 53635.8 remain subject to a maximum of 30 percent of the portfolio.*

L. *Reverse repurchase agreements or securities lending agreements may exceed the 92-day term if the agreement includes a written codicil guaranteeing a minimum earning or spread for the entire period be- tween the sale of a security using a reverse repurchase agreement or securities lending agreement and the final maturity dates of the same security.*

M. *Reverse repurchase agreements must be made with primary dealers of the Federal Reserve Bank of New York or with a nationally or state chartered bank that has a significant relationship with the local agency. The local agency must have held the securities used for the agreements for at least 30 days.*

N. *"Medium-term notes" are defined in Section 53601 as "all corporate and depository institution debt securities with a maximum remaining maturity of five years or less, issued by corporations organized and operating within the United States or by depository institutions licensed by the United States or any state and operating within the United States"*

O. *No more than 10 percent invested in any one mutual fund. This limitation does not apply to money market mutual funds.*

P. *A mutual fund must receive the highest ranking by not less than two nationally recognized rating agencies or the fund must retain an investment advisor who is registered with the SEC (or exempt from registration), have assets under management in excess of $500 million, and have at least five years' experience investing in instruments authorized by Sections 53601 and 53635.*

Q. *A money market mutual fund must receive the highest ranking by not less than two nationally recognized statistical rating organizations or retain an investment advisor registered with the SEC or exempt from registration and who has not less than five years' experience investing in money market instruments with assets under management in excess of $500 million.*

R. *Investments in notes, bonds, or other obligations under Section 53601(n) require that collateral be placed into the custody of a trust company or the trust department of a bank that is not affiliated with the issuer of the secured obligation, among other specific collateral requirements.*

S. *Security types authorized under Section 53601(o) that are issued or guaranteed by an issuer identified in subdivisions (b) or (f) are not subject to the limitations placed on privately issued securities authorized in Section 53601(o)(2)(A)(B).*

T. *A JPAP must retain an investment advisor who is registered with the SEC (or exempt from registration), has assets under management in excess of $500 million, and has at least five years' experience investing in instruments authorized by Section 53601, subdivisions (a) to (o).*

U. *Upon approval by their governing bodies, local entities can deposit $200 million to $10 billion into the Voluntary Investment Program Fund. Deposits in the fund will be invested in the Pooled Money Investment Account.*

V. *Only those obligations issued or unconditionally guaranteed by the International Bank for Reconstruction and Development (IBRD), International Finance Corporation (IFC), and Inter-American Development Bank (IADB), with a maximum remaining maturity of five years or less.*

GLOSSARY OF INVESTMENT TERMS AND INSTRUMENTS

Term	Description
Banker's Acceptance	A short-term bill of exchange that is accepted as payment by banks engaged in financing physical asset or merchandise trade.
Benchmark	A passive index used to compare the performance, relative to risk and return, of an investor's portfolio.
Bond	A debt obligation of a firm or public entity. A bond represents the agreement to repay the debt in principal and, typically, in interest on the principal.
Broker/Dealer	A person or a firm who can act as a broker or a dealer depending on the transaction. A broker brings buyers and sellers together for a commission. They do not take a position. A dealer acts as a principal in all transactions, buying and selling for his own account.
CalTrust	The Investment Trust of California (CalTrust) is a Joint Powers Authority created by public agencies in 2003 to provide a convenient method for public agencies to pool their assets for investment purposes. CalTrust is governed by a Board of Trustees made up of experienced local agency treasurers and investment officers. CalTrust offers Short-Term, Medium-Term, and Money Market funds managed by State Street Global Advisors. The Money Market fund offers daily (same-day) liquidity. All CalTrust accounts comply with the limits and restrictions placed on local investments by California statutes.
CAMP	The California Asset Management Program (CAMP) is a California Joint Powers Authority established in 1989 to provide California public agencies, together with any bond trustee acting on behalf of such public agency, assistance with the investment of and accounting for bond proceeds and surplus funds. The CAMP Pool is a short-term money market and cash management vehicle managed by PFM Asset Management LLC. The Pool seeks to attain as high a level of current income as is consistent with the preservation of principal. It seeks to maintain a constant Net Asset Value of $1 per share and a dollar-weighted average portfolio maturity of 60 days or less. The Pool purchases only investments of the type in which public agencies are permitted by statute to invest surplus funds and proceeds of their own bonds.
Cash Flow	A comparison of cash receipts (revenues) to required payments (debt service, operating expenses, etc.).
Certificate of Deposit	A short-term, secured deposit in a financial institution that usually returns principal and interest to the lender at the end of the loan period. Certificates of Deposits (CDs) differ in terms of collateralization and marketability. Those appropriate to public agency investing include:

Term	Description
	Negotiable Certificates of Deposit, Non-Negotiable Certificates of Deposit.
Commercial Paper	A short-term, unsecured promissory note issued by a corporation. Prime paper includes those having Moody's ratings of P-3 and above.
Corporate Notes & Bonds	Debt instruments, typically unsecured, issued by corporations, with original maturities in most cases greater than one year and less than ten years.
Credit Risk	The chance that an issuer will be unable to make scheduled payments of interest and principal on an outstanding obligation. Another concern for investors is that the market's perception of a corporation's credit will cause the market value of a security to fall, even if default is not expected.
Credit Rating	Various alphabetical and numerical designations used by institutional investors, Wall Street underwriters, and commercial rating companies to give relative indications of bond and note creditworthiness. Standard & Poor's and Fitch Ratings use the same system, starting with their highest of "AAA, AA, A, BBB, BB, B, CCC, CC, C, and D" for default. Moody's Investor Services uses "Aaa, Aa, A, Baa, Ba, B, Caa, Ca, C, and D". Each of the services use pluses (+), minuses (-), or numerical modifiers to indicate steps within each category. The top four letter categories are considered investment grade ratings.
Duration	A fixed-income metric that measures the sensitivity of a bond or portfolio to changes in interest rates. A portfolio or security with a higher duration will experience larger changes in market value as interest rates change.
Federal Agency and Instrumentality Obligations	Obligations issued by a government sponsored entity or a federally regulated institution. Federal Agencies and U.S. Government Sponsored Enterprises are U.S. Government related organizations, the largest of which are government financial intermediaries assisting specific credit markets (housing, agriculture). They include: ▪ Federal Home Loan Banks (FHLB) ▪ Federal Home Loan Mortgage Corporation (FHLMC or "Freddie Mac") ▪ Federal National Mortgage Association (FNMA or "Fannie Mae") ▪ Federal Farm Credit Banks (FFCB) ▪ Student Loan Marketing Association (SLMA or "Sallie Mae") ▪ Tennessee Valley Authority (TVA)
Inverse Floater	An inverse floater is a bond or other type of debt whose coupon rate has an inverse relationship to a benchmark rate. An inverse floater adjusts its coupon payment as the interest rate changes.
Issuer	Any corporation, governmental unit, or financial institution that borrows money through the sale of securities.

