MARIN COUNTY, CALIFORNIA

VOLUME 3A

TECHNICAL SPECIFICATIONS FOR

SECONDARY TREATMENT AND RECYCLED WATER TREATMENT FACILITY UPGRADE
(a.k.a. Novato South Service Area/LGVSD-MMWD Recycled Water Project)

JOB NO. 12600-07/16650-02
SEPTEMBER 2017

FOR BIDDING PURPOSE ONLY

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DISTRICT BOARD

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Megan Clark – Vice President
Rabi Elias
Craig K. Murray
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Michael P. Cortez, PE – District Engineer
Greg Pease – Collection System/Safety Manager
Susan McGuire, CPA – Administrative Services Manager
Mel Liebmann – Plant Manager

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work under separate contracts.
5. Access to site.
6. Coordination with occupants.
7. Work restrictions.
8. Specification and drawing conventions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: LGVSD Secondary Treatment and RWTF Upgrade

1. Project Location: 300 Smith Ranch Road, San Rafael, California 94903

B. Owner: Las Gallinas Valley Sanitary District (LGVSD)

C. Engineers: AQUA Engineering, Justin Logan (801) 299-1327

1. Engineers have been engaged for this Project to provide engineering services and to serve as Project's coordinator.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The following list has been furnished for the convenience of the Contractor and shall not be considered as representing all Work required in the Contract Documents. Contractor shall not take advantage of any errors or omissions in this listing and shall report any discrepancies or questionable items to the Engineer for clarification. The Work of Project is defined by the Contract Documents and consists of the following:

1. The Mobilization of all equipment, labor, tools, and materials to and from the project site.
2. Site demolition and removal of existing equipment and/or infrastructure as indicated in the Contract Documents.

3. Construction of all site improvements as indicated in the Contract Documents.

4. Modification of the existing Headworks, including grit chamber modifications and installation of fiberglass covers over basins and channels and piping for odor control along with other miscellaneous items.

5. Installation of launder covers for three (3) existing primary clarifiers (and recoating of launders).


7. Partial demolition of primary biofilter and installation of new media and distributor mechanism for temporary treatment during construction of new process basins. Demolition of entire primary biofilter once new process basins are operable.

8. Construction of new primary pump station, EQ basin, anoxic basins, and aeration basins and installation of all associated equipment, pumps, pipes, valves, gates, and other related items.

9. Construction of new secondary clarifiers (refer to bid alternate items for reference to number of secondary clarifiers) including splitter structures, RAS collection structure, and all associated mechanisms, piping, valves, and other related items.

10. Construction of new UV building (including associated electrical room) include all foundations, concrete channels/structures, interior rooms/finishes, and all installation of all associated equipment, pumps, pipes, valves, gates, and other related items.

11. Modifications to existing chlorine contact chamber piping, water storage piping, and outfall structure.

12. Construction of new DAFT structure and mechanism, and modification of existing gravity thickener to incorporate new DAFT equipment. Construction includes associated EQ basins, effluent chambers, mechanisms, piping, valves, gates, and other items associated with the DAFTs.

13. Removal of deep bed filter sand media and associated equipment and modifications to existing structure to accommodate additional RWTF feed pumps and storm water drain pumps.


15. Installation of additional recycled water treatment facility (RWTF) feed pumps in existing concrete channel.

16. Installation of RWTF membrane skids in existing process building.

17. Installation of new feed pumps in existing wet well to transfer RWTF to chlorine chamber.
18. Installation of new recycled water distribution pumps.


20. Installation of new restroom building.

21. Other site modifications such as parking awning covers, equipment pads, gasoline/fuel tank pads.

22. Coordination with other potential projects that may be ongoing at the same time as this project including other hill cutes, excavation, site grading, and construction of other administration or auxiliary structures.

23. All associated site grading, yard piping, electrical, valving, paving, retaining walls, concrete walkways, and other appurtenances as indicated in the design drawings and specifications.

24. Coordination of all construction activities with plant operators to ensure the reliable and efficient operation of the plant during construction and transition to new processes. The WWTP is an active plant that must remain operational at all times.

25. Project Construction Survey – The Contractor shall be responsible to survey the location of all buried piping and fittings. The survey information shall be presented on the Record Drawings and each surveyed point shall have the Station, Offset, Elevation information and a brief description. The survey shall also include the verification of fixed weir elevations in the Bioreactor #1 influent box and SC#3 effluent weir. The survey shall be performed and data certified by a licensed surveyor in the State of California.

List above is intended to provide an overview of the major project components and does not include all work described in Contract Documents.

B. Type of Contract.

1. Project will be constructed under a single prime contract.

1.4 CONSTRUCTION DOCUMENTS

A. The Contractor may obtain copies of the construction documents as directed in Volume I, “Contract Documents.” Electronic copies of the existing plant drawings will be available to the successful Contractor through the same means. Please note that hard copies of “record drawings” or “as-constructed drawings” from previous construction projects are not available. The contractor may produce hard copies as they may require internally from the electronic files provided.

1.5 PHASED CONSTRUCTION

A. The Work shall be conducted in accordance to an approved Contractor Schedule.

1. Work on the project shall commence simultaneously with the Notice to Proceed and be substantially complete and ready for occupancy Eight Hundred and Seventy (870) days
after the Notice to Proceed. It is expected that the project will consist of several phases due to the need to keep the facility operational during the construction. Phasing of the project will require continuous coordination between the Plant staff and the Contractor as the plant needs to be operational during the construction.

B. Phases:

1. Phase 1 shall be completed in 270 days from the Notice to Proceed and consists of the following main activities:
   - Install and commission all pumps, membranes, piping, valves, electrical, and other items associated with the expanded RWTF. See Item #4 this section for more specific sequencing of the RWTF expansion.
   - Remove distributor arm and rock media from Primary Biofilter #1 and install new media and distributor arm.
   - Install temporary MCC3 and remove existing MCC3 building
   - Construct new Electrical Building.
   - Construct new Primary Pump Station.
   - Construct new DAFT structure, including EQ and thickened sludge storage, and install new DAFT equipment.
   - Relocate overhead power lines as indicated.
   - Existing Equipment Building – remove existing generator, install new electrical service, distribution panel, transfer switches, and new generator.
   - Preload UV Building area and new road.

2. Phase 2 shall be completed in 570 days from the Notice to Proceed and consists of the following main activities:
   - Demolition of MMWD recycled water plant.
   - Demolition of Secondary Biofilter.
   - Install new biogas flare and remove/relocate existing biogas flare.
   - Construction of Aeration Basin.
   - Construction of Secondary Clarifier #2.
   - Construction of UV building.
   - Construction of recycled water distribution pump station.
   - Complete tie-ins for RWTF distribution pumps and piping. See Item #4 this section for more specific sequencing of the RWTF expansion.
   - Partial installation/grading of new roadway and continued pre-loading or roadway sections that were not pre-loaded in Phase 1.

3. Phase 3 shall be completed in 870 days from the Notice to Proceed and consists of the following main activities:
   - Demolition of MCC9.
   - Deep bed filters are removed from service.
   - Demolition of MCC7.
   - Demolition of Primary Biofilter (including new media and mechanism).
   - Demolition of Secondary Clarifier #1 and fixed film reactor.
   - Demolition of Lab Building.
   - Construction of EQ basin and Anoxic Basins.
   - Construction of Secondary Clarifier #1 and #3 (note that #3 is a bid alternate item).
• Removal of Gravity Thickener mechanism from existing basin and removal temporary MCC3.
• Install launder covers on primary clarifiers and install odor control system and perform headworks modifications.
• Modify existing structure (gravity thickener) and install new DAFT mechanism.
• Construction of Public Restroom building.
• Construction of Storage Building.
• Construction of Solar Awning.
• Modifications to sludge storage decant pump station.
• Complete road grading and paving for new roadway.
• Remove fuel tank and install new fuel tank

4. The upgrade to the RWTF will require several critical tie-ins to combine what are currently two independent recycled water plants. In order to facilitate the conversion into a combined plant and minimize down-time for both MMWD and NMWD, the following steps outline key points and tie-ins in the anticipated order of their completion.

   a. While MMWD and NMWD continue to operate as currently installed (Phase 1):
      • Install new GE membrane skids and headers in the RWTF building.
      • Install new process piping in RWTF Process building to tie-in points (without completing tie-ins).
      • Install new membrane supply pumps in the DBF effluent channel (without completing tie-in to the main supply header that serves the existing supply pumps).
      • Install new pond return piping (16” & 12”) lines to tie-in point with existing 16” MMWD supply line from ponds (do not complete the tie-in with the 16” MMWD line at this time).
      • Install 18” MMWD clearwell supply line to tie-in point with existing MMWD clearwell supply line near the existing MMWD distribution pumps.
      • Remove one (1) NMWD distribution pump from the UV awning structure and install Phase 1 piping in the UV awning area. This will allow NMWD to continue supplying their 12” distribution line while new MMWD clearwell supply pumps are installed and brought online.
      • Install two (2) MMWD clearwell supply pumps in the RWTF UV wet well (one in the vacant spot and one to replace the NMWD pump that was removed). This allows one NMWD pump to continue furnishing water while two of the three MMWD clearwell supply pumps can be installed.

In summary, at the end of step ‘a’, MMWD will continue to operate its facility as normal (including supply and distribution pumps), NMWD will have one distribution pump only but otherwise operate as normal.

   b. Once all membranes, pumps, and piping listed above have been installed, some downtime will be required to complete the first round of tie-ins. (Phase 1):
      • Tie-in new 18” MMWD clearwell supply line to existing supply line near the MMWD distribution pumps. The existing MMWD distribution pumps must remain intact and operable.
      • Complete tie-ins for the new GE membrane skids inside the RWTF process building to existing process lines (skid supply, product/permeate, backwash, clean in place supply/return, air scour, drain, electrical, etc.).
• Complete tie-ins for the two (2) new membrane supply pumps installed in the DBF effluent channel – this will require that the membrane supply be offline for a while as the entire supply header must be offline.

• After these items are completed, the membrane supply pumps and RWTF process (membrane) building will be at full capacity. Two of the three MMWD clearwell supply pumps will be installed providing full supply pumping capacity to the clearwell (with no standby pump). MMWD will transition to use water from the expanded RWTF facility. MMWD will continue using its existing distribution pumps, but the rest of its plant can be taken offline and decommissioned. NMWD will continue to pump water from the UV awning wet well with no standby pump.

• **At this point, the RWTF will not be able to run at full (4.0 MGD) capacity!** The existing closed vessel UV disinfection system can only treat 1.6 MGD per vessel (total of 3.2 MGD). Thus, supply cannot exceed 3.2 MGD if NMWD will be supplying water from the RWTF UV wet well.

• It is recommended that chlorine be introduced at this point for MMWD water to the clearwell so that this disinfection system can be monitored and verified before it becomes the sole point of disinfection.

At the end of step ‘b’, the expanded RWTF membranes will supply water for NMWD and MMWD. Permeate from the membranes will pass through the existing closed vessel UV units to achieve disinfection and ensure that NMWD water still meets Title 22 standards. NMWD will continue to pump from the UV wet well, and the new MMWD clearwell supply pumps will furnish water to MMWD’s clearwell. Chlorine may be injected to test the clearwell and any new disinfection monitoring that is in place. MMWD’s plant can be abandoned except for the four (4) distribution pumps that must remain online to deliver water from their clearwell.

c. Once the items listed in parts a and b are complete, preparation for final transition can be completed. *(End of Phase 1/Early Phase 2)*:

• Construct new RWTF distribution pump station. This will include installing two (2) new MMWD distribution pumps and relocating/refitting the one (1) NMWD pump that was removed from the UV awning wet well. Construct the can and install piping to accommodate the second NMWD pump to be relocated once the other pumps are operating. **The electrical room in the UV building must be constructed and online in order to power the new distribution pump station.**

• Replace the pond return pumps and complete tie-ins for the pond return line with the existing 16” MMWD supply line (no longer needed by MMWD at this point).

• Install piping for the new 18” supply line from the MMWD clearwell to the new distribution pump station (do not complete tie into existing MMWD clearwell discharge piping yet).

• Install piping for new 18” MMWD distribution line from the new pump station to the tie-in point with the existing 18” distribution line (near the existing MMWD distribution pumps; do not complete tie-in with existing distribution line at this time).

• Install new NMWD distribution line from new distribution pump station, utilizing a portion of the abandoned 16” MMWD line, and install line to the
tie-in point with the existing 12” NMWD distribution line (do not complete tie-in to 12” line until the new pump station is operable).

At the end of step ‘c’, MMWD will still be delivering water from their old distribution pump station but will have two (2) new distribution pumps installed and ready to bring online at the new RWTF distribution pump station. The closed vessel UV units at the RWTF UV awning will still be the primary source of disinfection, and NMWD will have one active pump at the UV wet well, and one relocated pump at the new distribution pump center ready to bring online.

d. Once all of the piping and pumps listed for item c are installed to the tie-in points, final transition can be completed (Phase 2):
• Complete tie-in of the 18” MMWD distribution line to the new RWTF distribution pump station.
• Complete MMWD clearwell tank bypass valving/connections.
• Complete tie-in of 16” NMWD distribution line to existing 12” line.
• Relocate/retrofit second NMWD distribution pump from the RWTF UV wet well to the new distribution pump station.
• Bring new RWTF distribution pump station online (powered from adjacent UV building). This station can be operating with only one NMWD distribution pump installed if necessary. The second pump may be installed with minimal downtime to this pump station.
• Install third (backup) MMWD clearwell supply pump at the RWTF UV wet well (where the relocated NMWD distribution pump was previously installed).
• Remove existing MMWD distribution pumps and complete demolition of the old MMWD site.

At this point, the RWTF should be online and operating at full capacity. A less critical tasks such as connecting the 12” MMWD clearwell drain line may still remain.

C. The Contractor’s Schedule shall include work phases and completion dates. It shall also be coordinated with the phasing and sequencing plan. It is anticipated and expected that work on all Phases will begin with the Notice to Proceed and only the completion dates of these Phases will be different. Items in later phases may be completed earlier based on an approved Contractor Schedule.

D. The following paragraphs are provided as guidance to the Contractor with the intent of providing general information regarding the required sequencing of construction of individual processes and infrastructure. It is not the intent of the following paragraphs to identify all the work required to be in place for a given process to be Substantially Complete. Thus, items such as utility water connections, access roads, plant drain system, and process piping are not specifically listed and discussed. The Contractor is responsible for all coordination and scheduling with the plant manager and personnel. The Contractor shall verify that all processes are available before the start-up of the systems. Also, some of the process infrastructure may be constructed (but not Substantially Complete) simultaneously, or ahead of the identified process predecessors. It is noted that the guidelines may change upon a more detailed review of the scheduling. The Engineer is not responsible for scheduling the Contractor’s work.
1. Headworks
   - This work shall be coordinated with the District to ensure proper treatment can be achieved while the work is completed. If facilities are to be removed from service, it is desirable that this work occur during the dry season June through October when flows are typically lower. While this work is performed one grit chamber must remain in operation at all times.
   - Predecessors - The Odor Control System shall be commissioned and operational prior to covering the basins and connecting the odor control piping.

2. Equipment Building
   - Time sensitive work will be accomplished in this building in phase 1, mainly electrical work associated with a new power feed to the plant, service entrance section, transfer switch, generator and etc. The generator removal, building wall modifications, equipment pad modifications, and etc. shall be coordinated with the electrical work done in this area.
   - Predecessors – NA

3. Primary Clarifiers
   - Predecessors
     1) The Odor Control System shall be commissioned and operational prior to placing the launder covers.
     2) Coating of the launders and an optional (bid alternate item) to recoat the mechanisms is included.
     3) Regarding the electrical work associated with the change in power feed to PC#2 and PC#3, MCCAB must be commissioned and operational prior to removing the existing power feed from MCC9 and connecting to MCCAB. This work shall be coordinated with operations to ensure proper treatment can be achieved while the power feed change is accomplished.