Term	Description
Joint Powers Authority Pool	Joint Powers Authorities are legally created entities that allow two or more public agencies to jointly exercise common powers. Under California Government Code Section 6509.7, public agencies that have the authority to invest funds in their treasuries may, by agreement, jointly exercise that common power by issuing shares of beneficial interest to participating public agencies. Each share represents an equal proportionate interest in the underlying pool of securities owned by the Joint Powers Authority.
LAIF	The Local Agency Investment Fund (LAIF), a voluntary program created by statute, began in 1977 as an investment alternative for California's local governments and special districts and continues today under the State of California Treasurer's office. This program offers participating agencies the opportunity to participate in a major portfolio which daily invests hundreds of millions of dollars, using the investment expertise of the State Treasurer's Office Investment staff. The LAIF is part of the Pooled Money Investment Account (PMIA), which began in 1955 and is overseen by a Board and an Investment Committee. The Local Investment Advisory Board provides oversight for LAIF. All securities are purchased under the authority of the Government Code Section 16430 and 16480.4. The State Treasurer's Office takes delivery of all securities purchased on a delivery versus payment basis using a third party custodian. All investments are purchased at market, and market valuation is conducted monthly. Deposits are subject to statutory limits.
Liquidity	The ease with which an investment may be converted to cash, either by selling it in the secondary market or by demanding its repurchase pursuant to a put or other prearranged agreement with the issuer or another party.
Market Risk	The chance that the value of a security will decline as interest rates rise. In general, as interest rates fall, prices of fixed income securities rise. Similarly, as interest rates rise, prices fall. Market risk also is referred to as systematic risk or risk that affects all securities within an asset class similarly.
Maturity	The stated date on which all or a stated portion of the principal amount of a security becomes due and payable.
Money Market Fund	A type of investment comprising a variety of short-term securities with high quality and high liquidity. The fund provides interest to shareholders and must strive to maintain a stable net asset value (NAV) of $1 per share.
Mortgage – Derived Interest only (IO) Strips	Mortgage-derived Interest only (IO) strips are a security where the holder receives a non-principal portion of the payments on the underlying mortgages. An interest only strip is created by separating the principal and interest portions of the payments on the underlying loan pool and

Term	Description
	selling them as distinct products. The process of separating the payments on the underlying debts is known as stripping. Although interest only strips can be created out of any debt-backed security that generates periodic payment, the term is strongly associated with mortgage-backed securities (MBS). The mortgage-backed securities that go through the process that separates the interest and principal payment streams are referred to as stripped MBS. The investor in the interest only stream benefits when prepayment rate on the underlying debt is low and interest rates are rising.
Nationally Recognized Statistical Rating Organization (NRSRO)	The formal term to describe credit rating agencies that provide credit ratings that are used by the U.S. government in several regulatory areas. Ratings provided by Nationally Recognized Statistical Ratings Organizations (NRSRO) are used frequently by investors and are used as benchmarks by federal and state agencies. Generally, to be considered an NRSRO, the agency has to be “nationally recognized” in the U.S. and provide reliable and credible ratings. Also taken into consideration is the size of the credit rating agency, operational capability and its credit rating process. Some examples of NRSRO’s include Moody’s Investors Service Inc., Standard and Poor’s Inc., Fitch Inc., Dominion Bond Rating Services Limited (DBRS) and A.M. Best Company Inc.
Notes	Debt obligations of a firm or public entity, usually maturing in less than ten years.
Pass-Through Security	A pass-through security is a security backed by a pool of mortgage loans or other debt instruments that provides the holder with the cash flow from the mortgage/debt payments. This income is passed through from the debtor to the investor by the financial institution or government agency issuing the security. The income payments are derived from and collateralized (or "backed") by a specified pool of underlying assets which are receivables. Pooling the assets into financial instruments allows them to be sold to general investors, a process called securitization, and allows the risk of investing in the underlying assets to be diversified because each security will represent a fraction of the total value of the diverse pool of underlying assets. The pools of underlying assets can comprise common payments such as credit cards, auto loans, mortgage loans, and other types of assets. Interest and principal is paid to investors from borrowers who are paying down their debt.
Portfolio	The combined holdings of all of an investor’s investment assets.
Public Bank	A corporation organized under the Nonprofit Mutual Benefit Corporation Law or the Nonprofit Public Benefit Corporation Law for the purpose of engaging in the commercial banking business or industrial banking business that is wholly owned by a local agency or agencies, or a Joint Powers Authority.

Term	Description
Range Accrual Note	A range accrual note is a type of financial derivative product where the earning, or accrual, of the coupon rate, depends on the value of an index. The index could be an interest rate, currency exchange rate, the price of a commodity or stock index. If the index value falls within a specified range, the coupon accrues or is credited, interest. If the index value falls outside of the specified range, the coupon rate does not accumulate.
Repurchase Agreement	From the perspective of a local agency, the short-term, often overnight, purchase of securities with an agreement to resell the securities to the counterparty seller on or before a specified date at an agreed upon price.
Reverse Repurchase Agreement	From the perspective of a local agency, the sale of securities with an agreement to repurchase the securities from the counterparty buyer on or before a specified date at a specified price.
Return	The principal gains or losses (realized and unrealized) plus interest on an investment or portfolio of investments. In certain unfavorable market environments or due to risk factors, income derived from principal and interest may be less than the original amount invested.
Risk	The uncertainty of maintaining the principal or interest associated with an investment due to a variety of factors.
State & Local Investment Pools	The combined deposits of state and local agencies organized and operated by the state treasurer or a Joint Powers Agreement between local agencies. Deposits of various participating local agencies are pooled and invested. Each agency's returns are based upon their share of the amount invested in the pool. This increases investment efficiencies, decreases costs, provides liquidity, and utilizes investment expertise of the pool managers.
Supranational	A supranational entity is formed by two or more central governments with the purpose of promoting economic development for the member countries. Supranational institutions finance their activities by issuing debt, such as supranational bonds. Examples of supranational institutions include the European Investment Bank and the World Bank. Similarly to the government bonds, the bonds issued by these institutions are considered direct obligations of the issuing nations and have a high credit rating.
Treasury Bill	A Treasury bill (T-Bill) is a short-term debt obligation backed by the Treasury Department of the U.S. government with a maturity of less than one year, sold in denominations of $1,000 up to a maximum purchase of $5 million. T-bills have various maturities and are issued at a discount from par.
Treasury Bond	A Treasury bond (T-Bond) is a marketable, fixed-interest U.S. government debt security with a maturity of more than 10 years. Treasury bonds make interest payments semi-annually, and the income received

Term	Description
	is only taxed at the federal level. Treasury bonds are known in the market as primarily risk-free; they are issued by the U.S. government with very little risk of default.
Treasury Note	A Treasury note is a marketable U.S. government debt security with a fixed interest rate and a maturity between one and ten years. Treasury notes are available from the government with either a competitive or noncompetitive bid. With a competitive bid, investors specify the yield they want, at the risk that their bid may not be approved; with a noncompetitive bid, investors accept whatever yield is determined at auction.
Treasury STRIPS	Treasury STRIPS are fixed-income securities sold at a significant discount to face value and offer no interest payments because they mature at par. STRIPS is an acronym for Separate Trading of Registered Interest and Principal of Securities. These zero-coupon bonds come about when the bond's coupons are separated from the bond or note; and investor's return is determined by the difference between the purchase price and the bond's trading value, or face value if held to maturity.
Yield to Maturity	The rate of income return on an investment, minus any premium above par or plus any discount with the adjustment spread over the period from the date of the purchase to the date of maturity of the bond.

Metropolitan Transit System

Policies and Procedures No. 30

Board Approval: ~~11/10/2022~~11/14/2024

SUBJECT:

INVESTMENT POLICY

PURPOSE:

The purpose of this Investment Policy for the San Diego Metropolitan Transit System (MTS) is to provide guidance and direction for the prudent investment of MTS funds, and to foster the creation of a systematic and controlled investment process. The ultimate goal is to maximize the efficiency of MTS's cash management system, and to enhance the economic status of MTS while protecting the principal of its pooled cash. The initial step toward a prudent investment policy is to set out a clear statement of fundamental investment direction.

POLICY:

MTS's policy is to invest public funds in a prudent manner, providing capital preservation, adequate liquidity, and a market rate of return consistent with the constraints imposed by safety objectives and cash flow considerations. Also, MTS's policy is to conform to all applicable federal, state and local statutes governing the investment of public funds.

30.1 SCOPE

This Investment Policy applies to all surplus assets of MTS. Surplus funds are defined as those funds not required for the immediate necessities of MTS; such funds do not include pension/retirement trust funds. Bond proceeds will be governed by relevant bond documents.