4. Primary Pump Station
   - This work is to be performed in Phase 1.
   - Predecessors
     1) MCCAB shall be commissioned
     2) Parallel work will include modifications to the Primary Biofilter. Associated yard piping required to connect this structure to the primary clarifiers, both pipelines, and to the Primary Biofilter.

5. Primary Biofilter Modifications/Removal
   - The existing primary biofilter media and distributor will be removed and a new distributor and media will be installed as part of Phase 1. Phase 3 includes the final removal of this process.
   - Predecessors
     1) Isolation of the common effluent box between both biofilters must be completed to isolate the primary biofilter from the secondary biofilter.
     2) Phase 1 work will include parallel work with the Primary Pump Station (PPS) and piping modifications required to send return flow to the PPS and to the existing secondary clarifier.
     3) Phase 3 removal – The final removal of this work can be performed after the Aeration Basin, Secondary Clarifier #2 (SC#2), and UV/Bioassay Building are commissioned and operational.
6. Secondary Biofilter Removal
   - This work shall be performed in Phase 2.
   - Predecessors
     1) Primary Biofilter modification and commissioning.

7. EQ Basin
   - This work shall be performed in Phase 3.
   - Predecessors
     1) Primary Pump Station
     2) Aeration Basins
     3) Primary and Secondary Biofilter removal
     4) MCCAB

8. Anoxic Basin
   - This work shall be completed in Phase 3 (partial construction of these basins will be done in Phase 2).
   - Predecessors
     1) Primary Pump Station
     2) Aeration Basins
     3) Primary and Secondary Biofilter removal
     4) MCCAB

9. Aeration Basin
   - This work shall be performed in Phase 2.
   - Predecessors
     1) Primary Pump Station
     2) Secondary Biofilter removal
     3) MCCAB
     4) Parallel activities include SC#2, UV/Bioassay Building.

10. Secondary Clarifier #2
    - This work shall be performed in Phase 2.
    - Predecessors
      1) MMWD demolition
      2) MCCUV
      3) Parallel activities include UV Building, Aeration Basins

11. Secondary Clarifier #1 and #3
    - This work shall be performed in Phase 3.
    - Predecessors
      1) Fixed Film Reactor/MCC#9 Building Demolition
      2) MMWD Demolition
      3) Recycled Water Distribution Pump Station
      4) Existing secondary clarifier removal
      5) Aeration Basins, Primary Pump Station, UV Building, SC#2

12. Fixed Film Reactor Removal
    - This work shall be performed in Phase 3.
    - Predecessors
1) Primary Pump Station, Aeration Basins, UV Building, SC#2

13. UV Building
   • This work shall be performed in Phase 2.
   • Predecessors
     1) Preload of UV building area in Phase 1.
     2) Utility transformer relocation
     3) MMWD removal
     4) Parallel activities include Aeration Basins, SC#2, outfall connection

14. Recycled Water Distribution Pump Station
   • This work shall be completed in Phase 2 though some preliminary work may be done near the end of Phase 1.
   • Predecessors
     1) MCCUV
     2) Recycled Water Treatment Facility (RWTF) upgrades
   • This task must be completed before the existing MMWD distribution pump station, transformer, and MCC are removed from service.

15. Recycled Water Treatment Facility Upgrade
   • This work shall be completed in Phase 1.
   • Predecessors
     1) MCCAB

16. Odor Control System
   • Predecessors
     1) MCCHW

17. DAFT Thickening
   • DAFT #2 shall be installed during Phase 1; DAFT #1 (from the existing gravity thickener) shall be completed in Phase 3.
   • Predecessors
     1) MCCAB
     2) Primary Pump Station
     3) DAFT#2 shall be commissioned prior to the modifications and construction of DAFT#1.
     4) Aeration Basin, SC #2, UV Building (for DAFT #1).
     5) Awning and other adjacent removals in this area.

18. Biogas Flare Modifications
   • Predecessors
     1) MCCAB
   • New flare must be installed, commissioned, and operational prior to relocating the existing flare.

19. Lab Demolition
   • This work is schedule for Phase 3 of the construction and should not be started until the new Administration building is completed, part of a separate project.

20. MMWD Demolition
• Predecessors
  1) RWTF
• The distribution pump station and associated electrical gear shall remain in service even though the rest of the MMWD facility is removed. The pump station cannot be removed until the new recycled water pump station has been started up and fully commissioned.

21. Restroom Facility
• Predecessors
  1) Lab demolition
  2) MCCEBH

22. Electrical Building
• This work shall be completed in Phase 1.
• Predecessors
  1) Removal of MCC-3 and temporary power associated with it.
  2) New main power feed
  3) Distribution panel work in Equipment Building that will feed power to the Electrical Building

23. Overhead Power Relocation
• Predecessors
  1) This work must be coordinated with power utility and must occur at the beginning of Phase 1.

24. Electrical Building MCC9 Removal
• Predecessors
  1) SC#2 shall be commissioned.
  2) UV/Bioassay building and MCCUV shall be commissioned and operational.

25. Solar Awning
• This work can be completed at any time but shall be coordinated with electrical work associated with Phase 1.

26. Storage Building
• Predecessors
  1) Lab Building removal
  2) Overhead Power Relocation

E. The Contractor shall prepare and submit phasing/sequencing plans, prepared by a licensed engineer or Grade 5 operator, for all major areas of work prior to the commencement of the work in that area. These plans will detail and sequence the general work flow, tie-ins, electrical work, and also address maintaining plant operations and permit compliance. Plans shall be submitted to the Owner, Engineer, and Construction Manager for review and approval just like other submittals. Phasing/sequencing meetings may be required to work through more complicated areas and to insure coordination with plant operations. The contractor may use the individual process sequencing listed above as a basis to propose construction phasing/sequencing. Again, when developing the phasing/sequencing plan, the contractor shall evaluate other construction factors such as the requirement to keep the plant operational at all times and provide adequate access for plant operations and maintenance.
F. There will be several local tie-ins and shut downs in order to bring on-line new equipment and infrastructure. The contractor shall coordinate ahead of time local tie-ins and shut-downs with the Plant staff and will be responsible for planning and coordinating all aspects of the work. The Contractor is required to submit a detailed work plan for each shutdown or tie-in event.

G. While localized shut downs or bypassing may be required, the Plant shall continue to process influent flows and meet the current Water Discharge Permit (available upon request). It shall be the responsibility of the Contractor to ensure that each process maintains operability throughout the construction. All bypass pumping shall be provided with complete redundancy. The Contractor shall bear any fines associated with the failure to meet Water Discharge Permit requirements due to construction activities. The Contractor shall also be held liable for violations of applicable permits due to construction activities. The Contractor shall be held liable for damages resulting from sewage spills caused by improperly performed shutdowns and bypasses.

H. For each proposed bypass operation, the Contractor shall submit a bypass plan in accordance with Section 020960 of the Specifications. Prior to any bypassing, the plan must be approved by the Owner and Engineer. The Contractor shall be responsible for clean-up and repair of any damage caused during bypassing.

1.6 OWNER FURNISHED EQUIPMENT

There is no Owner Furnished Equipment associated with this project.

1.7 OWNER SELECTED EQUIPMENT

A. The Contractor shall be responsible to purchase, receive, offload, inspect, store, and install Owner Selected Equipment.

B. See specification section 151100 for additional requirements and details.

1.8 ACCESS TO SITE

A. General: Contractor shall have full use of Project site, defined as the limits of construction, for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors for work on the site or facilities. Owner will inform the contractor of areas that are essential for facility operation which shall not be disturbed, blocked, or impacted by the construction efforts.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

• Schedule deliveries to minimize use of driveways and entrances by construction operations.
C. The Contractor shall place a project sign at least four feet tall by eight feet wide made of ¾ inch thick exterior grade plywood or other approved material in a prominent location on the Project site and shall maintain the sign in good condition for the duration of the construction period. The sign shall include the following color logos (available from the Authority) and the following disclosure statement:

“Funding for this project has been provided in full or in part by the Clean Water State Revolving Fund through an agreement with the State Water Resources Control Board. California’s Clean Water State Revolving Fund is capitalized through a variety of funding sources, including grants from the United States Environmental Protection Agency and state bond proceeds.”

1.9 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner’s day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.

2. Notify Owner not less than 72 hours in advance of activities that will affect Owner’s operations.

B. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.

2. Provide not less than 72 hours notice to Owner of activities that will affect Owner's operations.

C. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Engineer will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.

2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.

3. Before limited Owner occupancy, mechanical and electrical systems shall be Substantially Complete, and required tests and inspections shall be successfully
completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.

4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

D. The construction area includes a public access road. The phasing plans in the design drawings indicate proposed temporary routes for the public road to maintain necessary public access through the site. Contractor shall grade and maintain these roads and change the routing as possible to accommodate phased construction activity and required access – refer to Section 015000 Temporary Facilities and Controls for additional details.

1.10 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 6:30 a.m. to 3:00 p.m., Monday through Friday, unless otherwise indicated and/or agreed with the staff.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

   1. Notify Owner not less than two days in advance of proposed utility interruptions.

D. Noise, Vibration, and Odors: Coordinate with Owner all operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy.

   1. Notify Owner not less than two days in advance of proposed disruptive operations.

   2. Additional limits on allowable vibrations are applicable for shoring/pile driving required for excavation near existing structures and improvements. Refer to Sections 312000 and 315000 for additional details.

E. Smoking requirements are to comply with California State law.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

   2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
B. General and Special Conditions: Requirements of General and Special conditions provided in Volume I of Contract Documents apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

END OF SECTION 011000
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PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination drawings.
2. Requests for Information (RFIs).
3. Requests for Change (RFCs)
4. Project Web site.
5. Project meetings.

1.2 DEFINITIONS

A. RFI: Request from Owner, Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

B. RFC: Request from Contractor proposing a change to the contract requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

   a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Engineer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Engineer will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified. A sample RFI form is included at the end of this Specification.

1. Engineer will return RFIs submitted to Engineer by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
3. Owner or Engineer will not review the Contractor’s RFIs that are in fact Requests for Changes (RFCs), as determined by the Owner. In such cases, Contractor will be required to resubmit on the appropriate RFC form.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Engineer.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Engineer.

D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven (7) working days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. PST will be considered as received the following working day.
1. The following RFIs will be returned without action:
   
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for interpretation of Engineer's actions on submittals.
   f. Incomplete RFIs or inaccurately prepared RFIs.

2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt of additional information.

3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit a Change Proposal.

   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer and Construction Manager in writing within 10 (10) days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:

   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Engineer.
   4. RFI number including RFIs that were dropped and not submitted.
   5. RFI description.
   6. Date the RFI was submitted.
   7. Date Engineer's response was received.

F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven (7) days if Contractor disagrees with response.

   1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
   2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.7 REQUEST FOR CHANGE (RFCs)

A. Contractor shall submit a Request for Change when Contractor proposes a change in the Contract requirements. All change requests shall be submitted on the RFC form attached to this Specification. As shown therein, Contractor is required to fully describe the benefit(s) to the Owner, benefit(s) to the Contractor, the cost and/or schedule impact(s) associated with the requested change, along with whether or not Contractor proposes or requires a Contract Change Order for implementing the change. Except for as described in Section 1.6 herein, any Contractor RFC that is submitted on the RFI form will be returned without review.
B. As noted on the RFC form, it is understood that certain RFCs can be responded to promptly, with minimal expenditures required by Owner. It is also understood that other RFCs require significant expenditures by Owner in order to properly evaluate and respond to Contractor’s RFC. For those RFCs that fall in the latter category, Owner will provide an estimate (time and money) to Contractor as an initial response to RFC. Contractor may then elect to have Owner proceed with evaluating Contractor’s RFC (with estimated value deducted from Contractor’s Contract with the Owner), or elect to withdraw Contractor’s RFC.

1.8 PROJECT MEETINGS

A. General: Construction Manager will schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Engineer, within three (3) days of the meeting.

B. Preconstruction Conference: Engineer will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than fifteen (15) days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Construction Manager, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
   a. Tentative construction schedule.
   b. Phasing.
   c. Critical work sequencing and long-lead items.
   d. Designation of key personnel and their duties.
   e. Procedures for processing field decisions and Change Orders.
   f. Procedures for RFI's.
   g. Procedures for testing and inspecting.
   h. Procedures for processing Applications for Payment.
   i. Distribution of the Contract Documents.
   j. Submittal procedures.
   k. Preparation of record documents.
   l. Use of the premises and existing building.
   m. Work restrictions.
   n. Working hours.
   o. Owner's occupancy requirements.
   p. Responsibility for temporary facilities and controls.
   q. Procedures for disruptions and shutdowns.
r. Construction waste management and recycling.
s. Parking availability.
t. Office, work, and storage areas.
u. Equipment deliveries and priorities.
v. First aid.
w. Security.
x. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer, Construction Manager of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

   b. Options.
   c. Related RFIs.
   d. Related Change Orders.
   e. Purchases.
   f. Deliveries.
   g. Submittals.
   h. Review of mockups.
   i. Possible conflicts.
   j. Compatibility problems.
   k. Time schedules.
   l. Weather limitations.
   m. Manufacturer's written instructions.
   n. Warranty requirements.
   o. Compatibility of materials.
   p. Acceptability of substrates.
   q. Temporary facilities and controls.
   r. Space and access limitations.
   s. Regulations of authorities having jurisdiction.
   t. Testing and inspecting requirements.
   u. Installation procedures.
   v. Coordination with other work.
   w. Required performance results.
   x. Protection of adjacent work.
   y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Construction Manager will conduct progress meetings at weekly intervals.

1. Attendees: In addition to representatives of Owner, Construction Manager, and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

      1) Review schedule for next period.

   b. Contractor shall prepare three-week look ahead schedules for review at each progress meeting. The three-week look ahead schedules are not an acceptable substitute for CPM schedule updates that must be submitted with Contractor’s monthly partial payment requests.

c. Review present and future needs of each entity present, including the following:

   1) Interface requirements.
   2) Sequence of operations.
   3) Status of submittals.
   4) Status of documentation.
   5) Deliveries.
   6) Off-site fabrication.
   7) Access.
   8) Site utilization.
   9) Temporary facilities and controls.
  10) Progress cleaning.
  11) Quality and work standards.
  12) Status of correction of deficient items.
  13) Field observations.
  14) Status of RFI.
  15) Status of proposal requests.
  16) Pending changes.
  17) Status of Change Orders.
  18) Pending claims and disputes.
  19) Documentation of information for payment requests.
3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

4. It is noted that inspection will not be provided during scheduled progress meetings. Contractor is not permitted to perform work that requires inspection (as determined by Owner) during the progress meetings. Contractor shall adjust his schedule to accommodate said weekly progress meetings and no additional compensation will be provided for same. Contractor’s bid shall consider Owner’s requirements for weekly progress meetings. Owner, at its sole discretion, may decrease the frequency of progress meetings if deemed appropriate.

1.9 WORKSHOPS

A. The Contractor shall schedule, prepare agendas, conduct, and prepare minutes for coordination workshops. The workshops shall be attended by:

   1. Contractor’s Project Manager.
   2. A lead technical person within the organization providing the materials and services specified in Section 4409000.
   3. Other members of the Contractor’s organization.
   4. Owner’s Programmer.
   5. Owner’s representatives.
   6. Other parties as required.