30.2 PRUDENCE

The standard of prudence to be used for managing the MTS investment program is California Government Code Section 53600.3, the prudent investor standard, which states, "When investing, reinvesting, purchasing, acquiring, exchanging, selling, or managing public funds, a trustee shall act with care, skill, prudence, and diligence under the circumstances then prevailing, including, but not limited to, the general economic conditions and the anticipated needs of the agency, that a prudent person acting in a like capacity and familiarity with those matters would use in the conduct of funds of a like character and with like aims, to safeguard the principal and maintain the liquidity needs of the agency. Within the limitations of this section and considering individual

investments as part of an overall strategy, investments may be acquired as authorized by law."

MTS investment officers acting in accordance with written procedures and this Investment Policy, and exercising due diligence, shall be relieved of personal responsibility for an individual security's credit risk or market risk, provided deviations from expectations are reported in a timely fashion and appropriate action is taken to control adverse developments. All participants in the investment process shall act reasonably as custodians of the public trust.

30.3 RISK TOLERANCE

MTS recognizes that investment risks can result from issuer defaults, or various technical complications leading to temporary illiquidity.

1. Credit risk, defined as the risk of loss due to failure of the issuer of a security, shall be mitigated by investing in high grade securities and through issuer diversification.

2. Market risk, defined as market value fluctuations due to overall changes in market price and yield, shall be mitigated by maintaining appropriate asset diversification.

3. Interest rate risk, defined as bond market value fluctuations due to changes in interest rates, interest rate spreads, or the shape of the yield curve, shall be mitigated by maintaining an appropriate duration strategy and diversification of maturities.

4. Custodial credit risk, defined as the risk of loss due to the failure of the custodian, shall be mitigated by prudent custodian selection procedures and requirements, as described in Section 30.13 of this Policy.

30.4 OBJECTIVES

MTS strives to maintain in its investment portfolio 100% of all surplus funds, given daily and forecasted near-term cash flow needs. MTS funds shall be invested in accordance with all applicable policies and codes, State statutes, and Federal regulations, and in a manner designed to accomplish the following objectives, which are listed in priority order:

1. SAFETY. The safety and risk associated with an investment refers to the potential loss of principal, interest or a combination of those amounts. Safety of principal is the foremost objective of MTS's investment program, followed by liquidity and yield. Investments by MTS shall be undertaken in a manner that seeks to ensure the preservation of capital in the overall portfolio. MTS only operates in those investments that are considered very safe. Also, safety is ensured by diversification, which is required in order that potential losses on individual securities do not exceed income from the remainder of the portfolio.

2. LIQUIDITY. Liquidity refers to the ability to sell an investment at any given moment with a minimal chance of losing some portion of principal or interest. MTS's investment portfolio shall remain sufficiently liquid to meet all operating requirements that might be reasonably anticipated. MTS will maintain an adequate percentage of the portfolio in liquid short-term securities that can be converted to cash, if necessary, to meet disbursement requirements.

3. YIELD/RETURN. The portfolio shall be designed to attain a market rate of return throughout budgetary and economic cycles, taking into account the investment risk constraints and the cash flow characteristics of the portfolio, and State and local laws, regulations and resolutions that restrict the investment of short-term funds.

30.5 DELEGATION OF AUTHORITY

Management and oversight responsibility for MTS's investment program is delegated by the MTS Board of Directors (MTS Board) to the Chief Financial Officer, who shall establish procedures for the operation of the investment program, consistent with this Investment Policy. Such procedures will include appropriate delegation of authority to persons responsible for investment transactions. No person may engage in investment transactions except as provided under the terms of this Investment Policy and the procedures established by the Chief Financial Officer. The Chief Financial Officer is hereby delegated the authority from the MTS Board to:

1. Enter into agreements with MTS's financial depository in order to enable the Chief Financial Officer, or his/her designee, to execute investment transactions that will involve charges and credits to MTS's bank accounts.

2. Enter into banking arrangements with a third party bank trust department to facilitate the third-party safekeeping of MTS investments.

3. Establish operating procedures as deemed appropriate to operate an investment program consistent with this Investment Policy.

Upon the recommendation of the Chief Financial Officer, the MTS Board may engage the support services of outside investment advisors with respect to MTS's investment program, so long as it can be demonstrated that these services are expected to produce a net financial advantage or necessary financial protection of MTS's financial resources. Any investment advisor utilized by MTS should be registered with the Securities and Exchange Commission under the Investment Advisors Act of 1940, and shall operate in a manner consistent with this Investment Policy and other written instructions as provided.

30.6 ETHICS AND CONFLICT OF INTEREST

1. The Chief Financial Officer and all personnel involved in the investment process shall refrain from personal business activities that could conflict with proper execution of the investment program and/or which could impair their ability to make impartial investment decisions. MTS officers and employees involved in

the investment process shall abide by MTS's Conflict of Interest Code, California Government Code Section 1090 et seq., and the California Political Reform Act (California Government Code Section 81000 et seq.). The Chief Financial Officer and all responsible personnel shall disclose to the MTS Board any material financial interests in any financial institutions that conduct business with MTS that could be related in a conflicting manner to MTS's investment portfolio performance.

2. MTS officers and employees involved in the investment process shall disclose to the MTS Board any material financial interests in any financial institutions that conduct business with MTS which could be related in a conflicting manner to the performance of MTS's investment portfolio. Additionally, the Chief Financial Officer and all investment personnel designated by the Chief Financial Officer shall file a Statement of Economic Interests each year as required by California Government Code Section 87203 and regulations of the Fair Political Practices Commission.

30.7 AUTHORIZED BROKER/DEALERS

1. It is expected, though not required, that most of MTS's investments will be made through pooled investment funds provided by a California State and/or County entity. Allowable pools are detailed in Sections 30.8.9 – 30.8.11, of this Investment Policy Statement. When/if direct security investments are made by MTS, MTS's procedures shall be designed to encourage multiple bids and offers on investment transactions from an approved list of broker/dealers in order to provide for the optimum yield in MTS's portfolio.

When/if making direct security investments, the Chief Financial Officer (or the Corporate Controller or the Director of Financial Planning and Analysis, if delegated) shall utilize a list of broker/dealers approved for investment purposes by the San Diego County Treasurer-Tax Collector's office. Purchases of investments through brokers, dealers, and financial institutions shall be permitted as stated in California Government Code Section 53635.5. Each approved broker/dealer must possess an authorizing certificate from the California Commissioner of Corporations as required by Section 25210 of the California Corporations Code. The firms they represent must:

(a) be recognized as a Primary Dealer by the Federal Reserve Bank of New York or have a primary dealer within its holding company structure, or;

(b) Report voluntarily to the Federal Reserve Bank of New York, or

(c) Qualify under Securities and Exchange Commission (SEC) Rule 15c3-1 (Uniform Net Capital Rule).

2. If MTS utilizes an external investment advisor, the Chief Financial Officer may approve a list of authorized broker/dealers provided by the investment advisor.

30.8 AUTHORIZED AND SUITABLE INVESTMENTS

All investments and deposits of MTS assets shall be made in accordance with California Government Code Sections 16429.1, 53600-53609 and 53630-53686. Although the following includes authorized investments, the Chief Financial Officer shall determine the extent to which they are suitable based upon this Investment Policy and the resources used by the Chief Financial Officer in implementing it. This suitability determination shall include an examination of the Investment Policy Statements of utilized pooled investment funds to ensure that they are consistent with MTS's Policy.

Limitations identified in the following sections shall be adhered to and the percentage limits and credit criteria shall be measured against portfolio value on the date the investment is purchased. In the event of a credit downgrade below the minimum acceptable credit rating, MTS shall require investment advisors engaged in the investing of MTS funds to notify MTS staff of the downgrade, and provide a plan of action to address the downgrade.

The list of authorized investments, and the limitations associated with those investments are detailed in Figure 1 attached to this Investment Policy Statement; Figure 1 is taken from the 20244~~2~~ version of "Local Agency Investment Guidelines," published by the California Debt and Investment Advisory Commission. The authorized investments and associated limitations are as follows:

1. United States Treasury bills, notes, bonds, or strips with a final maturity not exceeding five years from the date of trade settlement.