B. These workshops shall be in addition to any other specified or required meetings for general project scheduling and coordination. These workshops shall be dedicated to the technical and coordination aspects of Plant controls. The workshops, and related recordkeeping shall capture workshop technical and coordination items, identify who within the Contractor’s organization is accomplishing the Contractor’s activities, making technical decisions, documenting those decisions, identifying and overcoming any obstacles, and related activities.

C. Workshops shall be by teleconference or in-person at the Plant, as noted. However, the District will consider, but is under no obligation to, allow selected parties to attend remotely. In this case, the Contractor shall provide suitable means to cover the subject matter (such as Web-X, etc.)

D. Within 8 weeks of the Notice-To Proceed the Contractor shall submit a draft workshop schedule package, which includes the following:

   1. Names, organizations, and detailed contact information for each proposed participant.
   2. A list of workshops, with a participant matrix. Also, indicate suggested Owner representatives.
   3. Draft high-level Agendas for each workshop. (Detailed Agendas submissions are also required prior to each workshop.)
   4. Rough workshop schedule, with detailed consideration of related activities. For example, workshops which have a bearing on shop drawing development should be scheduled in advance.
E. Except where noted otherwise, allow 5 hours for each workshop. Tailor the agendas as needed, including the topics noted in this Specification. Prior to each workshop submit a detailed Agenda, with accompanying documents where warranted. Receive and incorporate review comments. Following the workshop submit minutes.

F. Throughout of the workshops series the Contractor shall develop and maintain the following records:
   1. Action Item List
   2. Decision Log

G. Throughout the workshop series the Contractor shall maintain red marks on the following categories of Contract Documents, also annotated with the origins of the changes. Where applicable, copies of the red-marked documents should be included in the workshop preparations and results.
   1. Process and Instrumentations diagrams
   2. Input/output lists
   3. Block diagrams

H. Provide the following workshops

   1. WS#1 – Overview (in person):
      a. Review workshop series, content
      b. Schedule/sequencing overview
      c. Divisions of responsibility
      d. Existing standards (published/defacto)
      e. Status of Existing SCADA
      f. Preliminary assessment of information needed
      g. Workshop #2 preparations
      h. Define workshop dates, attendees
      i. Other topics, as required

   2. WS #2 – Project Website (teleconference, 2 hours)
      Review how the project website will be used, with particular attention to its role in the I&C work and the workshop series.

   3. WS #3 – Control Strategies, Part 1 (in person)
      This workshop pertains to existing functions, and controls which are generally outside of the scope of the Owner-selected bid items (which have their own workshops). Review applicable project P&ID’s, control strategies, and input/output lists. Reconcile against shop drawings, including motor control and package system interfaces. Discuss existing functionality where it applies, and new functions. Address related construction sequencing considerations, such as intermediate arrangements which might be required.

   4. WS #4 Control Strategies, Part 2 (in person)
      Continuation of above.

   5. WS#5 Bid Item #1, Hybrid Fixed Film Activated Sludge Process (in person)
      This workshop, and its content, is typical for Owner Selected bid items. The purpose is to address details of integration, standard approaches, etc. Topics shall include the following:
      a. PLC configuration/programing, data types, data mapping, data management
b. PLC Communication
c. Local Graphical Operator Interface Standards
d. Control Strategies
e. Signal interfaces:
   i. Incoming
   ii. Outgoing
f. Responses on loss of variables
g. Integration into existing SCADA
h. Submittals
f. Test Procedures, Testing

6. WS#6 Bid Item #2, Trickling Filter Distributor (in person)
   Topics similar to Workshop 5.

7. WS#7 Bid Item #6, Open Channel UV Disinfection System (in person)
   Topics similar to Workshop 5.

8. WS#8 Bid Item #7A, DAFT Dissolved Air Flotation Thickener System (in person)
   Topics similar to Workshop 5.

9. WS# 9 – Sequencing (in person).
   Address control system, plan operations during testing and cutovers. Consider
downtimes, intermediate configurations, other provisions.

10. WS# 10 – Sequencing (teleconference, 2 hours).
    Continuation of above.

11. WS# 11 – Sequencing (teleconference, 2 hours).
    Continuation of above.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)
# SAMPLE

**CONTRACTOR'S REQUEST FOR INFORMATION (RFI) #__________**

<table>
<thead>
<tr>
<th>To (Engineer):</th>
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<tr>
<th>Subject:</th>
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| Reference: Construction Drawing: Specification (Section and Page): |
|-----------------|------------------|

## REQUEST

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<tr>
<td>Received by CM (Date):</td>
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## RESPONSE

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Final Distribution:
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<tr>
<th>REQUEST</th>
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<td>To (Engineer):</td>
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<td>From (Contractor):</td>
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<th>Specification (Section and Page):</th>
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<td>Received by CM (Date):</td>
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<tr>
<td>Benefit to Owner:</td>
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<tr>
<th>Benefit to Contractor:</th>
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<table>
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<tr>
<th>Cost and/or Schedule Impact:</th>
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<tr>
<th>Change Order Required or Proposed?</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>

**RESPONSE**
Response to Change Request: \(^{(1)}\)

Response By (Name): [Name]  
Date: [Date]

(1) It is understood that certain RFCs can be responded to promptly, with minimal expenditures required by Owner. It is also understood that other RFCs require significant expenditures by Owner in order to properly evaluate and respond to Contractor's RFC. For those RFCs that fall in the latter category, Owner will provide an estimate (time and money) to Contractor as an initial response to RFC. Contractor may then elect to have Owner proceed with evaluating Contractor's RFC (with estimated value deducted from Contractor's Contract with Owner), or elect to withdraw Contractor's RFC.

Final Distribution:
END OF SECTION 013100
SECTION 013130 - SAFETY

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor’s safety program shall conform to the requirements specified in the General Conditions and Supplementary Conditions.

B. This specification provides general guidance for site safety and a site safety program. This specification is supplemental to but does not replace or supersede the District Safe Work Requirements and Confined Space Entry Program as provided in Appendix A and Appendix B respectively in Volume 2 of the Bid Documents.

1.2 DEFINITIONS

A. For the purposes of this Section, an “active construction area” is any area where construction activities are occurring or construction activities could be considered a potential hazard to people.

B. A “Designated Safety Officer” or “Safety Representative” for the purposes of this Contract, means anyone who is capable of identifying the existing and predictable hazards in the areas surrounding a construction project or those working conditions at a construction project that are unsanitary or dangerous to employees. A “Designated Safety Officer” has the authority to make prompt corrective measures to eliminate those hazards.

C. For the purposes of this Section, a “classified area” represents any area within the classified boundary or envelope of an active wastewater treatment process basin, channel, or other facility. A table summarizing the classified areas present within the boundaries and scope of this project is provided in paragraph 1.4 of this Section.

1.3 SUBMITTALS

A. Demonstrate compliance action with the stipulations of California Occupational Safety and Health Administration (CAL OSHA), Mine Safety and Health Administration (MSHA), and other applicable local, state, and federal safety requirements by submitting to Engineer a copy of all safety plans, programs, and permits. Such plans and programs shall include, but are not limited to:

1. Hazard Analysis Prior to Major Activities (job safety analysis, JSA).
2. Emergency Plan.
4. Excavation and Trenching Plans.
5. Respiratory Protection Program.
7. Confined Space Entry Program.
8. Explosives Handling and Storage.
9. Confined Space Entry Program.
10. Electrical Safety (drop cords, temporary power, GFCI’s, etc.)
11. Lock Out/Tag Out.
12. Fall Protection.
15. Training Plan.
17. Project Site Rules and Regulations (hazard protection plan).
18. Material Handling (storage-disposal).
22. Ventilation.
23. Personal Protective Equipment (hearing, eye, face).
24. Power Transmission/Distribution (temporary and/or permanent).
25. Traffic Control.
27. Safety Meetings.
29. First Aid Facilities.

B. Engineer’s receipt of safety plans or programs will not relieve Contractor in any way from the full and complete responsibility for safety and training of its personnel, and the onsite personnel of Owner, Engineer, and other visitors to areas of active construction areas. On a daily basis, inform Engineer of changes to the boundaries of the active construction areas.

C. Be responsible for safety training all personnel who will have access to the active construction areas to meet state, federal, local and Contractor requirements. Maintain reasonable, regularly scheduled training sessions in mutually accessible facilities through entire Contract. Training costs for all personnel and visitors, except those costs associated with training personnel of Contractor, subcontractors, suppliers, and visitors will be considered incidental to other lump-sum portions of the Work and no additional compensation for such training will be provided.

D. Safety Program Requirements:
1. Safety Representative Requirements:
   a. Assign a full-time Safety Representative as defined in the General Conditions of the Contract.
   b. The Safety Representative’s duties and responsibilities will be hazard recognition, accidents prevention, new employee orientation (including subcontractors), and the maintaining and supervising of safety precautions and program. This person shall have no other duties. The Safety Representative or a qualified and approved deputy shall be onsite at all times while Work is ongoing.
   c. Qualifications of the Safety Representative and assigned deputies shall be submitted to Engineer for review. Acceptance of their qualifications by Engineer is required prior to the start of any activity on the Project. The Safety Representative will, as a minimum, meet the requirements of regulations per the CAL OSHA Enforcement Branch Program.

2. Hazardous Substances:
   a. Provide Engineer with a list of all hazardous substances anticipated to be brought on-site.
   b. Maintain on site Material Safety Data Sheets (MSDS) prior to arrival of any hazardous substances on the Project.
   c. Use storage area(s) as outlined in the spill control plan.

3. Job Safety Analysis (JSA):
   a. Outline the sequence of the Work, equipment to be used, identify hazards that may exist or may be created and what procedures and/or safety equipment will be used
to eliminate or reduce these hazards. A Scope of Work JSA shall be prepared and provided to the Engineer prior to the start of unusual, hazardous, or have risk potential activities on the Project. The name of the competent person assigned to this activity will be included on the JSA.

b. Complete a JSA for any activity, which may be of an unusual nature or involves unique hazards.

4. Reports
   a. Provide to Engineer copies of Contractor’s and subcontractor’s:
      1) First aid, recordable, lost time and near miss, monthly logs.
      2) OSHA 200 injury log (annually).
      3) Safety meeting reports and topics (weekly).
      4) List of competent persons as required by OSHA and the Project Health and Safety Manual for each required task and their qualification as such.
      5) Injury and accident reports will be submitted to Engineer within 24 hours of any incident. Immediate notification to Engineer of an accident is required. Full cooperation with Engineer in accident investigation is required.
   b. Conduct weekly safety inspections. Corrective actions shall be taken within 24 hours to address all deficiencies identified during inspections. Deficiency reports shall be prepared and submitted to Engineer within 48 hours indicating corrective actions taken. Failure to comply with required corrective measures identified in the safety inspection will result in the delayed signing of the monthly application for progress payment by Engineer.
   c. Provide Engineer with a report of any periodic audit of Contractor’s safety performance and/or records.

1.4 CLASSIFIED AREAS

A. The Site is an active wastewater treatment plant that must remain operational and online at all times. Consequently, construction activities for this project will involve working near process basins and equipment that must remain online and operational. In addition to the usual hazards of open, deep basins containing and equipment/machinery that is actively operating, many of these basins and structures are considered classified zones (per NFPA 820) with potential hazards for fire and explosions due to the presence of explosive gases associated with wastewater.

B. Contractor shall take all additional precautions necessary when working within the classified zones and envelopes in these areas to prevent sparks, open flames, ignitions, and reduce the risk of fire or explosion. Precautions include but are not limited to: reviewing classified areas with all workers and subcontractors as part of the regular safety meetings and site orientation; providing proper PPE for workers entering classified areas; avoid using electrical tools, plugs, extension cords, welding equipment, open flames/heaters, and other potential sources for sparks or ignition within the classified envelopes; and following all guidelines and recommendations provided in NFPA and CALOSHA for working in classified areas,

C. The following table is provided as a reference to the guidelines provided in NFPA 820 regarding classified areas that are in or near the construction area associated with this project:
<table>
<thead>
<tr>
<th>Location</th>
<th>Classification/Description</th>
<th>Fire Protection Requirement*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headworks Screen Channels</td>
<td>Open to Atmosphere – <strong>Class 1/Div 2</strong> for a 10-foot envelope around open channel (vertical and horizontal).</td>
<td>FE, H</td>
</tr>
<tr>
<td>Grit Chambers</td>
<td>Open to Atmosphere – <strong>Class 1/Div 2</strong> for a 10-foot envelope around open basin (vertical and horizontal).</td>
<td>FE, H</td>
</tr>
<tr>
<td>Primary Clarifiers</td>
<td>Open to Atmosphere - <strong>Class 1/Div 2</strong> for an envelope extending 18-inches above basin top of wall and horizontally for 3-feet from the edge of the basin wall.</td>
<td>H</td>
</tr>
<tr>
<td>Scum Pits</td>
<td>Open to Atmosphere – <strong>Class 1/Div 2</strong> for a 10-foot envelope around open channel/pit (vertical and horizontal).</td>
<td>FE, H</td>
</tr>
<tr>
<td>Sludge Storage</td>
<td>Enclosed (non-ventilated) – <strong>Class 1/Div 1</strong> for the entire space.</td>
<td>FE, H, OCG</td>
</tr>
<tr>
<td>Sludge Thickener</td>
<td>Open to Atmosphere - <strong>Class 1/Div 2</strong> for an envelope extending 18-inches above basin top of wall and horizontally for 3-feet from the edge of the basin wall.</td>
<td>H</td>
</tr>
<tr>
<td>Flares</td>
<td><strong>Class 1/Div 1</strong> for a 10-foot envelope around fixtures and housing. <strong>Class 1/Div 2</strong> for additional 15-feet vertically above the Class 1/Div 1 envelope.</td>
<td>-</td>
</tr>
<tr>
<td>Biogas Storage</td>
<td>Open to Atmosphere – <strong>Class 1/Div 1</strong> for a 10-foot envelope around storage vessel.</td>
<td>FE</td>
</tr>
</tbody>
</table>

* Fire Protection Requirements Code (per NFPA 820) – additional precautions required to have on site in or immediately adjacent to area.
  
  FE: Fire Extinguisher
  H: Hydrant access and protection per 7.2.4
  CGD: Combustible gas detection (treat as confined space including CGD monitoring when entering the space).

END OF SECTION 013130
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Site condition reports.

1.2 RELATED SECTIONS:

A. General Conditions

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format: 
1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.
3. Two (2) paper copies.

B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Daily Construction Reports: Submit at weekly intervals to the Construction Manager.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

1.5 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than twenty (20) days, unless specifically allowed by Engineer.
2. Procurement Activities: Include procurement process activities for the long lead items, major items, and Owner Selected equipment requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times in schedule as indicated in Section 013300 "Contractor Submittals." Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than fifteen (15) days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Engineer's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than thirty (30) days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Partial occupancy before Substantial Completion.
   e. Use of premises restrictions.
   g. Seasonal variations.
   h. Environmental control.
5. Work Stages: Indicate important stages of construction for each major portion of the Work.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.