2. Federal Agency or U.S. government-sponsored enterprise obligations, participations, or other instruments, including those issued by or fully guaranteed as to principal and interest by Federal agencies or U.S. government-sponsored enterprises with maturities not exceeding five years from the date of trade settlement. There is no limit on the percentage of U.S. Treasury, Federal Agency, or U.S. government-sponsored enterprise obligations that may be held in MTS's portfolio.

3. Eligible Banker's Acceptances with a maturity not exceeding 180 days from the date of trade settlement, drawn on or accepted by a FDIC insured commercial bank with combined capital and surplus of at least $250 million, rated in a rating category of A-1, its equivalent, or higher by a nationally recognized statistical rating organization (NRSRO) at the time of purchase and whose senior long-term debt is rated in a rating category of "A", its equivalent, or higher by a NRSRO at the time of purchase. No more than 5% of MTS's total portfolio shall be invested in banker's acceptances of any one issuer, and the aggregate investment in banker's acceptances shall not exceed 40% of MTS's total portfolio.

4. Prime Commercial Paper (CP) with a maturity not exceeding 270 days from the date of trade settlement with the highest ranking or of the highest letter and number rating as provided for by a NRSRO. The entity issuing the commercial

paper shall meet all of the following conditions in either sub-paragraph A. or sub-paragraph B. below:

(a) The entity shall (1) be organized and operating in the United States as a general corporation, (2) have total assets in excess of $500,000,000 and (3) have debt other than commercial paper, if any, that is rated in a rating category of “A”, its equivalent, or higher by a NRSRO.

(b) The entity shall (1) be organized within the United States as a special purpose corporation, trust, or limited liability company, (2) have program wide credit enhancements, including, but not limited to, over collateralization, letters of credit or surety bond and (3) have commercial paper that is rated in a rating category of A-1, its equivalent, or higher, by a NRSRO.

No more than 5% of MTS’s total portfolio shall be invested in the commercial paper of any one issuer, the maximum exposure to a single issuer shall be 10% of total portfolio value inclusive of any other non-CP investments with said issuer, and MTS shall not purchase more than 10% of the outstanding commercial paper of any single issuer. The aggregate non-pooled fund investment in commercial paper shall not exceed 25% of MTS’s total portfolio. Pooled fund commercial paper investments shall not exceed 40% of MTS’s total portfolio, and the combined pooled fund and non-pooled fund investment in commercial paper shall also not exceed 40% of MTS’ total portfolio.

5. Non-negotiable certificates of deposit (CD) with a final maturity not exceeding five years and meeting the conditions in either paragraph (a) or paragraph (b) below:

(a) Certificates of deposit shall meet the requirements for deposit under California Government Code Section 53630 et seq. To be eligible to receive MTS deposits, the financial institution must meet the requirements of California Government Code Section 53635.2. Deposits are required to be collateralized as specified under California Government Code Section 53630 et seq. The Chief Financial Officer, at his or her discretion, may waive the collateralization requirements for any portion that is covered by federal deposit insurance. MTS shall also have a signed agreement with the depository per California Government Code Section 53649.

(b) Certificates of deposit placed through a deposit placement service shall meet the requirements of Government Code Section 53601.8. The full amount of the principal and the interest that may be accrued during the maximum term of each certificate of deposit shall at all times be insured by federal deposit insurance.

No more than 5% of the portfolio shall be held in any one non-negotiable certificate of deposit or allocated to any one issuer, the maximum exposure to a single issuer shall be 10% of total portfolio value inclusive of any other non-CD

investments with said issuer, and the aggregate investment in non-negotiable certificates of deposit and negotiable certificates of deposit shall not exceed 30% of MTS's total portfolio.

6. Negotiable Certificates of Deposit with a final maturity not exceeding five years issued by a nationally or state-chartered bank, a savings association or a federal association (as defined by Section 5102 of the Financial Code), a state or federal credit union, or by a federally- or state-licensed branch of a foreign bank. Negotiable CD issuers must be rated in a rating category of "A", its equivalent, or higher by two NRSROs.

   No more than 10% of the portfolio shall be held in any one negotiable certificate of deposit or allocated to any one issuer, the maximum exposure to a single issuer shall be 10% of total portfolio value inclusive of any other non-CD investments with said issuer, and the aggregate investment in non-negotiable certificates of deposit and negotiable certificates of deposit shall not exceed 30% of MTS's total portfolio.

7. Repurchase Agreements with a final termination date not exceeding 1 year collateralized by U.S. Treasury obligations, Federal Agency securities, or Federal Instrumentality securities listed in Sections 30.8.1 and 30.8.2 above with the maturity of the collateral not exceeding ten years. For the purpose of this section, the term collateral shall mean purchased securities under the terms of MTS's approved Master Repurchase Agreement. The purchased securities shall have a minimum market value including accrued interest of 102% of the dollar value of the funds borrowed. Collateral shall be held in MTS's custodian bank, as safekeeping agent, and the market value of the collateral securities shall be marked-to-market daily.

   Repurchase Agreements shall be entered into only with broker/dealers who are recognized as Primary Dealers with the Federal Reserve Bank of New York or with firms that have a primary dealer within their holding company structure. Repurchase agreement counterparties shall execute an MTS-approved Master Repurchase Agreement with MTS. The Chief Financial Officer shall maintain a copy of MTS's approved Master Repurchase Agreement along with a list of the broker/dealers who have executed such an agreement.

   The Repurchase Agreement exposure to a single broker/dealer shall not exceed 10% of MTS's total portfolio when the dollar-weighted average Repurchase Agreement maturity is greater than 5 days, or 15% of MTS's total portfolio when the dollar-weighted average Repurchase Agreement maturity is 5 days or less. Maximum Repurchase Agreement exposure shall not exceed 40% of MTS's total portfolio.

8. Reverse Repurchase Agreements may only be directly utilized after prior approval by the MTS Board, or indirectly utilized as a permitted investment by the California Local Agency Investment Fund, the San Diego County Treasurer's Pooled Money Fund, or a Joint Powers Authority Pool.

If an MTS Reverse Repurchase Agreement is authorized by the MTS Board, it may only be utilized if: 1) the security to be sold has been owned and fully paid for by MTS for a minimum of 30 days prior to the sale; 2) the total of all Reverse Repurchase Agreements does not exceed 20% of the value of the total MTS portfolio; and 3) the agreement does not exceed a term of 92 days unless the agreement includes a written codicil guaranteeing a minimum earning or spread for the entire period between the sale of the security using a Reverse Repurchase Agreement and the final maturity of the same security. The proceeds of the Reverse Repurchase Agreement may not be invested in securities whose maturity exceeds the term of the Reverse Repurchase Agreement.

Reverse Repurchase Agreements shall be entered into only with broker/dealers who are recognized as Primary Dealers with the Federal Reserve Bank of New York or with firms that have a primary dealer within their holding company structure. Reverse Repurchase Agreement counterparties shall execute an MTS-approved Master Repurchase Agreement with MTS. The Chief Financial Officer shall maintain a copy of MTS's approved Master Repurchase Agreement along with a list of the broker/dealers who have executed such an agreement.

The Reverse Repurchase Agreement exposure to a single broker-dealer shall not exceed 10% of MTS's total portfolio.

9. State of California's Local Agency Investment Fund (LAIF), pursuant to California Government Code Section 16429.1. There is no limit on the percentage of MTS's portfolio that may be invested in LAIF, though LAIF may impose statutory limits.

10. The San Diego County Treasurer's Pooled Money Fund (SDPMF). There is no limit on the percentage of MTS's total portfolio that may be invested in SDPMF.

11. A Joint Powers Authority Pool (JPAP), pursuant to California Government Code Section 53601(p) as long as the portfolio is rated among the top two rating categories by a NRSRO. Such a pool must retain an investment advisor who is registered with the SEC (or exempt from registration), has assets under management of at least $500,000,000, and has at least five years of experience investing in instruments authorized by Section 53601(a-o). Examples of such pools include, but are not limited to, those offered by the California Asset Management Program (CAMP) and the Investment Trust of California (CalTrust). There is no limit on the percentage of JPAPs which offer daily (same-day) liquidity that may be held in MTS's portfolio; however, the aggregate investment in any JPAPs which do not offer daily liquidity shall not exceed 2.5% of MTS's total portfolio.

12. Medium Term Notes (MTN) issued by corporations organized and operating within the United States or by depository institutions licensed by the United States or any state and operating within the United States with a final maturity not exceeding five years from the date of trade settlement. These notes must be rated in a rating category of "A", its equivalent, or higher by a NRSRO.

No more than 10% of MTS's total portfolio shall be invested in medium term notes of any one issuer, the maximum exposure to a single issuer shall be 10% of total portfolio value inclusive of any other non-MTN investments with said issuer, and the aggregate investment in medium term notes shall not exceed 30% of MTS's total portfolio.

13. Money Market Funds registered under the Investment Company Act of 1940 that 1) are "no-load" (meaning no commission or fee shall be charged on purchases or sales of shares); 2) have a constant net asset value per share of $1.00; 3) invest only in the securities and obligations authorized by State statute and 4) have attained the highest ranking or the highest letter and numerical rating provided by at least two NRSROs, or retained an investment advisor registered or exempt from registration (such as a bank holding company regulated by the Federal Deposit Insurance Corporation) with the Securities and Exchange Commission with not less than five years' experience managing money market mutual funds with assets under management in excess of $500,000,000.

    No more than 10% of MTS's total portfolio shall be invested in money market funds of any one issuer, and the aggregate investment in money market funds shall not exceed 20% of MTS's total portfolio.

14. Municipal bonds that are listed below with a final maturity not exceeding five years from the date of trade settlement and that must be rated in a rating category of "A," its equivalent, or higher by a NRSRO at the time of purchase. No more than 5% of MTS's total portfolio shall be invested in any single issuer, and the aggregate investment in municipal bonds shall not exceed 30% of MTS's total portfolio.

    (a) Bonds issued by MTS, including bonds payable solely out of the revenues from a revenue-producing property owned, controlled, or operated by MTS or by a department, board, agency, or authority of MTS.

    (b) Registered State warrants or treasury notes or bonds of the State of California, including bonds payable solely out of the revenues from a revenue-producing property owned, controlled, or operated by the State or by a department, board, agency, or authority of the State.

    (c) Bonds, notes, warrants, or other evidences of indebtedness of a local agency within California, including bonds payable solely out of the revenues from a revenue-producing property owned, controlled, or operated by the local agency, or by a department, board, agency, or authority of the local agency.

    (d) Registered treasury notes or bonds of any of the other 49 states in addition to California, including bonds payable solely out of the revenues from a revenue-producing property owned, controlled, or operated by a state or by a department, board, agency, or authority of any of the other 49 states, in addition to California.

15. Supranationals, which are United States dollar denominated senior unsecured unsubordinated obligations issued or unconditionally guaranteed by the International Bank for Reconstruction and Development (IBRD), International Finance Corporation (IFC), or Inter-American Development Bank (IADB), with a maximum remaining maturity of five years or less, and eligible for purchase and sale within the United States.

    Investments under this subdivision shall be rated in the rating category of "AA," its equivalent, or better by at least one NRSRO. Purchases of supranational shall not exceed 30% of the investment portfolio of MTS, and the exposure to a single supranational issuer shall not exceed 10% of the investment portfolio of MTS.

16. Mortgage pass-through securities, collateralized mortgage obligations, mortgage-backed or other pay-through bonds, equipment lease-backed certificates, consumer receivable pass-through certificates, or consumer receivable-backed bonds ~~with a maximum maturity of five years~~. For s~~S~~ecurities eligible for investment under this subdivision not issued or guaranteed by an agency or issuer identified in Sections 53601(b) or 53601(f) of the California Government Code, the following limitations apply: ~~shall be issued by an issuer in a rating category of "A," its equivalent, or better for the issuer's debt as provided by a NRSRO, and~~ the individual security must be rated in a category of "AA," its equivalent, or better by at least one NRSRO and have a maximum remaining maturity of five years or less; and ~~. P~~purchases of securities authorized by this subdivision may not exceed 20% of MTS's total portfolio.

17. Commercial paper, debt securities, or other obligations of a public bank, as defined in Section 57600 of the California Government Code.

30.9 PROHIBITED INVESTMENTS

In accordance with Section 53601.6 of the California Government Code, MTS shall not invest any funds in inverse floaters, range notes or mortgage-derived interest-only strips, or in any security that could result in zero-interest accrual if held to maturity, with the following exception: in accordance with Section 53601.6(b)(2), MTS may invest in securities issued by, or backed by, the United States government that could result in zero- or negative-interest accrual if held to maturity, in the event of, and for the duration of, a period of negative market interest rates.

30.10 INVESTMENT POOLS

MTS allows investments in public agency investment pools (per Sections 30.8.9 – 30.8.11). Although many of these pools are long-standing, the Chief Financial Officer will annually obtain operating information from each utilized pool which includes the information detailed in Section 30.15 of this Investment Policy Statement.

30.11 MATURITY

MTS will not invest in instruments whose maturities exceed five years at the time of trade settlement unless the MTS Board has provided approval for a specific purpose at least three months before the investment is made. The Chief Financial Officer shall be responsible for determining and monitoring an average maturity which meets MTS's projected cash flow requirements and shall be reported to the MTS Board as required under State Law. The average duration of any externally managed fund utilized by MTS shall not exceed 150 percent of the duration of the appropriate benchmark for that fund.

30.12. SELECTION OF DEPOSITORIES

The Chief Financial Officer shall only utilize FDIC insured banks eligible to provide depository and other banking services for MTS. To be eligible, a bank must qualify as a depository of public funds in the State of California as defined in California Government Code Section 53630.5 and shall secure deposits in excess of FDIC insurance coverage in accordance with California Government Code Section 53652.

30.13. SAFEKEEPING & CUSTODY

The Chief Financial Officer may select one or more banks to provide third-party safekeeping and custodial services for MTS, in accordance with the provisions of Section 53608 of the California Government Code. A Safekeeping Agreement approved by MTS shall be executed with each custodian bank prior to utilizing that bank's safekeeping services. Custodian banks will be selected on the basis of their ability to provide services for MTS's account and the competitive pricing of their safekeeping related services.

The purchase and sale of securities and repurchase agreement transactions shall be settled on a delivery versus payment basis. All securities shall be held in the name of MTS, with sufficient evidence to title consistent with modern investment, banking and commercial practices.

All investment securities, except non-negotiable certificates of deposit, money market funds, and public agency investment pools, purchased by MTS will be delivered by book entry and will be held in third-party safekeeping by an MTS-approved custodian bank or its Depository Trust Company (DTC) participant account.

All Fed wireable book entry securities owned by MTS shall be held in the Federal Reserve System in a customer account for the custodian bank which will name MTS as "customer."

All DTC eligible securities shall be held in the custodian bank's DTC participant account and the custodian bank shall provide evidence that the securities are held for MTS as "customer."

30.14. DIVERSIFICATION

MTS shall diversify its investments to avoid incurring unreasonable risks inherent in over investing in specific instruments, individual financial institutions or maturities. Nevertheless, the asset allocation in the portfolio should be managed depending upon the outlook for the economy, the securities markets, and MTS's anticipated cash flow needs.