F. Recovery Schedule: When periodic update indicates the Work is fourteen (14) or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within fourteen (14) days of date established for the Notice to Proceed. Outline significant construction activities for the first ninety (90) days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than sixty (60) days after date established for the Notice to Proceed.

   a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Engineer's approval of the schedule.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

3. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

   a. Preparation and processing of submittals.
   b. Mobilization and demobilization.
   c. Purchase of materials.
   d. Delivery.
   e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and commissioning.
j. Punch list and final completion.
k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
   a. Sub networks on separate sheets are permissible for activities clearly off the critical path.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
   1. Contractor or subcontractor and the Work or activity.
   2. Description of activity.
   3. Main events of activity.
   4. Immediate preceding and succeeding activities.
   5. Early and late start dates.
   6. Early and late finish dates.
   7. Activity duration in workdays.
   8. Total float or slack time.
   10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
   1. Identification of activities that have changed.
   2. Changes in early and late start dates.
   3. Changes in early and late finish dates.
   5. Changes in the critical path.
   6. Changes in total float or slack time.
2.3 REPORTS

A. Daily Construction Reports: The Contractor shall prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Work Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

C. Quarterly Reports: The Contractor shall assist the Engineer, as requested, in preparing quarterly reports, which shall include at a minimum, the following:

1. A summary of progress to date including a description of progress since the last report, percent construction complete, percent contractor invoiced, and percent schedule elapsed.
2. A description of compliance with environmental requirements.
3. A listing of change orders including amount, description of work, and change in contract amount and schedule.
4. Any problems encountered, proposed resolution, schedule for resolution, and status of previous problem resolutions.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Engineer, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200
SECTION 013300 – CONTRACTOR SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals. The Contractor shall coordinate the submittal requirements in this section with those given in the General and Special Conditions of Volume 1, “Bid and Contract Documents.”

B. Related Requirements:

1. Section 013200 “Construction Progress Documentation” for submitting schedules and reports, including Contractor's construction schedule.
2. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.

B. Construction Schedule: Within fourteen (14) days after the date of Notice to Proceed, the Contractor shall submit a construction schedule providing the starting and completion dates of the various stages of the Work. The Contractor shall be prepared to discuss its construction schedule at the pre-construction conference.

C. Schedule of Values or lump sum price breakdown: Within fourteen (14) days after the date of Notice to Proceed, the Contractor shall submit a schedule of values or lump sum price breakdown for progress payment purposes.
1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Engineer's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.

1. Engineer will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.
   a. Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
   b. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Engineer.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
   a. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow fifteen (15) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow fifteen (15) days for review of each resubmittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Include the following information for processing and recording action taken:
   a. Project name.
   b. Date.
   c. Name of Engineer.
   d. Name of Construction Manager.
   e. Name of Contractor.
   f. Name of subcontractor.
   g. Name of supplier.
   h. Name of manufacturer.
i. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

j. Number and title of appropriate Specification Section.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Other necessary identification.

3. Submittal Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

4. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will return without review submittals received from sources other than Contractor.

b. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

1) Project name.
2) Date.
3) Destination (To:).
4) Source (From:).
5) Name and address of Engineer.
6) Name of Construction Manager.
7) Name of Contractor.
8) Name of firm or entity that prepared submittal.
9) Names of subcontractor, manufacturer, and supplier.
10) Category and type of submittal.
11) Submittal purpose and description.
12) Specification Section number and title.
13) Specification paragraph number or drawing designation and generic name for each of multiple items.
14) Drawing number and detail references, as appropriate.
15) Indication of full or partial submittal.
16) Transmittal number.
17) Submittal and transmittal distribution record.
18) Remarks.
19) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.
   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer.

4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
   a. Project name.
   b. Date.
   c. Name and address of Engineer.
   d. Name of Construction Manager.
   e. Name of Contractor.
   f. Name of firm or entity that prepared submittal.
   g. Names of subcontractor, manufacturer, and supplier.
   h. Category and type of submittal.
   i. Submittal purpose and description.
   j. Specification Section number and title.
   k. Specification paragraph number or drawing designation and generic name for each of multiple items.
   l. Drawing number and detail references, as appropriate.
   m. Location(s) where product is to be installed, as appropriate.
   n. Related physical samples submitted directly.
   o. Indication of full or partial submittal.
   p. Transmittal number.
   q. Submittal and transmittal distribution record.
   r. Other necessary identification.
   s. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

F. Options: Identify options requiring selection by Engineer.

G. Deviations: Identify deviations from the Contract Documents on submittals.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

   1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Action Submittals: Submit one (1) electronic copy and/or one (1) hard copy (if requested by the Authority) of each submittal unless otherwise indicated.
2. Informational Submittals: Submit one (1) electronic copy and/or one (1) hard copy (if requested by the Authority) of each submittal unless otherwise indicated. Engineer will not return copies.
3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit two (2) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit two (2) sets of Samples. Engineer will retain one (1) Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Submit product schedule in the following format:

a. Four (4) paper copies of product schedule or list unless otherwise indicated. Engineer will return three (3) copies.

F. Coordination Drawings Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

J. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of engineers and owners, and other information specified.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

T. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three (3) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed and certified.

3.2 ENGINEER'S ACTION

A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:

1. “NO EXCEPTIONS TAKEN” or “EXCEPTIONS AS NOTED” will require no formal revision and resubmission.

2. “REVISE AND RESUBMIT” or “REJECTED” will require the Contractor to revise said submittal and shall resubmit the required number of copies of said revised submittal to the Engineer.

C. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

F. Fabrication of an item shall commence only after the Engineer has reviewed the submittal and returned copies to the Contractor marked either “NO EXCEPTIONS TAKEN” or “EXCEPTIONS AS NOTED”. Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work.

END OF SECTION 013300
SECTION 013550 – SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Protect the active construction areas of the Work, including all material, equipment, field office trailers, and their contents from theft, vandalism, and unauthorized entry.

B. Provide continuous security service and post guards 24 hours per day, seven days per week for these active construction areas.

1.2 DEFINITIONS

A. For the purposes of this Section, an “active construction area” is any area where construction activities are occurring or construction activities could be considered a potential hazard to people.

1.3 RELATED SECTIONS

A. Section 015000 - Temporary Facilities and Controls

B. Section 015600– Project Environmental Controls

1.4 SUBMITTALS

A. Prior to performance of any work at the Project Site, submit to Engineer for record only, two copies of the security plan commensurate with the needs of the Project, signed by officer of Contractor. Be solely responsible for adequacy of the security plan.

B. Provide Engineer with drawing and data showing temporary fencing and gate locations, along with materials to be used.

C. Provide Engineer with a list of 24-hour emergency phone numbers for Contractor personnel.

D. Submit to Engineer an updated progressive inventory of materials and equipment received on-site.

E. Submit log of workmen and visitors to Project Site.

1.5 SECURITY PROGRAM

A. Protect Work and existing premises, including the field office trailers and their contents, from theft, vandalism, and unauthorized entry during working and non-working hours.

B. Accept sole responsibility for Project Site security and protection of the Work.

C. Initiate the security program at job mobilization and maintain the security program throughout construction period.

D. Limit lighting to basic safety and security requirements, and shield when possible.
E. Be responsible for the security of storage compound and lay down area, and for all plant material, equipment, and tools at all times.

F. Prohibit firearms for the Project Site.

G. Prohibit dogs from the Project Site, with the exception of those clearly used for security purposes within fenced areas.

H. Erect and maintain temporary security fencing as required to protect the Work, the Project Site, and existing facilities on the Project Site. The location of all temporary security fencing shall be approved in advance by Engineer.
   1. Fence Height: 6 feet
   2. Fence Material: Galvanized Steel

I. Erect and maintain temporary tortoise-proof fencing as described in Section 015000 – Temporary Facilities and Controls.

1.6 ENTRY CONTROL

A. Entry control shall not unreasonably limit the personnel of Owner, Engineer, and their operations and maintenance groups from performing assigned duties. Temporary access limitations will be identified to Engineer and the operations and maintenance groups at least 24 hours prior to such limitation.

B. Restrict entry of unauthorized persons and vehicles into Project Site.

C. Allow entry only to authorized persons with proper identification.

D. When requested by Owner, implement a security badge system for the Project Site, approved by Owner.

E. Maintain a log of workmen and visitors and make log available to Owner on request. This log shall be submitted to Engineer biweekly or as necessary.

F. Require all visitors to sign the visitor log acknowledgment of the project rules included in this Section. A copy of the project rules shall be given to each visitor. Submit copies of these forms to Engineer biweekly.

G. Contractor has the right to refuse access to the Project Site or require that a person or vehicle be removed from the Project Site if found violating any of the project rules.

H. Give jobsite security orientation training to all affected employees, including subcontractor employees. Employee participation in the security orientation shall be acknowledged by their respective individual signatures affixed to an orientation roster.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013550
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

2. Requirements for Contractor to provide quality-assurance and -control services required by Engineer, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

3. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer or Construction Manager.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five (5) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.

B. In instances where a conflict arises between standards and/or between the Technical Specifications and the Design Drawings, the more stringent standard or requirement shall govern at the discretion of Owner and Engineer.

C. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Engineer.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Engineer.

B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.5 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

   a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
d. When testing is complete, remove test specimens, assemblies, and mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Engineer or Construction Manager.
2. Notify Engineer and Construction Manager seven (7) days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Engineer's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
   a. Allow seven (7) days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services. Testing services provided by Owner, if any, are for the sole benefit of Owner. However, test results shall be available to Contractor. It is the Contractor’s responsibility to schedule the testing provided by such agencies. Testing necessary to satisfy Contractor's internal quality control procedures shall be the sole responsibility of Contractor.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
3. Testing Services furnished by Owner: Unless otherwise specified, Owner will provide quality control testing services in connection with the following materials and equipment incorporated in the Work:
   a. Concrete strength tests.
   b. Moisture-density and relative density tests on embankment, fill, and backfill materials.
   c. In-place field density test on embankments, fills, and backfill.
   d. Other materials and equipment as specified herein.
   e. Testing, including sampling, shall be performed by Engineer or testing firm's laboratory personnel, in general manner and frequency indicated in the Specifications.
   f. Furnish all sample materials and cooperate in the testing activities, including sampling. Interrupt the Work when necessary to allow testing, including sampling to be performed. There shall be no claim for an increase in Contract Price or Contract Times due to such interruption. When testing activities, including sampling, are performed in the field by the testing firm's laboratory personnel, furnish personnel and facilities to assist in the activities.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services:
   a. Concrete materials and mix designs.
   b. Embankment, fill, and backfill materials.
   c. Quality control testing of all precast concrete.
   d. All other tests and engineering data required for Engineer’s review of materials and equipment proposed to be used in the Work.
   e. In addition, the following quality control tests shall be performed by Contractor:
      1) Holiday testing of pipeline coatings.
      2) Air testing of field-welded joints for steel pipe or pipe cylinders and fabricated specials.
      3) All testing and inspection of welding work including, but not limited to, welding procedure qualifications, welder operator qualifications, all work performed by the certified welding inspector, all appropriate nondestructive testing of welds and all repair and retest of weld defects.

1.8 The testing firm’s laboratory shall perform all laboratory tests within a reasonable time consistent with the specified standards and will furnish a written report of each test. Distribution of the reports shall be as directed by Engineer.

   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.

C. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Engineer, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Engineer, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

6. Do not perform any duties of Contractor.

E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

4. Facilities for storage and field curing of test samples.

5. Delivery of samples to testing agencies.

6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

7. Security and protection for samples and for testing and inspecting equipment at Project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.
1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections and in Statement of Special Inspections included in the Contract Documents (Drawings), and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Engineer, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Engineer, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Engineer.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.
C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000
SECTION 014120 - PERMITS

PART 1 - GENERAL

1.1 ADMINISTRATIVE REQUIREMENTS

A. Obtain permits required for the execution of Work in accordance with the Contract Documents. Provide copies of these permits to Owner.

B. The intent of this Section is to furnish the known list of required permits for the Work under the Contract Documents. Contractor is responsible for determining and verifying the extent of all permits required and for obtaining such permits.

C. In the Bid Price, include costs for obtaining all necessary permits, including application fees and other costs, and the costs of complying with the conditions of all permits. Any fees listed in this section are estimates and are for information only. Verify and pay all actual fees.

D. Within 30 Days of the Limited Notice to Proceed, submit a list of all permits and licenses to be obtained, indicating the agency required to grant the permit, the expected date of submittal for the permit, and required date for receipt of the permit.

1.2 SUMMARY OF PERMITS TO BE OBTAINED BY CONTRACTOR

A. Obtain the following permits. Submit copies of these permits to Engineer and maintain copies on-site. Comply with all conditions of the permits and pay all applicable fees. Types of permits that may be required include:

1. SWPPP
2. Any required construction permits from City, County, or State agencies
3. Permits for road construction
4. Permits for transport of equipment and materials to/from the site.
5. Permits for disposal of any debris or demolition materials (as needed)
6. Permits required for environmental protection including dewatering and discharging of waters.
7. Permits for noise or pollution control as required.

1.3 SUMMARY OF PERMITS OBTAINED BY OWNER

A. Owner is not responsible for obtaining any permits.

1.4 NPDES PERMIT

Attached to this section is a copy of the District’s NPDES permit for reference. The plant must comply with these requirements at all time and, accordingly, all construction activity including tie-ins, downtime, demolition, startup, etcetera, must be coordinated with operators to ensure the plant continues to operate as required.

END OF SECTION
San Francisco Bay Regional Water Quality Control Board

ORDER No. R2-2015-0021
NPDES No. CA0037851

The following discharger is subject to waste discharge requirements (WDRs) set forth in this Order.

Table 1. Discharger Information

<table>
<thead>
<tr>
<th>Discharger</th>
<th>Las Gallinas Valley Sanitary District</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Name</td>
<td>Las Gallinas Valley Sanitary District Sewage Treatment Plant and its wastewater collection system</td>
</tr>
<tr>
<td>Facility Address</td>
<td>300 Smith Ranch Road, San Rafael, CA 94903, Marin County</td>
</tr>
<tr>
<td>CIWQS Place Number</td>
<td>236598</td>
</tr>
</tbody>
</table>

Table 2. Discharge Locations

<table>
<thead>
<tr>
<th>Discharge Point</th>
<th>Effluent Description</th>
<th>Discharge Point Latitude (North)</th>
<th>Discharge Point Longitude (West)</th>
<th>Receiving Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>Secondary treated municipal effluent</td>
<td>38.23718°</td>
<td>122.43186°</td>
<td>Miller Creek</td>
</tr>
<tr>
<td>002</td>
<td>Secondary treated municipal effluent</td>
<td>38.21834°</td>
<td>122.38325°</td>
<td>Miller Creek</td>
</tr>
</tbody>
</table>

Table 3. Administrative Information

<table>
<thead>
<tr>
<th></th>
<th>May 13, 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>This Order was adopted on:</td>
<td></td>
</tr>
<tr>
<td>This Order shall become effective on:</td>
<td>July 1, 2015</td>
</tr>
<tr>
<td>This Order shall expire on:</td>
<td>June 30, 2020</td>
</tr>
<tr>
<td>The Discharger shall file a Report of Waste Discharge as an application for reissuance of WDRs in accordance with California Code of Regulations, title 23, and an application for reissuance of a National Pollutant Discharge Elimination System (NPDES) permit no later than:</td>
<td>October 1, 2019</td>
</tr>
<tr>
<td>The U.S. Environmental Protection Agency (U.S. EPA) and the California Regional Water Quality Control Board, San Francisco Bay Region, have classified this discharge as follows:</td>
<td>Major</td>
</tr>
</tbody>
</table>

I, Bruce H. Wolfe, Executive Officer, do hereby certify that this Order with all attachments is a full, true, and correct copy of the Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on the date indicated above.

Digitally signed by Bruce H. Wolfe
DN: cn=Bruce H. Wolfe,
o=SWRCB, ou=Region 2,
email=bwolfe@waterboards.ca.gov
ov, c=US
Date: 2015.05.15 17:58:18 -07'00'

Bruce H. Wolfe, Executive Officer
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   B. Monitoring and Reporting Provisions ..................................... 7
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Attachment E – Monitoring and Reporting Program (MRP) ............ E-1
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Attachment G – Regional Standard Provisions and Monitoring and Reporting Requirements G-1
I. FACILITY INFORMATION

Information describing the Las Gallinas Valley Sanitary District Sewage Treatment Plant and Wastewater Collection System (collectively, the Facility) is summarized in Table 1 and in Fact Sheet (Attachment F) sections I and II.

II. FINDINGS

The California Regional Water Quality Control Board, San Francisco Bay Region (Regional Water Board), finds:

A. Legal Authorities. This Order serves as WDRs pursuant to California Water Code article 4, chapter 4, division 7 (commencing with § 13260). This Order is also issued pursuant to federal Clean Water Act (CWA) section 402 and implementing regulations adopted by U.S. EPA, and Water Code chapter 5.5, division 7 (commencing with § 13370). It shall serve as an NPDES permit for point source discharges from this facility to surface waters.

B. Background and Rationale for Requirements. The Regional Water Board developed the requirements in this Order based on information the Discharger submitted as part of its application, information obtained through monitoring and reporting programs, and other available information. The Fact Sheet (Attachment F) contains background information and rationale for the requirements in this Order, and is hereby incorporated into and constitutes findings for this Order. Attachments A through E, and G are also incorporated into this Order.

C. Provisions and Requirements Implementing State Law. No provisions and requirements in this Order are included to implement State law only.

D. Cease and Desist Order No. R2-2009-0071. The Regional Water Board issued Cease and Desist Order No. R2-2009-0071 because it believed the Discharger could not immediately comply with the copper requirements in Order No. R2-2009-0070 (previous order). The Discharger complied with the Cease and Desist Order, and, because the Discharger is expected to be able to comply with this Order’s copper requirements (see Fact Sheet section IV.C.4.c), Cease and Desist Order No. R2-2009-0071 is no longer necessary and can be rescinded.

E. Notification of Interested Parties. The Regional Water Board notified the Discharger and interested agencies and persons of its intent to prescribe these WDRs and provided an opportunity to submit written comments and recommendations. The Fact Sheet provides details regarding the notification.

F. Consideration of Public Comment. The Regional Water Board, in a public meeting, heard and considered all comments pertaining to the discharge. The Fact Sheet provides details regarding the public hearing.

THEREFORE, IT IS HEREBY ORDERED that Order No. R2-2009-0070 and Cease and Desist Order No. R2-2009-0071 are rescinded upon the effective date of this Order except for enforcement purposes, and, in order to meet the provisions of Water Code division 7 (commencing with § 13000) and regulations adopted thereunder, and the provisions of the CWA and regulations and guidelines adopted thereunder, the Discharger shall comply with the requirements in this Order. This action in no way
prevents the Regional Water Board from taking enforcement action for past violations of the previous order.

III. DISCHARGE PROHIBITIONS

A. Discharge of treated wastewater at a location or in a manner different from that described in this Order is prohibited.

B. Discharge to Miller Creek at Discharge Point Nos. 001 and 002 is prohibited during the dry season each year, from June 1 through October 31, except when facility inflow exceeds the capacity of influent storage and the capacity of the recycled water distribution and storage system due to wet weather. The need to discharge may arise as a result of early or late season storms. As soon as possible after determining that discharge will be necessary, the Discharger shall notify the Regional Water Board case manager by phone or email and provide information supporting its determination. Unless the case manager objects, the Discharger may commence discharge but only when absolutely necessary and only to the extent necessary for the reason stated above. The discharge shall be monitored and meet limitations and shall consist of fully treated effluent (or meet the requirements for blending in Discharge Prohibition III.C. below). The discharge shall not contain water directly from the storage ponds.

For each discharge event, the Discharger shall submit a report within five business days after the end of discharge that describes the reasons for the need to discharge, with supporting information, and that describes the discharge flow volume, duration, and estimated dilution within the receiving water. In accordance with the Monitoring and Reporting Program (MRP, Attachment E), discharge quality shall be reported in the next monthly self-monitoring report.

C. The bypass of untreated or partially-treated wastewater to waters of the United States is prohibited, except as provided for in Attachment D section I.G.

Blended wastewater is biologically-treated wastewater blended with wastewater diverted around secondary (biological) treatment units. Such discharges are hereby approved under the bypass conditions stated in 40 C.F.R. section 122.41(m)(4) when (1) the peak wet weather influent flow volume exceeds the reliable process capacity of the secondary treatment units of 8 million gallons per day (MGD), (2) the discharge complies with the effluent and receiving water limitations contained in this Order, and (3) the Discharger complies with Provision VI.C.5.b of this Order. The Discharger shall operate the Facility in accordance with its Operation and Maintenance Manual. It shall optimize storage and use of equalization units and fully use the biological treatment units and advanced treatment units. The Discharger shall report incidents of blended effluent discharges in self-monitoring reports and monitor such discharges as specified in the MRP.

D. Average dry weather flow through the treatment plant in excess of 2.92 MGD is prohibited. Average dry weather treatment flow shall be determined from daily measurements of influent flows to the treatment plant during three consecutive dry weather months each year. Compliance shall be measured at Monitoring Location INF-001 as described in the MRP.

E. Any sanitary sewer overflow that results in a discharge of untreated or partially-treated wastewater to waters of the United States is prohibited.
IV. EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

A. Conventional, Non-Conventional, and Toxic Pollutants

The Discharger shall comply with the following effluent limitations at Discharge Point Nos. 001 and 002, with compliance determined at Monitoring Locations EFF-001 and EFF-001B (if blending) as described in the MRP:

Table 4. Effluent Limitations

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Discharge Month [3]</th>
<th>Effluent Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average Monthly</td>
<td>Average Weekly</td>
</tr>
<tr>
<td>Biochemical Oxygen Demand, 5-day @ 20°C (BOD₅)</td>
<td>mg/L</td>
<td>November - April</td>
<td>30</td>
</tr>
<tr>
<td>Total Suspended Solids (TSS)</td>
<td>mg/L</td>
<td>November - April</td>
<td>30</td>
</tr>
<tr>
<td>Oil and Grease</td>
<td>mg/L</td>
<td>November - April</td>
<td>10</td>
</tr>
<tr>
<td>Ammonia, Total</td>
<td>mg/L as N</td>
<td>November - April</td>
<td>10</td>
</tr>
<tr>
<td>BOD₅ percent removal [1]</td>
<td>%</td>
<td>November - May</td>
<td>85 (minimum)</td>
</tr>
<tr>
<td>TSS percent removal [1]</td>
<td>%</td>
<td>November - May</td>
<td>85 (minimum)</td>
</tr>
<tr>
<td>pH [8]</td>
<td>s.u.</td>
<td>November - May</td>
<td>---</td>
</tr>
<tr>
<td>Chlorine Residual</td>
<td>mg/L</td>
<td>November - May</td>
<td>---</td>
</tr>
<tr>
<td>Copper</td>
<td>µg/L</td>
<td>November - May</td>
<td>8.6</td>
</tr>
<tr>
<td>Nickel</td>
<td>µg/L</td>
<td>November - May</td>
<td>11</td>
</tr>
<tr>
<td>Cyanide</td>
<td>µg/L</td>
<td>November - May</td>
<td>6.4</td>
</tr>
<tr>
<td>Bis(2-Ethylhexyl)Phthalate</td>
<td>µg/L</td>
<td>November - May</td>
<td>5.9</td>
</tr>
<tr>
<td>Dioxin-TEQ</td>
<td>µg/L</td>
<td>November - May</td>
<td>1.4 x 10⁻⁸</td>
</tr>
<tr>
<td>Chronic Toxicity</td>
<td>TUₑ</td>
<td>November - May</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Unit Abbreviations:

mg/L = milligrams per liter  
µg/L = micrograms per liter  
s.u. = standard units  
TUₑ = chronic toxicity units, equal to 100/NOEL, where NOEL = IC₂₅, EC₂₅, or NOEC

Footnotes:

[1] The average monthly BOD₅ and TSS percent removal shall not be less than 85 percent (i.e., in each calendar month, the arithmetic mean of BOD₅ and TSS effluent concentrations shall not exceed 15 percent of the arithmetic mean of BOD₅ and TSS influent concentrations at approximately the same times during the same periods).

[2] If the Discharger monitors pH continuously, pursuant to 40 C.F.R. § 401.17 the Discharger shall be in compliance with this pH limitation provided that both of the following conditions are satisfied: (i) the total time during which the pH is outside the required range shall not exceed 7 hours and 26 minutes in any calendar month, and (ii) no individual excursion from the required pH range shall exceed 60 minutes.

[3] Discharges occurring during June through October shall comply with the effluent limitations for May.

[4] The maximum daily limitation for chronic toxicity shall be interpreted as the maximum test result for the month.

Limitations and Discharge Requirements
B. Enterococcus Bacteria

The geometric mean enterococcus bacteria concentration of all samples collected in a calendar month at Discharge Point Nos. 001 and 002, with compliance measured at Monitoring Locations EFF-001 and EFF-001B (if blending) as described in the MRP, shall not exceed 35 most probable number per 100 milliliters (MPN/100 mL).

C. Whole Effluent Acute Toxicity

Discharges at Discharge Point Nos. 001 and 002 shall comply with the following limitations, with compliance determined at Monitoring Location EFF-001 as described in the MRP:

- A three-sample median value of not less than 90 percent survival; and
- A single-sample maximum value of not less than 70 percent survival.

These acute toxicity limitations are defined as follows:

- **Three-sample median.** A bioassay test showing survival of less than 90 percent represents a violation of this effluent limit if one or more of the past two bioassay tests also shows less than 90 percent survival.
- **Single-sample maximum.** Any bioassay test showing survival of less than 70 percent represents a violation of this effluent limit.

If the Discharger can demonstrate that toxicity exceeding the levels cited above is caused by ammonia and that the ammonia in the discharge complies with the ammonia effluent limits in Table 4 of this Order, then such toxicity does not constitute a violation of this effluent limitation.

V. RECEIVING WATER LIMITATIONS

A. The discharge shall not cause the following conditions to exist in receiving waters at any place:

1. Floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses;

2. Alteration of suspended sediment in such a manner as to cause nuisance or adversely affect beneficial uses, or detrimental increase in the concentrations of toxic pollutants in sediments or aquatic life;

3. Suspended material in concentrations that cause nuisance or adversely affect beneficial uses;

4. Bottom deposits or aquatic growths to the extent that such deposits or growths cause nuisance or adversely affect beneficial uses;

5. Alteration of temperature, beyond present natural background levels;

6. Changes in turbidity that cause nuisance or adversely affect beneficial uses, or increase from normal background light penetration or turbidity greater than 10 percent in areas where natural turbidity is greater than 50 nephelometric turbidity units;

7. Coloration that causes nuisance or adversely affects beneficial uses;
8. Visible, floating, suspended, or deposited oil or other products of petroleum origin; or

9. Toxic or other deleterious substances in concentrations or quantities that cause deleterious effects on wildlife, waterfowl, or other aquatic biota, or render any of these unfit for human consumption, either at levels created in the receiving waters or as a result of biological concentration.

B. The discharge shall not cause the following limits to be exceeded in receiving waters at any place within one foot of the water surface:

1. Dissolved Oxygen  
   5.0 mg/L, minimum
   The median dissolved oxygen concentration for any three consecutive months shall not be less than 80% of the dissolved oxygen content at saturation. When natural factors cause concentrations less than that specified above, the discharge shall not cause further reduction in ambient dissolved oxygen concentrations.

2. Dissolved Sulfide  
   Natural background levels

3. pH  
   The pH shall not be depressed below 6.5 or raised above 8.5. The discharge shall not cause changes greater than 0.5 pH units in normal ambient pH levels.

4. Nutrients  
   Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

C. The discharge shall not cause a violation of any water quality standard for receiving waters adopted by the Regional Water Board or State Water Board as required by the CWA and regulations adopted thereunder. If more stringent water quality standards are promulgated or approved pursuant to CWA section 303, or amendments thereto, the Regional Water Board may revise or modify this Order in accordance with the more stringent standards.

VI. PROVISIONS

A. Standard Provisions

1. The Discharger shall comply with all “Standard Provisions” in Attachment D.

2. The Discharger shall comply with all applicable provisions of the “Regional Standard Provisions, and Monitoring and Reporting Requirements for NPDES Wastewater Discharge Permits” (Attachment G).

B. Monitoring and Reporting Provisions

The Discharger shall comply with the MRP (Attachment E), and future revisions thereto, and applicable sampling and reporting requirements in Attachments D and G.
C. Special Provisions

1. Reopener Provisions

The Regional Water Board may modify or reopen this Order prior to its expiration date in any of the following circumstances as allowed by law:

a. If present or future investigations demonstrate that the discharges governed by this Order have or will have a reasonable potential to cause or contribute to, or will cease to have, adverse impacts on water quality or beneficial uses of the receiving waters.

b. If new or revised water quality objectives or total maximum daily loads (TMDLs) come into effect for San Francisco Bay and contiguous water bodies (whether statewide, regional, or site-specific). In such cases, effluent limitations in this Order may be modified as necessary to reflect the updated water quality objectives and wasteload allocations in the TMDLs. Adoption of the effluent limitations in this Order is not intended to restrict in any way future modifications based on legally adopted water quality objectives or TMDLs, or as otherwise permitted under federal regulations governing NPDES permit modifications.

c. If translator, dilution, or other water quality studies provide a basis for determining that a permit condition should be modified.

d. If State Water Board precedential decisions, new policies, new laws, or new regulations are adopted.

e. If an administrative or judicial decision on a separate NPDES permit or WDRs addresses requirements similar to this discharge.

f. If the Discharger requests adjustments in effluent limits due to the implementation of stormwater diversion pursuant to the Municipal Regional Stormwater Permit (Permit No. CAS612008) for redirecting dry weather and first flush discharges from the storm drain system to the sanitary sewer system as a stormwater pollutant control strategy.

g. Or as otherwise authorized by law.

The Discharger may request a permit modification based on any of the circumstances above. With any such request, the Discharger shall include antidegradation and anti-backsliding analyses.

2. Effluent and Receiving Water Characterization Study and Report

a. Study Elements. The Discharger shall continue to characterize and evaluate the discharge from the following discharge points to verify that the “no” or “unknown” reasonable potential analysis conclusions of this Order remain valid and to inform the next permit reissuance. The Discharger shall collect representative samples at the monitoring station set forth below, as defined in the MRP, at no less than the frequency specified below:

<table>
<thead>
<tr>
<th>Discharge Point</th>
<th>Monitoring Location</th>
<th>Minimum Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>001 and 002</td>
<td>EFF-001</td>
<td>Once per calendar year</td>
</tr>
</tbody>
</table>
The samples shall be analyzed for the priority pollutants listed in Attachment G, Table C, except for those priority pollutants with effluent limitations where the MRP already requires more frequent monitoring and except for those priority pollutants for which there are no water quality criteria (see Fact Sheet Table F-6). Compliance with this requirement shall be achieved in accordance with Attachment G sections III.A.1 and III.A.2.

The Discharger shall evaluate on an annual basis if concentrations of any of these priority pollutants significantly increase over past performance. The Discharger shall investigate the cause of any such increase. The investigation may include, but need not be limited to, an increase in monitoring frequency, monitoring of internal process streams, and monitoring of influent sources. The Discharger shall establish remedial measures addressing any increase resulting in reasonable potential to cause or contribute to an excursion above applicable water quality objectives. This requirement may be satisfied through identification of the constituent as a “pollutant of concern” in the Discharger’s Pollutant Minimization Program, described in Provision VI.C.3.

b. Reporting Requirements

i. Routine Reporting. The Discharger shall, within 45 days of receipt of analytical results, report the following in the transmittal letter for the appropriate self-monitoring report:

(a) Indication that a sample for this characterization study was collected; and

(b) Identity of priority pollutants detected at or above applicable water quality criteria (see Fact Sheet Table F-7 for the criteria) and the detected concentrations of those pollutants.

ii. Annual Reporting. The Discharger shall summarize the annual data evaluation and source investigation in its annual self-monitoring report.

iii. Final Report. The Discharger shall submit a final report that presents all these data with its application for permit reissuance.