30.15. REPORTING

Quarterly, the Chief Financial Officer shall submit to the MTS Board a report of the investment earnings and performance results of MTS's investment portfolio. The report shall be submitted within 60 days following the end of the quarter, and shall include the following information for each individual investment:

1. Investment type, issuer, purchase date (trade and settlement), date of maturity, par value, purchase price and dollar amount invested in all securities, and investments and monies held by MTS;

2. A description of the funds, investments and programs;

3. A market value as of the date of the report (or the most recent valuation as to assets not valued monthly) and the source of the valuation;

4. Current period yield (based on cost) and rates of return for short-term and mid-term investments, including comparison to established benchmarks;

5. A statement of compliance with this Investment Policy or an explanation for non-compliance; and

6. A statement of MTS's ability to meet expenditure requirements for six months, and an explanation of why money will not be available if that is the case.

For investments in authorized investment pools, the most recent statement received from these pools may be used in lieu of the information listed above.

30.16 INTERNAL CONTROLS

The Chief Financial Officer (or the Corporate Controller, or the Director of Financial Planning and Analysis, if delegated) shall establish a system of internal controls, which shall be documented in writing. The internal controls will be reviewed with both the outside independent auditor and MTS's internal auditor. The controls shall be designed to prevent loss of public funds arising from fraud, employee error, or misrepresentation by third parties, unanticipated changes in financial markets or imprudent actions by employees and officers of MTS. Controls deemed most important include: control of collusion, segregation of duties, separating transaction authority from accounting and record keeping, custodial safekeeping, clear delegation of authority, written (email or faxed allowable) confirmation of telephone transactions, documentation of transactions and strategies and code of ethical standards.

30.17 PERFORMANCE STANDARDS

The investment portfolio shall be designed to attain a market rate of return throughout budgetary and economic cycles, taking into account prevailing market conditions, risk constraints for eligible securities, and cash flow requirements. The performance of MTS's portfolio and any external investment managers shall be compared to appropriate benchmark indices.

30.18 REVIEW, ADOPTION & AMENDMENTS

This Investment Policy shall be reviewed biennially by the MTS Board. Such review shall include review of the "Summary of Statutory Changes" and Figure 1 (Allowable Investment Instruments per State Government Code) in the Local Agency Investment Guidelines. The MTS Investment Policy may not be altered, amended or changed in any particular way, except by formal approval of the MTS Board.

Attachments: Figure 1: Summary of California Code and MTS Policy
Table of Notes for Figure 1
Glossary of Investment Terms and Instruments

Original Policy accepted on 10/23/86.
Policy revised on 9/23/93.
Policy repealed and readopted 6/13/96.
Policy revised on 12/11/97.
Policy revised on 8/12/99.
Policy revised on 8/10/00.
Policy revised on 9/13/01.
Policy revised on 3/11/04.
Policy revised on 6/14/07.
Policy revised on 10/11/18.
Policy revised on 05/14/2020.
Policy revised on 12/16/2021.
Policy revised on 11/10/2022.
Policy Revised on 11/14/2024

Figure 1: Summary of California Code and MTS Policy

INVESTMENT TYPE	CA CODE MAXIMUM MATURITY[C]	CA CODE MAXIMUM SPECIFIED % OF PORTFOLIO[D]	CA CODE MINIMUM QUALITY REQUIREMENTS	MTS POLICY MAXIMUM SPECIFIED % OF PORTFOLIO[D]	MTS POLICY MINIMUM QUALITY REQUIREMENTS
Local Agency Bonds	5 years	None	None	**30%**	**"A" rating category or its equivalent or better**
U.S. Treasury Obligations	5 years	None	None	Same as CA Code	Same as CA Code
State Obligations—CA And Others	5 years	None	None	**30%**	**"A" rating category or its equivalent or better**
CA Local Agency Obligations	5 years	None	None	**30%**	**"A" rating category or its equivalent or better**
U.S Agency Obligations	5 years	None	None	Same as CA Code	Same as CA Code
Bankers' Acceptances	180 days	40%[E]	None	Same as CA Code	**"A-1" rating category or its equivalent or better**
Commercial Paper—Pooled Funds[I]	270 days	40% of the agency's money[G]	Highest letter and number rating by an NRSRO[H]	Same as CA Code	Same as CA Code
Commercial Paper—Non-Pooled Funds[F]	270 days	If investment assets <$100 million, 25% of the agency's money; if investment assets >$100 million, 40% of the agency's money[G]	Highest letter and number rating by an NRSRO[H]	**25%**	Same as CA Code
Negotiable Certificates of Deposit	5 years	30%J	None	Same as CA Code	**"A" rating category or its equivalent or better**
Non-negotiable Certificates of Deposit	5 years	None	None	**30%**	Same as CA Code
Placement Service Deposits	5 years	50%	None	**30%**	Same as CA Code
Placement Service Certificates of Deposit	5 years	50%	None	**30%**	Same as CA Code
Repurchase Agreements	1 year	None	None	**40%**	Same as CA Code
Reverse Repurchase Agreements & Securities Lending Agreements	92 days[L]	20% of the base value of the portfolio	None[M]	Same as CA Code	Same as CA Code
Medium-Term Notes[N]	5 years	30%	"A" rating category or its equivalent or better	Same as CA Code	Same as CA Code
Mutual Funds And Money Market Mutual Funds	N/A	20%	Multiple[P,Q]	Same as CA Code	Same as CA Code
Collateralized Bank DepositsR	5 years	None	None	Same as CA Code	Same as CA Code
Mortgage Pass–Through and Asset-Backed Securities[S]	5 years	20%	"AA" rating category or its equivalent or better[S]	Same as CA Code	Same as CA Code
County Pooled Investment Funds	N/A	None	None	Same as CA Code	Same as CA Code
Joint Powers Authority Pool	N/A	None	Multiple[S]T	**2.5% on Pools not offering daily liquidity**	Same as CA Code
Local Agency Investment Fund (LAIF)	N/A	None	None	Same as CA Code	Same as CA Code
Voluntary Investment Program Fund[T]U	N/A	None	None	Same as CA Code~~N/A – minimum investment is $200 million.~~	Same as CA Code~~N/A – minimum investment is $200 million~~.
Supranational Obligations[U]V	5 years	30%	"AA" rating category or its equivalent or better	Same as CA Code	Same as CA Code
Public Bank Obligations	5 years	None	None	Same as CA Code	Same as CA Code

TABLE OF NOTES FOR FIGURE 1

A. *Sources: Sections 16340, 16429.1, 27133, 53601, 53601.6, 53601.8, 53630 et seq., 53635, 53635.8, and 57603.*

B. *Municipal Utilities Districts have the authority under the Public Utilities Code Section 12871 to invest in certain securities not addressed here.*

C. *Section 53601 provides that the maximum term of any investment authorized under this section, unless otherwise stated, is five years. However, the legislative body may grant express authority to make investments either specifically or as a part of an investment program approved by the legislative body that exceeds this five year maturity limit. Such approval must be issued no less than three months prior to the purchase of any security exceeding the five-year limit.*

D. *Percentages apply to all portfolio investments regardless of source of funds. For instance, cash from a reverse repurchase agreement would be subject to the restrictions.*

E. *No more than 30 percent of the agency's money may be in bankers' acceptances of any one commercial bank.*

F. *Includes agencies defined as a "city, a district, or other local agency that do[es] not pool money in deposits or investment with other local agencies, other than local agencies that have the same governing body.*

G. *Local agencies, other than counties or a city and county, may purchase no more than 10 percent of the outstanding commercial paper and medium-term notes of any single issuer.*

H. *Issuing corporation must be organized and operating within the U.S., have assets in excess of $500 million, and debt other than commercial paper must be in a rating category of "A" or its equivalent or higher by a nationally recognized statistical rating organization, or the issuing corporation must be organized within the U.S. as a special purpose corporation, trust, or LLC, have program wide credit enhancements, and have commercial paper that is rated "A-1" or higher, or the equivalent, by a nationally recognized statistical rating agency.*

I. *Includes agencies defined as a county, a city and county, or other local agency "that pools money in deposits or investments with other local agencies, including local agencies that have the same governing body." Local agencies that pool exclusively with other local agencies that have the same governing body must adhere to the limits set forth in Section 53601(h)(2)(C).*