3. Pollutant Minimization Program

a. The Discharger shall continue to improve its existing Pollutant Minimization Program to promote minimization of pollutant loadings to the Facility and therefore to the receiving waters.

b. The Discharger shall submit an annual report no later than February 28 each year. Each annual report shall include at least the following information:

i. Brief description of treatment plant. The description shall include the service area and treatment plant processes.

ii. Discussion of current pollutants of concern. Periodically, the Discharger shall analyze its circumstances to determine which pollutants are currently a problem and
which pollutants may be potential future problems. This discussion shall include the reasons for choosing the pollutants.

iii. **Identification of sources for pollutants of concern.** This discussion shall include how the Discharger intends to estimate and identify pollutant sources. The Discharger shall include sources or potential sources not directly within the ability or authority of the Discharger to control, such as pollutants in the potable water supply and air deposition.

iv. **Identification of tasks to reduce the sources of pollutants of concern.** This discussion shall identify and prioritize tasks to address the Discharger’s pollutants of concern. The Discharger may implement the tasks by itself or participate in group, regional, or national tasks that address its pollutants of concern. The Discharger is strongly encouraged to participate in group, regional, or national tasks that address its pollutants of concern whenever it is efficient and appropriate to do so. An implementation timeline shall be included for each task.

v. **Outreach to employees.** The Discharger shall inform employees about the pollutants of concern, potential sources, and how they might be able to help reduce the discharge of these pollutants of concern into the Facility. The Discharger may provide a forum for employees to provide input.

vi. **Continuation of Public Outreach Program.** The Discharger shall prepare a pollution prevention public outreach program for its service area. Outreach may include participation in existing community events, such as county fairs; initiating new community events, such as displays and contests during Pollution Prevention Week; conducting school outreach programs; conducting plant tours; and providing public information in newspaper articles or advertisements, radio or television stories or spots, newsletters, utility bill inserts, or web sites. Information shall be specific to target audiences. The Discharger shall coordinate with other agencies as appropriate.

vii. **Discussion of criteria used to measure Pollutant Minimization Program and task effectiveness.** The Discharger shall establish criteria to evaluate the effectiveness of its Pollutant Minimization Program. This discussion shall identify the specific criteria used to measure the effectiveness of each task in Provisions VI.C.3.b.iii, iv, v, and vi.

viii. **Documentation of efforts and progress.** This discussion shall detail all of the Discharger’s Pollutant Minimization Program activities during the reporting year.

ix. **Evaluation of Pollutant Minimization Program and task effectiveness.** This Discharger shall use the criteria established in Provision VI.C.3.b.vii to evaluate the program and task effectiveness.

x. **Identification of specific tasks and timelines for future efforts.** Based on the evaluation, the Discharger shall explain how it intends to continue or change its tasks to more effectively reduce the amount of pollutants flowing to the Facility and subsequently in its effluent.
c. The Discharger shall develop and conduct a Pollutant Minimization Program as further described below when there is evidence that a priority pollutant is present in the effluent above an effluent limitation (e.g., sample results reported as detected but not quantified [DNQ] when the effluent limitation is less than the method detection limit [MDL], sample results from analytical methods more sensitive than those methods required by this Order, presence of whole effluent toxicity, health advisories for fish consumption, or results of benthic or aquatic organism tissue sampling) and either:

i. A sample result is reported as DNQ and the effluent limitation is less than the Reporting Level (RL); or

ii. A sample result is reported as not detected (ND) and the effluent limitation is less than the MDL, using definitions in Attachment A and reporting protocols described in the MRP.

d. If triggered by the reasons set forth in Provision VI.C.3.c, above, the Discharger’s Pollutant Minimization Program shall include, but not be limited to, the following actions and submittals:

i. Annual review and semi-annual monitoring of potential sources of the reportable priority pollutants, which may include fish tissue monitoring and other bio-uptake sampling, or alternative measures when source monitoring is unlikely to produce useful analytical data;

ii. Quarterly monitoring for the reportable priority pollutants in the influent to the Facility. The Executive Officer may approve alternative measures when influent monitoring is unlikely to produce useful analytical data;

iii. Submittal of a control strategy designed to proceed toward the goal of maintaining concentrations of the reportable priority pollutants in the effluent at or below the effluent limitation;

iv. Implementation of appropriate cost-effective control measures for the reportable priority pollutants, consistent with the control strategy; and

v. Inclusion of the following specific items within the annual report required by Provision VI.C.3.b above:

(a) All Pollutant Minimization Program monitoring results for the previous year;
(b) List of potential sources of the reportable priority pollutants;
(c) Summary of all actions undertaken pursuant to the control strategy; and
(d) Description of actions to be taken in the following year.

4. Special Provisions for Municipal Facilities

a. Sludge and Biosolids Management

i. All sludge and biosolids shall be disposed of, managed, or reused in a municipal solid waste landfill; through land application; as a Class A compost; through a waste-to-
energy facility or another recognized and approved technology; in a sludge-only landfill; or in a sewage sludge incinerator in accordance with 40 C.F.R. part 503.

ii. Sludge and biosolids treatment, storage, and disposal, or reuse, shall not create a nuisance, such as objectionable odors or flies, or result in groundwater contamination.

iii. The sludge and biosolids treatment and storage site shall have facilities adequate to divert surface runoff from adjacent areas, to protect site boundaries from erosion, and to prevent any conditions that would cause drainage from the materials in the storage site. Adequate protection is defined as protection from at least a 100-year storm and the highest possible tidal stage that may occur.

iv. Sludge or biosolids disposed in a municipal solid waste landfill shall meet the requirements of 40 C.F.R. part 258. In the annual self-monitoring report, the Discharger shall provide the amount of sludge or biosolids disposed and indicate the landfill to which it was sent.

v. This Order does not authorize permanent on-site sludge or biosolids storage or disposal. A Report of Waste Discharge shall be filed and the site brought into compliance with all applicable regulations prior to commencement of any such activity.

b. **Collection System Management.** The Discharger shall properly operate and maintain its entire collection system (see Attachment D section I.D). The Discharger shall report any noncompliance (see Attachment D sections V.E.1 and V.E.2) and mitigate any discharge from its collection system that violates this Order (see Attachment D section I.C).

The *Statewide General Waste Discharge Requirements for Sanitary Sewer Systems* (General Collection System WDRs), State Water Board Order No. 2006-0003 DWQ, as amended by State Water Board Order No. WQ 2013-0058-EXEC, has requirements for operation and maintenance of separate sanitary sewer collection systems, and for reporting and mitigating sanitary sewer overflows from the separate sanitary sewer portion of the Discharger’s collection system. While the Discharger must comply with both the General Collection System WDRs and this Order, the General Collection System WDRs more clearly and specifically stipulate requirements for operation and maintenance, and for reporting and mitigating sanitary sewer overflows. Implementation of the General Collection System WDRs for proper operation and maintenance and mitigation of sanitary sewer overflows will satisfy the corresponding federal NPDES requirements specified in Attachment D (as supplemented by Attachment G). Following the notification and reporting requirements in the General Collection System WDRs will satisfy the corresponding NPDES reporting requirements specified in Attachment D (as supplemented by Attachment G) for sanitary sewer overflows from the separate sanitary sewer portion of the collection system.
5. Other Special Provisions

a. Reliability Assurance Plan and Status Report

i. The Discharger shall evaluate the reliability of its treatment systems and submit a Reliability Assurance Plan by April 1, 2016. At a minimum, the plan shall include the following elements:

(a) Review incidents involving the release of inadequately-treated wastewater during the previous order term.

(b) Identify current and future reliability concerns, including, but not limited to, safeguards for critical process units, sea level rise, and cyber security.

(c) Describe measures or safeguards in place (e.g., treatment and storage, critical system redundancies, spare parts, warning alarms, etc.) to ensure the reliability of the system in preventing inadequately-treated wastewater from being discharged.

(d) Identify appropriate reliability improvement actions and establish a timeline for completion.

ii. The Discharger shall maintain the Reliability Assurance Plan in usable condition and have it available for reference and use by all relevant personnel.

iii. The Discharger shall regularly (at least annually) review, revise, or update, as necessary, the Reliability Assurance Plan to ensure that the document remains useful and relevant to current equipment and operations. For any significant changes in equipment or operational practices, the Discharger shall revise the plan as soon as practicable.

iv. The Discharger shall submit a report describing the current status of its Reliability Assurance Plan, including any recommended or planned actions and the timeline for completion, by February 1 each year. The report shall discuss in detail incidents, if any, involving the release of inadequately treated wastewater during the previous calendar year.

b. Corrective Measures to Minimize Blending

The Discharger shall implement the following tasks to reduce blending:
<table>
<thead>
<tr>
<th>Task</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Develop and Implement Updated Wet Weather Improvement Plan.</strong></td>
<td></td>
</tr>
<tr>
<td>The Discharger shall develop an updated Wet Weather Improvement Plan</td>
<td></td>
</tr>
<tr>
<td>that takes into account the alternatives identified in the 2012</td>
<td></td>
</tr>
<tr>
<td>Brown and Caldwell study and the corrective measures identified, but</td>
<td></td>
</tr>
<tr>
<td>not yet completed, in the Discharger’s Wet Weather Improvements</td>
<td></td>
</tr>
<tr>
<td>Report (dated May 1, 2010) and Wet Weather Improvements Workplan</td>
<td></td>
</tr>
<tr>
<td>(dated August 1, 2010). The Plan shall establish measurable goals</td>
<td>November 1, 2015</td>
</tr>
<tr>
<td>to minimize and eventually eliminate blending due to wet weather</td>
<td></td>
</tr>
<tr>
<td>events. The Plan shall specify measures to be implemented at the</td>
<td></td>
</tr>
<tr>
<td>plant and wastewater collection system and shall identify their</td>
<td></td>
</tr>
<tr>
<td>costs, implementation schedules, and proposed funding mechanisms.</td>
<td></td>
</tr>
<tr>
<td>These measures shall include, but are not limited to, the following:</td>
<td></td>
</tr>
<tr>
<td>a. Implementation of collection system capital improvement projects</td>
<td></td>
</tr>
<tr>
<td>at a rate consistent with industry standards based on the condition</td>
<td></td>
</tr>
<tr>
<td>of the system;</td>
<td></td>
</tr>
<tr>
<td>b. Feasible reduction of rainwater inflow from known sources,</td>
<td></td>
</tr>
<tr>
<td>including residential swimming pools, runoff from the Guide Dogs</td>
<td></td>
</tr>
<tr>
<td>for the Blind facility, and runoff from the treatment plant grounds</td>
<td></td>
</tr>
<tr>
<td>that is captured and returned to the plant headworks;</td>
<td></td>
</tr>
<tr>
<td>c. Construction of an additional secondary clarifier;</td>
<td></td>
</tr>
<tr>
<td>d. Construction of a flow equalization system;</td>
<td></td>
</tr>
<tr>
<td>e. Construction of new activated sludge basins or other secondary</td>
<td></td>
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<tr>
<td>treatment capacity enhancements.</td>
<td></td>
</tr>
<tr>
<td>The Plan may include alternatives to items c, d, and e above that</td>
<td></td>
</tr>
<tr>
<td>provide an equivalent means of achieving the blending reduction</td>
<td></td>
</tr>
<tr>
<td>goals. The Discharger shall identify in the Plan the measures to be</td>
<td></td>
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<tr>
<td>undertaken during the term of this Order. The Discharger shall</td>
<td></td>
</tr>
<tr>
<td>describe the extent to which implementing these measures will</td>
<td></td>
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<tr>
<td>improve wet weather management. The Discharger shall incorporate</td>
<td></td>
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<tr>
<td>feedback, if any, from the Executive Officer and begin</td>
<td></td>
</tr>
<tr>
<td>implementation of the Plan by the date specified.</td>
<td></td>
</tr>
<tr>
<td>2. <strong>Report Progress on Implementing Wet Weather Improvement Plan.</strong></td>
<td>Annually, with Annual Self-Monitoring Report due February 1</td>
</tr>
<tr>
<td>The Discharger shall evaluate and report on the implementation and</td>
<td></td>
</tr>
<tr>
<td>effectiveness of its Wet Weather Improvement Plan annually.</td>
<td></td>
</tr>
<tr>
<td>3. <strong>Complete Implementation of Updated Wet Weather Improvement</strong></td>
<td>April 30, 2020</td>
</tr>
<tr>
<td><strong>Plan.</strong></td>
<td></td>
</tr>
<tr>
<td>The Discharger shall implement wet weather improvement measures in</td>
<td></td>
</tr>
<tr>
<td>accordance with the schedules proposed in its updated Wet Weather</td>
<td></td>
</tr>
<tr>
<td>Improvement Plan. Any changes shall be subject to Executive Officer</td>
<td></td>
</tr>
<tr>
<td>approval.</td>
<td></td>
</tr>
<tr>
<td>4. <strong>Develop Private Sewer Lateral Ordinance.</strong></td>
<td>Annually, with Annual Self-Monitoring Report due February 1</td>
</tr>
<tr>
<td>The Discharger shall review the ordinances of Bay Area communities</td>
<td></td>
</tr>
<tr>
<td>that have successfully adopted measures requiring inspection of</td>
<td></td>
</tr>
<tr>
<td>private sewer laterals (e.g., upon ownership change). The Discharger</td>
<td></td>
</tr>
<tr>
<td>shall develop a lateral inspection ordinance appropriate for its</td>
<td></td>
</tr>
<tr>
<td>service area and present it to its governing board for</td>
<td></td>
</tr>
<tr>
<td>consideration. The Discharger shall report the status of the</td>
<td></td>
</tr>
<tr>
<td>proposed lateral inspection ordinance as part of the Wet Weather</td>
<td></td>
</tr>
<tr>
<td>Improvement Plan progress report.</td>
<td></td>
</tr>
</tbody>
</table>
5. **Prepare No Feasible Alternatives Analysis (Utility Analysis).**

If the Discharger seeks to continue to bypass peak wet weather flows around the secondary treatment units based on 40 C.F.R. section 122.41(m)(4)(i)(A)-(C), it shall conduct a Utility Analysis that contains all elements described in U.S. EPA’s proposed guidance *NPDES Permit Requirements for Peak Wet Weather Discharges from Publicly Owned Treatment Works Treatment Plants Serving Separate Sanitary Sewer Collection Systems* (December 2005, or the most recent version). The analysis shall account for efforts to reduce inflow and infiltration. In addressing the elements in the guidance, the analysis shall specifically contain an alternatives analysis for blending reduction to evaluate strategies to further reduce blending through capital improvements. The analysis shall identify all feasible alternatives and explain why infeasible alternatives are infeasible. The Discharger shall select feasible actions based on factors including, but not limited to, the need to blend (considering the effectiveness of the collection system and treatment plant improvement projects), the foreseeable impact on the need to blend, and estimated costs relative to the Discharger’s ability to finance the costs. (One means to assess a community’s ability to fund wet weather improvements is to consult U.S. EPA’s *CSO Guidance for Financial Capability Assessment and Schedule Development*, EPA Publication No. 832-B-97-004.) The Utility Analysis shall include a timeline for implementation of feasible actions.

<table>
<thead>
<tr>
<th>Task</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Prepare No Feasible Alternatives Analysis (Utility Analysis).</td>
<td>With Report of Waste Discharge due July 1, 2019</td>
</tr>
</tbody>
</table>

6. **Develop and Implement Public Notification Protocol.**

The Discharger shall develop and implement a public notification protocol to alert the public of any bypass, including blending. The protocol shall provide a mechanism to notify the public within 24 hours of the start of a blending incident and provide an approximate duration and volume for the incident within 48 hours of it ending.