J. *No more than 30 percent of the agency's money may be in negotiable certificates of deposit that are authorized under Section 53601(i).*

K. *Effective January 1, 2020, no more than 50 percent of the agency's money may be invested in deposits, including certificates of deposit, through a placement service as authorized under 53601.8 (excludes negotiable certificates of deposit authorized under Section 53601(i)). On January 1, 2026, the maximum percentage of the portfolio reverts back to 30 percent. Investment made pursuant to 53635.8 remain subject to a maximum of 30 percent of the portfolio.*

L. *Reverse repurchase agreements or securities lending agreements may exceed the 92-day term if the agreement includes a written codicil guaranteeing a minimum earning or spread for the entire period be- tween the sale of a security using a reverse repurchase agreement or securities lending agreement and the final maturity dates of the same security.*

M. *Reverse repurchase agreements must be made with primary dealers of the Federal Reserve Bank of New York or with a nationally or state chartered bank that has a significant relationship with the local agency. The local agency must have held the securities used for the agreements for at least 30 days.*

N. *"Medium-term notes" are defined in Section 53601 as "all corporate and depository institution debt securities with a maximum remaining maturity of five years or less, issued by corporations organized and operating within the United States or by depository institutions licensed by the United States or any state and operating within the United States"*

O. *No more than 10 percent invested in any one mutual fund. This limitation does not apply to money market mutual funds.*

P. *A mutual fund must receive the highest ranking by not less than two nationally recognized rating agencies or the fund must retain an investment advisor who is registered with the SEC (or exempt from registration), have assets under management in excess of $500 million, and have at least five years' experience investing in instruments authorized by Sections 53601 and 53635.*

Q. *A money market mutual fund must receive the highest ranking by not less than two nationally recognized statistical rating organizations or retain an investment advisor registered with the SEC or exempt from registration and who has not less than five years' experience investing in money market instruments with assets under management in excess of $500 million.*

R. Investments in notes, bonds, or other obligations under Section 53601(n) require that collateral be placed into the custody of a trust company or the trust department of a bank that is not affiliated with the issuer of the secured obligation, among other specific collateral requirements.

~~*R.*~~*S. Security types authorized under Section 53601(o) that are issued or guaranteed by an issuer identified in subdivisions (b) or (f) are not subject to the limitations placed on privately issued securities authorized in Section 53601(o)(2)(A)(B).*

~~*S.*~~*T. A JPAP must retain an investment advisor who is registered with the SEC (or exempt from registration), has assets under management in excess of $500 million, and has at least five years' experience investing in instruments authorized by Section 53601, subdivisions (a) to (o).*

~~*T.*~~*U. Upon approval by their governing bodies, local entities can deposit $200 million to $10 billion into the ~~Volun-tary~~Voluntary Investment Program Fund. Deposits in the fund will be invested in the Pooled Money Investment Account.*

~~*U.*~~*V. Only those obligations issued or unconditionally guaranteed by the International Bank for Reconstruction and Devel-opment (IBRD), International Finance Corporation (IFC), and Inter-American Development Bank (IADB), with a maximum remaining maturity of five years or less.*

GLOSSARY OF INVESTMENT TERMS AND INSTRUMENTS

Term	Description
Banker's Acceptance	A short-term bill of exchange that is accepted as payment by banks engaged in financing physical asset or merchandise trade.
Benchmark	A passive index used to compare the performance, relative to risk and return, of an investor's portfolio.
Bond	A debt obligation of a firm or public entity. A bond represents the agreement to repay the debt in principal and, typically, in interest on the principal.
Broker/Dealer	A person or a firm who can act as a broker or a dealer depending on the transaction. A broker brings buyers and sellers together for a commission. They do not take a position. A dealer acts as a principal in all transactions, buying and selling for his own account.
CalTrust	The Investment Trust of California (CalTrust) is a Joint Powers Authority created by public agencies in 20035 to provide a convenient method for public agencies to pool their assets for investment purposes. CalTrust is governed by a Board of Trustees made up of experienced local agency treasurers and investment officers. CalTrust offers Government, Short-Term, Medium-Term, and Money Market funds managed by BlackRockState Street Global Advisors. The Money Market and Government funds offers daily (same-day) liquidity. All CalTrust accounts comply with the limits and restrictions placed on local investments by California statutes.
CAMP	The California Asset Management Program (CAMP) is a California Joint Powers Authority established in 1989 to provide California public agencies, together with any bond trustee acting on behalf of such public agency, assistance with the investment of and accounting for bond proceeds and surplus funds. The CAMP Pool is a short-term money market and cash management vehicle managed by PFM Asset Management LLC. The Pool seeks to attain as high a level of current income as is consistent with the preservation of principal. It seeks to maintain a constant Net Asset Value of $1 per share and a dollar-weighted average portfolio maturity of 60 days or less. The Pool purchases only investments of the type in which public agencies are permitted by statute to invest surplus funds and proceeds of their own bonds.
Cash Flow	A comparison of cash receipts (revenues) to required payments (debt service, operating expenses, etc.).
Certificate of Deposit	A short-term, secured deposit in a financial institution that usually returns principal and interest to the lender at the end of the loan period. Certificates of Deposits (CDs) differ in terms of collateralization and marketability. Those appropriate to public agency investing include:

Term	Description
	Negotiable Certificates of Deposit, Non-Negotiable Certificates of Deposit.
Commercial Paper	A short-term, unsecured promissory note issued by a corporation. Prime paper includes those having Moody's ratings of P-3 and above.
Corporate Notes & Bonds	Debt instruments, typically unsecured, issued by corporations, with original maturities in most cases greater than one year and less than ten years.
Credit Risk	The chance that an issuer will be unable to make scheduled payments of interest and principal on an outstanding obligation. Another concern for investors is that the market's perception of a corporation's credit will cause the market value of a security to fall, even if default is not expected.
Credit Rating	Various alphabetical and numerical designations used by institutional investors, Wall Street underwriters, and commercial rating companies to give relative indications of bond and note creditworthiness. Standard & Poor's and Fitch Ratings use the same system, starting with their highest of "AAA, AA, A, BBB, BB, B, CCC, CC, C, and D" for default. Moody's Investor Services uses "Aaa, Aa, A, Baa, Ba, B, Caa, Ca, C, and D". Each of the services use pluses (+), minuses (-), or numerical modifiers to indicate steps within each category. The top four letter categories are considered investment grade ratings.
Duration	A fixed-income metric that measures the sensitivity of a bond or portfolio to changes in interest rates. A portfolio or security with a higher duration will experience larger changes in market value as interest rates change.
Federal Agency and Instrumentality Obligations	Obligations issued by a government sponsored entity or a federally regulated institution. Federal Agencies and U.S. Government Sponsored Enterprises are U.S. Government related organizations, the largest of which are government financial intermediaries assisting specific credit markets (housing, agriculture). They include: ▪ Federal Home Loan Banks (FHLB) ▪ Federal Home Loan Mortgage Corporation (FHLMC or "Freddie Mac") ▪ Federal National Mortgage Association (FNMA or "Fannie Mae") ▪ Federal Farm Credit Banks (FFCB) ▪ Student Loan Marketing Association (SLMA or "Sallie Mae") ▪ Tennessee Valley Authority (TVA)
Inverse Floater	An inverse floater is a bond or other type of debt whose coupon rate has an inverse relationship to a benchmark rate. An inverse floater adjusts its coupon payment as the interest rate changes.
Issuer	Any corporation, governmental unit, or financial institution that borrows money through the sale of securities.

Term	Description
Joint Powers Authority Pool	Joint Powers Authorities are legally created entities that allow two or more public agencies to jointly exercise common powers. Under California Government Code Section 6509.7, public agencies that have the authority to invest funds in their treasuries may, by agreement, jointly exercise that common power by issuing shares of beneficial interest to participating public agencies. Each share represents an equal proportionate interest in the underlying pool of securities owned by the Joint Powers Authority.
LAIF	The Local Agency Investment Fund (LAIF), a voluntary program created by statute, began in 1977 as an investment alternative for California's local governments and special districts and continues today under the State of California Treasurer's office. This program offers participating agencies the opportunity to participate in a major portfolio which daily invests hundreds of millions of dollars, using the investment expertise of the State Treasurer's Office Investment staff. The LAIF is part of the Pooled Money Investment Account (PMIA), which began in 1955 and is overseen by a Board and an Investment Committee. The Local Investment Advisory Board provides oversight for LAIF. All securities are purchased under the authority of the Government Code Section 16430 and 16480.4. The State Treasurer's Office takes delivery of all securities purchased on a delivery versus payment basis using a third party custodian. All investments are purchased at market, and market valuation is conducted monthly. Deposits are subject to statutory limits.
Liquidity	The ease with which an investment may be converted to cash, either by selling it in the secondary market or by demanding its repurchase pursuant to a put or other prearranged agreement with the issuer or another party.
Market Risk	The chance that the value of a security will decline as interest rates rise. In general, as interest rates fall, prices of fixed income securities rise. Similarly, as interest rates rise, prices fall. Market risk also is referred to as systematic risk or risk that affects all securities within an asset class similarly.
Maturity	The stated date on which all or a stated portion of the principal amount of a security becomes due and payable.
Money Market Fund	A type of investment comprising a variety of short-term securities with high quality and high liquidity. The fund provides interest to shareholders and must strive to maintain a stable net asset value (NAV) of $1 per share.
Mortgage – Derived Interest only (IO) Strips	Mortgage-derived Interest only (IO) strips are a security where the holder receives a non-principal portion of the payments on the underlying mortgages. An interest only strip is created by separating the principal and interest portions of the payments on the underlying loan pool and

Term	Description
	selling them as distinct products. The process of separating the payments on the underlying debts is known as stripping. Although interest only strips can be created out of any debt-backed security that generates periodic payment, the term is strongly associated with mortgage-backed securities (MBS). The mortgage-backed securities that go through the process that separates the interest and principal payment streams are referred to as stripped MBS. The investor in the interest only stream benefits when prepayment rate on the underlying debt is low and interest rates are rising.
Nationally Recognized Statistical Rating Organization (NRSRO)	The formal term to describe credit rating agencies that provide credit ratings that are used by the U.S. government in several regulatory areas. Ratings provided by Nationally Recognized Statistical Ratings Organizations (NRSRO) are used frequently by investors and are used as benchmarks by federal and state agencies. Generally, to be considered an NRSRO, the agency has to be “nationally recognized” in the U.S. and provide reliable and credible ratings. Also taken into consideration is the size of the credit rating agency, operational capability and its credit rating process. Some examples of NRSRO’s include Moody’s Investors Service Inc., Standard and Poor’s Inc., Fitch Inc., Dominion Bond Rating Services Limited (DBRS) and A.M. Best Company Inc.
Notes	Debt obligations of a firm or public entity, usually maturing in less than ten years.
Pass-Through Security	A pass-through security is a security backed by a pool of mortgage loans or other debt instruments that provides the holder with the cash flow from the mortgage/debt payments. This income is passed through from the debtor to the investor by the financial institution or government agency issuing the security. The income payments are derived from and collateralized (or "backed") by a specified pool of underlying assets which are receivables. Pooling the assets into financial instruments allows them to be sold to general investors, a process called securitization, and allows the risk of investing in the underlying assets to be diversified because each security will represent a fraction of the total value of the diverse pool of underlying assets. The pools of underlying assets can comprise common payments such as credit cards, auto loans, mortgage loans, and other types of assets. Interest and principal is paid to investors from borrowers who are paying down their debt.
Portfolio	The combined holdings of all of an investor’s investment assets.
Public Bank	A corporation organized under the Nonprofit Mutual Benefit Corporation Law or the Nonprofit Public Benefit Corporation Law for the purpose of engaging in the commercial banking business or industrial banking business that is wholly owned by a local agency or agencies, or a Joint Powers Authority.

Term	Description
Range Accrual Note	A range accrual note is a type of financial derivative product where the earning, or accrual, of the coupon rate, depends on the value of an index. The index could be an interest rate, currency exchange rate, the price of a commodity or stock index. If the index value falls within a specified range, the coupon accrues or is credited, interest. If the index value falls outside of the specified range, the coupon rate does not accumulate.
Repurchase Agreement	From the perspective of a local agency, the short-term, often overnight, purchase of securities with an agreement to resell the securities to the counterparty seller on or before a specified date at an agreed upon price.
Reverse Repurchase Agreement	From the perspective of a local agency, the sale of securities with an agreement to repurchase the securities from the counterparty buyer on or before a specified date at a specified price.
Return	The principal gains or losses (realized and unrealized) plus interest on an investment or portfolio of investments. In certain unfavorable market environments or due to risk factors, income derived from principal and interest may be less than the original amount invested.
Risk	The uncertainty of maintaining the principal or interest associated with an investment due to a variety of factors.
State & Local Investment Pools	The combined deposits of state and local agencies organized and operated by the state treasurer or a Joint Powers Agreement between local agencies. Deposits of various participating local agencies are pooled and invested. Each agency's returns are based upon their share of the amount invested in the pool. This increases investment efficiencies, decreases costs, provides liquidity, and utilizes investment expertise of the pool managers.
Supranational	A supranational entity is formed by two or more central governments with the purpose of promoting economic development for the member countries. Supranational institutions finance their activities by issuing debt, such as supranational bonds. Examples of supranational institutions include the European Investment Bank and the World Bank. Similarly to the government bonds, the bonds issued by these institutions are considered direct obligations of the issuing nations and have a high credit rating.
Treasury Bill	A Treasury bill (T-Bill) is a short-term debt obligation backed by the Treasury Department of the U.S. government with a maturity of less than one year, sold in denominations of $1,000 up to a maximum purchase of $5 million. T-bills have various maturities and are issued at a discount from par.
Treasury Bond	A Treasury bond (T-Bond) is a marketable, fixed-interest U.S. government debt security with a maturity of more than 10 years. Treasury bonds make interest payments semi-annually, and the income received

Term	Description
	is only taxed at the federal level. Treasury bonds are known in the market as primarily risk-free; they are issued by the U.S. government with very little risk of default.
Treasury Note	A Treasury note is a marketable U.S. government debt security with a fixed interest rate and a maturity between one and ten years. Treasury notes are available from the government with either a competitive or noncompetitive bid. With a competitive bid, investors specify the yield they want, at the risk that their bid may not be approved; with a noncompetitive bid, investors accept whatever yield is determined at auction.
Treasury STRIPS	Treasury STRIPS are fixed-income securities sold at a significant discount to face value and offer no interest payments because they mature at par. STRIPS is an acronym for Separate Trading of Registered Interest and Principal of Securities. These zero-coupon bonds come about when the bond's coupons are separated from the bond or note; and investor's return is determined by the difference between the purchase price and the bond's trading value, or face value if held to maturity.
Yield to Maturity	The rate of income return on an investment, minus any premium above par or plus any discount with the adjustment spread over the period from the date of the purchase to the date of maturity of the bond.

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 16

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

Orange Line Improvement Project Phases 1 & 2 – Overhead Contact System (OCS) Poles – Contract Award

AGENDA ITEM WILL BE PROVIDED BEFORE BOARD MEETING

1255 Imperial Avenue, Suite 1000, San Diego, CA 92101-7490 • (619) 231-1466 • sdmts.com

Metropolitan Transit System

DRAFT FOR EXECUTIVE COMMITTEE REVIEW DATE: 11/7/2024

Agenda Item No. 17

MEETING OF THE SAN DIEGO METROPOLITAN TRANSIT SYSTEM
BOARD OF DIRECTORS

November 14, 2024

SUBJECT:

66th Street Track Repair – Work Order Agreement

AGENDA ITEM WILL BE PROVIDED BEFORE BOARD MEETING

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