<table>
<thead>
<tr>
<th>Task</th>
<th>Compliance Date</th>
</tr>
</thead>
</table>

**c. Copper Action Plan.** The Discharger shall continue to implement source control and pollution prevention for copper in accordance with the following tasks and time schedule:

**Table 6. Copper Action Plan**

<table>
<thead>
<tr>
<th>Task</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Review Potential Copper Sources</strong></td>
<td>Completed (submitted December 28, 2009)</td>
</tr>
<tr>
<td>The Discharger shall submit an inventory of potential copper sources to the Facility.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2. Implement Copper Control Program</strong></td>
<td>Completed plan (submitted as part of 2009 Annual Pollution Prevention Report on February 28, 2010, and updated annually) with implementation ongoing</td>
</tr>
<tr>
<td>The Discharger shall submit a plan for and begin implementation of a program to reduce copper sources identified in Task 1. The plan shall consist, at a minimum, of the following elements:</td>
<td></td>
</tr>
</tbody>
</table>

| a. Provide education and outreach to the public (e.g., focus on proper pool and spa maintenance and plumbers’ roles in reducing corrosion); |                                                                 |
| b. If corrosion is determined to be a significant copper source, work cooperatively with local water purveyors to reduce and control water corrosivity, as appropriate, and ensure that local plumbing contractors implement best management practices to reduce corrosion in pipes; and |                                                                 |
c. Educate plumbers, designers, and maintenance contractors for pools and spas to encourage best management practices that minimize copper discharges.

3. Implement Additional Measures
   If the Regional Water Board notifies the Discharger that the three-year rolling mean copper concentration in San Pablo Bay exceeds 3.0 μg/L, then within 90 days of the notification, the Discharger shall evaluate the effluent copper concentration trend and, if it is increasing, develop and begin implementation of additional measures to control copper discharges. The Discharger shall report on the progress and effectiveness of actions taken, and provide a schedule for actions to be taken in the next 12 months.

4. Undertake Studies to Reduce Copper Pollutant Impact Uncertainties
   The Discharger shall submit an updated study plan and schedule to conduct or cause to be conducted technical studies to investigate possible copper sediment toxicity and to investigate sub-lethal effects on salmonids. Specifically, the Discharger shall include the manner in which the above will be accomplished and describe the studies to be performed with an implementation schedule. To satisfy this requirement, the Discharger may collaborate and conduct these studies as a group.

5. Report Status of Copper Control Program
   The Discharger shall submit an annual report documenting copper control program implementation and addressing the effectiveness of the actions taken, including any additional copper controls required by Task 3 above, and provide a schedule for actions to be taken in the next 12 months. Additionally, the Discharger shall report the findings and results of the studies completed, planned, or in progress under Task 4. Regarding Task 4 studies, dischargers may collaborate and provide this information in a single report to satisfy this requirement for an entire group.

   If required, progress report with next annual pollution prevention report due February 28 (at least 90 days following notification)

   Completed
   (submitted January 6, 2011 by Bay Area Clean Water Agencies)

   With annual pollution prevention report due February 28 each year

   d. Cyanide Action Plan. The Discharger shall implement monitoring and surveillance, source control and pollution prevention for cyanide in accordance with the following tasks and time schedule:

<table>
<thead>
<tr>
<th>Task</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Review Potential Cyanide Sources</td>
<td></td>
</tr>
<tr>
<td>The Discharger shall submit an inventory of potential cyanide sources to the Facility. If no cyanide sources are identified, tasks 2 and 3 are not required, unless the Discharger receives a request to discharge detectable levels of cyanide to the sewer. If so, the Discharger shall notify the Executive Officer and implement tasks 2 and 3.</td>
<td>Completed; no source identified (submitted March 1, 2010)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task</th>
<th>Compliance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Implement Cyanide Control Program</td>
<td></td>
</tr>
<tr>
<td>The Discharger shall continue to implement its program to minimize cyanide discharges to its treatment plant consisting, at a minimum, of the following elements: a. Inspect each potential source to assess the need to include that source in the control program.</td>
<td>Completed (submitted March 1, 2010)</td>
</tr>
<tr>
<td>Task</td>
<td>Compliance Date</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
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<tr>
<td>b. Inspect contributing sources included in the control program annually. Inspection elements may be based on U.S. EPA guidance, such as <em>Industrial User Inspection and Sampling Manual for POTWs</em> (EPA 831-B-94-01).</td>
<td></td>
</tr>
<tr>
<td>c. Develop and distribute educational materials to sources and potential sources regarding the need to prevent cyanide discharges.</td>
<td></td>
</tr>
<tr>
<td>d. Prepare an emergency monitoring and response plan to be implemented if a significant cyanide discharge occurs. For purposes of this Order, a “significant cyanide discharge” is occurring if cyanide is found in the plant’s influent above 18 µg/L.</td>
<td></td>
</tr>
<tr>
<td>3. <strong>Implement Additional Measures</strong></td>
<td>If required, with next annual pollution prevention report due February 28 (at least 90 days following notification)</td>
</tr>
<tr>
<td>If the Regional Water Board notifies the Discharger that ambient monitoring shows cyanide concentrations are 1.0 µg/L or higher in the main body of San Francisco Bay, then within 90 days of the notification, the Discharger shall commence actions to identify and abate cyanide sources responsible for the elevated ambient concentrations and shall report on the progress and effectiveness of actions taken and provide a schedule for actions to be taken in the next 12 months.</td>
<td></td>
</tr>
<tr>
<td>4. <strong>Report Status of Cyanide Control Program</strong></td>
<td>With annual pollution prevention report due February 28 each year</td>
</tr>
<tr>
<td>The Discharger shall submit an annual report documenting cyanide control program implementation and addressing the effectiveness of actions taken, including any additional cyanide controls required by Task 3, above, and provide a schedule for actions to be taken in the next 12 months.</td>
<td></td>
</tr>
<tr>
<td>e. <strong>Standard Operating Procedures for Resource Recovery (Optional)</strong></td>
<td></td>
</tr>
<tr>
<td>If the Discharger receives hauled-in anaerobically-digestible material for injection into an anaerobic digester, the Discharger shall notify the Regional Water Board and develop and implement Standard Operating Procedures for this activity. The Standard Operating Procedures shall be developed prior to initiation of hauling. The Standard Operating Procedures shall address material handling, including unloading, screening, or other processing prior to anaerobic digestion, and transportation; spill prevention; spill response; avoidance of the introduction of materials that could cause interference, pass through, or upset of the treatment processes; avoidance of prohibited material; vector control; odor control; operation and maintenance; and the disposition of any solid waste segregated from introduction to the digester. The Discharger shall train its staff on the Standard Operating Procedures and maintain records for a minimum of three years for each load received, describing the hauler, waste type, and quantity received. In addition, the Discharger shall maintain records for a minimum of three years for the disposition, location, and quantity of cumulative pre-digestion segregated solid waste hauled offsite.</td>
<td></td>
</tr>
</tbody>
</table>
ATTACHMENT A – DEFINITIONS

Arithmetic Mean (μ)
Also called the average, the sum of measured values divided by the number of samples. For ambient water concentrations, the arithmetic mean is calculated as follows:

\[
\text{Arithmetic mean } = \mu = \frac{\Sigma x}{n} \quad \text{where:} \quad \Sigma x \text{ is the sum of the measured ambient water concentrations, and } n \text{ is the number of samples.}
\]

Average Monthly Effluent Limitation (AMEL)
The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

Average Weekly Effluent Limitation (AWEL)
The highest allowable average of daily discharges over a calendar week (Sunday through Saturday), calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

Bioaccumulative
Taken up by an organism from its surrounding medium through gill membranes, epithelial tissue, or from food and subsequently concentrated and retained in the body of the organism.

Carcinogenic
Known to cause cancer in living organisms.

Coefficient of Variation
Measure of data variability calculated as the estimated standard deviation divided by the arithmetic mean of the observed values.

Daily Discharge
Either: (1) the total mass of the constituent discharged over the calendar day (12:00 am through 11:59 pm) or any 24-hour period that reasonably represents a calendar day for purposes of sampling (as specified in the permit) for a constituent with limitations expressed in units of mass; or (2) the unweighted arithmetic mean measurement of the constituent over the day for a constituent with limitations expressed in other units of measurement (e.g., concentration).

The daily discharge may be determined by the analytical results of a composite sample taken over the course of one day (a calendar day or other 24-hour period defined as a day) or by the arithmetic mean of analytical results from one or more grab samples taken over the course of the day.

For composite sampling, if 1 day is defined as a 24-hour period other than a calendar day, the analytical result for the 24-hour period is considered the result for the calendar day in which the 24-hour period ends.

Detected, but Not Quantified (DNQ)
Sample result less than the RL, but greater than or equal to the laboratory’s MDL. Sample results reported as DNQ are estimated concentrations.
Dilution Credit
Amount of dilution granted to a discharge in the calculation of a water quality-based effluent limitation, based on the allowance of a specified mixing zone. It is calculated from the dilution ratio or determined by conducting a mixing zone study or modeling the discharge and receiving water.

Effluent Concentration Allowance (ECA)
Value derived from the water quality criterion/objective, dilution credit, and ambient background concentration that is used, in conjunction with the CV for the effluent monitoring data, to calculate a long-term average (LTA) discharge concentration. The ECA has the same meaning as waste load allocation (WLA) as used in U.S. EPA guidance (Technical Support Document For Water Quality-based Toxics Control, March 1991, second printing, EPA/505/2-90-001).

Enclosed Bay
Indentation along the coast that encloses an area of oceanic water within a distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between the headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. Enclosed bays include, but are not limited to, Humboldt Bay, Bodega Harbor, Tomales Bay, Drake’s Estero, San Francisco Bay, Morro Bay, Los Angeles-Long Beach Harbor, Upper and Lower Newport Bay, Mission Bay, and San Diego Bay. Enclosed bays do not include inland surface waters or ocean waters.

Estimated Chemical Concentration
Concentration that results from the confirmed detection of the substance below the ML value by the analytical method.

Estuaries
Waters, including coastal lagoons, located at the mouths of streams that serve as areas of mixing for fresh and ocean waters. Coastal lagoons and mouths of streams that are temporarily separated from the ocean by sandbars are considered estuaries. Estuarine waters are considered to extend from a bay or the open ocean to a point upstream where there is no significant mixing of fresh water and seawater. Estuarine waters include, but are not limited to, the Sacramento-San Joaquin Delta, as defined in Water Code section 12220, Suisun Bay, Carquinez Strait downstream to the Carquinez Bridge, and appropriate areas of the Smith, Mad, Eel, Noyo, Russian, Klamath, San Diego, and Otay rivers. Estuaries do not include inland surface waters or ocean waters.

Inland Surface Waters
All surface waters of the state that do not include the ocean, enclosed bays, or estuaries.

Instantaneous Maximum Effluent Limitation
Highest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous maximum limitation).

Instantaneous Minimum Effluent Limitation
Lowest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous minimum limitation).
Maximum Daily Effluent Limitation (MDEL)
Highest allowable daily discharge of a pollutant, over a calendar day (or 24-hour period). For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the arithmetic mean measurement of the pollutant over the day.

Median
Middle measurement in a set of data. The median of a set of data is found by first arranging the measurements in order of magnitude (either increasing or decreasing order). If the number of measurements (n) is odd, then the median = \(X_{(n+1)/2}\). If n is even, then the median = \(X_{n/2} + X_{(n/2)+1}/2\) (i.e., the midpoint between \(n/2\) and \(n/2+1\)).

Method Detection Limit (MDL)
Minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero, as defined in in 40 C.F.R. part 136, Attachment B, revised as of July 3, 1999.

Minimum Level (ML)
Concentration at which the entire analytical system gives a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method specified sample weights, volumes, and processing steps have been followed.

Mixing Zone
Limited volume of receiving water allocated for mixing with a wastewater discharge where water quality criteria can be exceeded without causing adverse effects to the overall water body.

Not Detected (ND)
Sample results less than the laboratory’s MDL.

Persistent Pollutants
Substances for which degradation or decomposition in the environment is nonexistent or very slow.

Pollutant Minimization Program
Program of waste minimization and pollution prevention actions that include, but are not limited to, product substitution, waste stream recycling, alternative waste management methods, and education of the public and businesses. The goal of the Pollutant Minimization Program is to reduce all potential sources of a priority pollutant through pollutant minimization (control) strategies, including pollution prevention measures as appropriate, to maintain the effluent concentration at or below the water quality-based effluent limitation. Pollution prevention measures may be particularly appropriate for persistent bioaccumulative priority pollutants where there is evidence that beneficial uses are being impacted. Cost effectiveness may be considered when establishing the requirements of a Pollutant Minimization Program. The completion and implementation of a Pollution Prevention Plan, if required pursuant to Water Code section 13263.3(d), is considered to fulfill Pollutant Minimization Program requirements.
Pollution Prevention
Any action that causes a net reduction in the use or generation of a hazardous substance or other pollutant that is discharged into water and includes, but is not limited to, input change, operational improvement, production process change, and product reformulation (as defined in Water Code section 13263.3). Pollution prevention does not include actions that merely shift a pollutant in wastewater from one environmental medium to another environmental medium, unless clear environmental benefits of such an approach are identified to the satisfaction of the State Water Board or Regional Water Board.

Reporting Level (RL)
ML (and its associated analytical method) chosen by the Discharger for reporting and compliance determination from the MLs included in this Order, including an additional factor if applicable as discussed herein. The MLs included in this Order correspond to approved analytical methods for reporting a sample result that are selected by the Regional Water Board either from Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Policy or SIP) Appendix 4 in accordance with SIP section 2.4.2 or established in accordance with SIP section 2.4.3. The ML is based on the proper application of method-based analytical procedures for sample preparation and the absence of any matrix interferences. Other factors may be applied to the ML depending on the specific sample preparation steps employed. For example, the treatment typically applied in cases where there are matrix-effects is to dilute the sample or sample aliquot by a factor of ten. In such cases, this additional factor must be applied to the ML in the computation of the RL.

Source of Drinking Water
Any water designated as having a municipal or domestic supply (MUN) beneficial use.

Standard Deviation ($\sigma$)
Measure of variability calculated as follows:

$$\sigma = \left( \frac{\sum(x - \mu)^2}{(n-1)} \right)^{0.5}$$

where:
- $x$ is the observed value;
- $\mu$ is the arithmetic mean of the observed values; and
- $n$ is the number of samples.

Toxicity Reduction Evaluation (TRE)
Study conducted in a step-wise process designed to identify the causative agents of effluent or ambient toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in toxicity. The first steps of the TRE consist of the collection of data relevant to the toxicity, including additional toxicity testing, and an evaluation of facility operations and maintenance practices, and best management practices. A Toxicity Identification Evaluation (TIE) may be required as part of the TRE, if appropriate. A TIE is a set of procedures to identify the specific chemicals responsible for toxicity. These procedures are performed in three phases (characterization, identification, and confirmation) using aquatic organism toxicity tests.
ATTACHMENT D – STANDARD PROVISIONS

I. STANDARD PROVISIONS – PERMIT COMPLIANCE

A. Duty to Comply

1. The Discharger must comply with all of the terms, requirements, and conditions of this Order. Any noncompliance constitutes a violation of the Clean Water Act (CWA) and the California Water Code and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application; or a combination thereof. (40 C.F.R. § 122.41(a); Wat. Code §§ 13261, 13263, 13265, 13268, 13000, 13001, 13304, 13350, 13385.)

2. The Discharger shall comply with effluent standards or prohibitions established under CWA section 307(a) for toxic pollutants and with standards for sewage sludge use or disposal established under CWA section 405(d) within the time provided in the regulations that establish these standards or prohibitions, even if this Order has not yet been modified to incorporate the requirement. (40 C.F.R. § 122.41(a)(1).)

B. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a Discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Order. (40 C.F.R. § 122.41(c).)

C. Duty to Mitigate

The Discharger shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this Order that has a reasonable likelihood of adversely affecting human health or the environment. (40 C.F.R. § 122.41(d).)

D. Proper Operation and Maintenance

The Discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Discharger to achieve compliance with the conditions of this Order. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems that are installed by a Discharger only when necessary to achieve compliance with the conditions of this Order. (40 C.F.R. § 122.41(e).)

E. Property Rights

1. This Order does not convey any property rights of any sort or any exclusive privileges. (40 C.F.R. § 122.41(g).)

2. The issuance of this Order does not authorize any injury to persons or property or invasion of other private rights, or any infringement of state or local law or regulations. (40 C.F.R. § 122.5(c).)
F. Inspection and Entry

The Discharger shall allow the Regional Water Board, State Water Board, U.S. EPA, or their authorized representatives (including an authorized contractor acting as their representative), upon the presentation of credentials and other documents, as may be required by law, to (33 U.S.C. § 1318(a)(4)(B); 40 C.F.R. § 122.41(i); Wat. Code, §§ 13267, 13383):

1. Enter upon the Discharger's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this Order (33 U.S.C. § 1318(a)(4)(B)(i); 40 C.F.R. § 122.41(i)(1); Wat. Code, §§ 13267, 13383);

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Order (33 U.S.C. § 1318(a)(4)(B)(ii); 40 C.F.R. § 122.41(i)(2); Wat. Code, §§ 13267, 13383);

3. Inspect and photograph, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order (33 U.S.C. § 1318(a)(4)(B)(ii); 40 C.F.R. § 122.41(i)(3); Wat. Code, §§ 13267, 13383); and

4. Sample or monitor, at reasonable times, for the purposes of assuring Order compliance or as otherwise authorized by the CWA or the Water Code, any substances or parameters at any location. (33 U.S.C. § 1318(a)(4)(B); 40 C.F.R. § 122.41(i)(4); Wat. Code, 13267, 13383.)

G. Bypass

1. Definitions

   a. “Bypass” means the intentional diversion of waste streams from any portion of a treatment facility. (40 C.F.R. § 122.41(m)(1)(i).)

   b. “Severe property damage” means substantial physical damage to property, damage to the treatment facilities, which causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production. (40 C.F.R. § 122.41(m)(1)(ii).)

2. Bypass not exceeding limitations. The Discharger may allow any bypass to occur which does not cause exceedances of effluent limitations, but only if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions listed in Standard Provisions – Permit Compliance I.G.3, I.G.4, and I.G.5 below. (40 C.F.R. § 122.41(m)(2).)

3. Prohibition of bypass. Bypass is prohibited, and the Regional Water Board may take enforcement action against a Discharger for bypass, unless (40 C.F.R. § 122.41(m)(4)(i)):

   a. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage (40 C.F.R. § 122.41(m)(4)(i)(A));

   b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of
equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance (40 C.F.R. § 122.41(m)(4)(i)(B)); and

c. The Discharger submitted notice to the Regional Water Board as required under Standard Provisions – Permit Compliance I.G.5 below. (40 C.F.R. § 122.41(m)(4)(i)(C).)

4. Approval. The Regional Water Board may approve an anticipated bypass, after considering its adverse effects, if the Regional Water Board determines that it will meet the three conditions listed in Standard Provisions—Permit Compliance I.G.3 above. (40 C.F.R. § 122.41(m)(4)(ii).)

5. Notice

a. Anticipated bypass. If the Discharger knows in advance of the need for a bypass, it shall submit a notice, if possible at least 10 days before the date of the bypass. (40 C.F.R. § 122.41(m)(3)(i).)


H. Upset

Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the Discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation. (40 C.F.R. § 122.41(n)(1).)

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Standard Provisions – Permit Compliance I.H.2 below are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review. (40 C.F.R. § 122.41(n)(2).)

2. Conditions necessary for a demonstration of upset. A Discharger who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that (40 C.F.R. § 122.41(n)(3)):

a. An upset occurred and that the Discharger can identify the cause(s) of the upset (40 C.F.R. § 122.41(n)(3)(i));

b. The permitted facility was, at the time, being properly operated (40 C.F.R. § 122.41(n)(3)(ii));

c. The Discharger submitted notice of the upset as required in Standard Provisions—Reporting V.E.2.b below (24-hour notice) (40 C.F.R. § 122.41(n)(3)(iii)); and
d. The Discharger complied with any remedial measures required under Standard Provisions—Permit Compliance I.C above. (40 C.F.R. § 122.41(n)(3)(iv).)

3. Burden of proof. In any enforcement proceeding, the Discharger seeking to establish the occurrence of an upset has the burden of proof. (40 C.F.R. § 122.41(n)(4).)

II. STANDARD PROVISIONS—PERMIT ACTION

A. General

This Order may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Discharger for modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any Order condition. (40 C.F.R. § 122.41(f).)

B. Duty to Reapply

If the Discharger wishes to continue an activity regulated by this Order after the expiration date of this Order, the Discharger must apply for and obtain a new permit. (40 C.F.R. § 122.41(b).)

C. Transfers

This Order is not transferable to any person except after notice to the Regional Water Board. The Regional Water Board may require modification or revocation and reissuance of the Order to change the name of the Discharger and incorporate such other requirements as may be necessary under the CWA and the Water Code. (40 C.F.R. §§ 122.41(l)(3), 122.61.)

III. STANDARD PROVISIONS—MONITORING

A. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. (40 C.F.R. § 122.41(j)(1).)

B. Monitoring results must be conducted according to test procedures approved under 40 C.F.R. part 136 for the analysis of pollutants unless another method is required under 40 C.F.R. subchapters N or O. In the case of pollutants for which there are no approved methods under 40 C.F.R. part 136 or otherwise required under 40 C.F.R. subchapters N or O, monitoring must be conducted according to a test procedure specified in this Order for such pollutants. (40 C.F.R. §§ 122.41(j)(4), § 122.44(i)(1)(iv).)

IV. STANDARD PROVISIONS—RECORDS

A. Except for records of monitoring information required by this Order related to the Discharger’s sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 C.F.R. part 503), the Discharger shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this Order, and records of all data used to complete the application for this Order, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Regional Water Board Executive Officer at any time. (40 C.F.R. § 122.41(j)(2).)
B. Records of monitoring information shall include the following:

1. The date, exact place, and time of sampling or measurements (40 C.F.R. § 122.41(j)(3)(i));

2. The individual(s) who performed the sampling or measurements (40 C.F.R. § 122.41(j)(3)(ii));

3. The date(s) the analyses were performed (40 C.F.R. § 122.41(j)(3)(iii));

4. The individual(s) who performed the analyses (40 C.F.R. § 122.41(j)(3)(iv));

5. The analytical techniques or methods used (40 C.F.R. § 122.41(j)(3)(v)); and

6. The results of such analyses. (40 C.F.R. § 122.41(j)(3)(vi).)

C. Claims of confidentiality for the following information will be denied (40 C.F.R. § 122.7(b)):

1. The name and address of any permit applicant or Discharger (40 C.F.R. § 122.7(b)(1)); and

2. Permit applications and attachments, permits, and effluent data. (40 C.F.R. § 122.7(b)(2).)

V. STANDARD PROVISIONS—REPORTING

A. Duty to Provide Information

The Discharger shall furnish to the Regional Water Board, State Water Board, or U.S. EPA within a reasonable time, any information which the Regional Water Board, State Water Board, or U.S. EPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Order or to determine compliance with this Order. Upon request, the Discharger shall also furnish to the Regional Water Board, State Water Board, or U.S. EPA copies of records required to be kept by this Order. (40 C.F.R. § 122.41(h); Wat. Code, §§ 13267, 13383.)

B. Signatory and Certification Requirements

1. All applications, reports, or information submitted to the Regional Water Board, State Water Board, and/or U.S. EPA shall be signed and certified in accordance with Standard Provisions—Reporting V.B.2, V.B.3, V.B.4, and V.B.5 below. (40 C.F.R. § 122.41(k).)

2. For a corporation, all permit applications shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures. (40 C.F.R. § 122.22(a)(1).)
For a partnership or sole proprietorship, all permit applications shall be signed by a general partner or the proprietor, respectively. (40 C.F.R. § 122.22(a)(2).)

For a municipality, State, federal, or other public agency, all permit applications shall be signed by either a principal executive officer or ranking elected official. For purposes of this provision, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA). (40 C.F.R. § 122.22(a)(3).)

3. All reports required by this Order and other information requested by the Regional Water Board, State Water Board, or U.S. EPA shall be signed by a person described in Standard Provisions – Reporting V.B.2 above, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Standard Provisions—Reporting V.B.2 above (40 C.F.R. § 122.22(b)(1));

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) (40 C.F.R. § 122.22(b)(2)); and

c. The written authorization is submitted to the Regional Water Board and State Water Board. (40 C.F.R. § 122.22(b)(3).)

4. If an authorization under Standard Provisions – Reporting V.B.3 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Standard Provisions—Reporting V.B.3 above must be submitted to the Regional Water Board and State Water Board prior to or together with any reports, information, or applications, to be signed by an authorized representative. (40 C.F.R. § 122.22(c).)

5. Any person signing a document under Standard Provisions—Reporting V.B.2 or V.B.3 above shall make the following certification:

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.” (40 C.F.R. § 122.22(d).)
C. Monitoring Reports

1. Monitoring results shall be reported at the intervals specified in the Monitoring and Reporting Program in this Order. (40 C.F.R. § 122.22(l)(4).)

2. Monitoring results must be reported on a Discharge Monitoring Report (DMR) form or forms provided or specified by the Regional Water Board or State Water Board for reporting results of monitoring of sludge use or disposal practices. (40 C.F.R. § 122.41(l)(4)(i).)

3. If the Discharger monitors any pollutant more frequently than required by this Order using test procedures approved under 40 C.F.R. part 136, or another method required for an industry-specific waste stream under 40 C.F.R. subchapters N or O, the results of such monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Regional Water Board. (40 C.F.R. § 122.41(l)(4)(ii).)

4. Calculations for all limitations, which require averaging of measurements, shall utilize an arithmetic mean unless otherwise specified in this Order. (40 C.F.R. § 122.41(l)(4)(iii).)

D. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this Order, shall be submitted no later than 14 days following each schedule date. (40 C.F.R. § 122.41(l)(5).)

E. Twenty-Four Hour Reporting

1. The Discharger shall report any noncompliance that may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the Discharger becomes aware of the circumstances. A written submission shall also be provided within five (5) days of the time the Discharger becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. (40 C.F.R. § 122.41(l)(6)(i).)

2. The following shall be included as information that must be reported within 24 hours under this paragraph (40 C.F.R. § 122.41(l)(6)(ii)):
   a. Any unanticipated bypass that exceeds any effluent limitation in this Order. (40 C.F.R. § 122.41(l)(6)(ii)(A).)
   b. Any upset that exceeds any effluent limitation in this Order. (40 C.F.R. § 122.41(l)(6)(ii)(B).)

3. The Regional Water Board may waive the above-required written report under this provision on a case-by-case basis if an oral report has been received within 24 hours. (40 C.F.R. § 122.41(l)(6)(iii).)
F. Planned Changes

The Discharger shall give notice to the Regional Water Board as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required under this provision only when (40 C.F.R. § 122.41(l)(1)):

1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 C.F.R. section 122.29(b) (40 C.F.R. § 122.41(l)(1)(i)); or

2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitations in this Order. (Alternatively, for an existing manufacturing, commercial, mining, or silvicultural discharge as referenced in 40 C.F.R. section 122.42(a), this notification applies to pollutants that are subject neither to effluent limitations in this Order nor to notification requirements under 40 C.F.R. section 122.42(a)(1) (see Additional Provisions—Notification Levels VII.A.1.)) (40 C.F.R. § 122.41(l)(1)(ii).)

3. The alteration or addition results in a significant change in the Discharger's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan. (40 C.F.R. § 122.41(l)(1)(iii).)

G. Anticipated Noncompliance

The Discharger shall give advance notice to the Regional Water Board or State Water Board of any planned changes in the permitted facility or activity that may result in noncompliance with this Order's requirements. (40 C.F.R. § 122.41(l)(2).)

H. Other Noncompliance

The Discharger shall report all instances of noncompliance not reported under Standard Provisions—Reporting V.C, V.D, and V.E above at the time monitoring reports are submitted. The reports shall contain the information listed in Standard Provision—Reporting V.E above. (40 C.F.R. § 122.41(l)(7).)

I. Other Information

When the Discharger becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Water Board, State Water Board, or U.S. EPA, the Discharger shall promptly submit such facts or information. (40 C.F.R. § 122.41(l)(8).)

VI. STANDARD PROVISIONS – ENFORCEMENT

A. The Regional Water Board is authorized to enforce the terms of this Order under several provisions of the Water Code, including, but not limited to, sections 13268, 13385, 13386, and 13387.
VII. ADDITIONAL PROVISIONS—NOTIFICATION LEVELS

A. Non-Municipal Facilities

Existing manufacturing, commercial, mining, and silvicultural Dischargers shall notify the Regional Water Board as soon as they know or have reason to believe (40 C.F.R. § 122.42(a)):

1. That any activity has occurred or will occur that would result in the discharge, on a routine or frequent basis, of any toxic pollutant that is not limited in this Order, if that discharge will exceed the highest of the following “notification levels” (40 C.F.R. § 122.42(a)(1)):
   a. 100 micrograms per liter (μg/L) (40 C.F.R. § 122.42(a)(1)(i));
   b. 200 μg/L for acrolein and acrylonitrile; 500 μg/L for 2,4-dinitrophenol and 2-methyl-4,6-dinitrophenol; and 1 milligram per liter (mg/L) for antimony (40 C.F.R. § 122.42(a)(1)(ii));
   c. Five (5) times the maximum concentration value reported for that pollutant in the Report of Waste Discharge (40 C.F.R. § 122.42(a)(1)(iii)); or
   d. The level established by the Regional Water Board in accordance with section 122.44(f). (40 C.F.R. § 122.42(a)(1)(iv).)

2. That any activity has occurred or will occur that would result in the discharge, on a non-routine or infrequent basis, of any toxic pollutant that is not limited in this Order, if that discharge will exceed the highest of the following “notification levels” (40 C.F.R. § 122.42(a)(2)):
   a. 500 micrograms per liter (μg/L) (40 C.F.R. § 122.42(a)(2)(i));
   b. 1 milligram per liter (mg/L) for antimony (40 C.F.R. § 122.42(a)(2)(ii));
   c. Ten (10) times the maximum concentration value reported for that pollutant in the Report of Waste Discharge (40 C.F.R. § 122.42(a)(2)(iii)); or
   d. The level established by the Regional Water Board in accordance with section 122.44(f). (40 C.F.R. § 122.42(a)(2)(iv).)

B. Publicly-Owned Treatment Works (POTWs)

All POTWs shall provide adequate notice to the Regional Water Board of the following (40 C.F.R. § 122.42(b)):

1. Any new introduction of pollutants into the POTW from an indirect discharger that would be subject to CWA sections 301 or 306 if it were directly discharging those pollutants (40 C.F.R. § 122.42(b)(1)); and

2. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of adoption of this Order. (40 C.F.R. § 122.42(b)(2).)

3. Adequate notice shall include information on the quality and quantity of effluent introduced into the POTW as well as any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW. (40 C.F.R. § 122.42(b)(3).)
ATTACHMENT E – MONITORING AND REPORTING PROGRAM (MRP)

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ATTACHMENT E – MONITORING AND REPORTING PROGRAM (MRP)

Clean Water Act section 308 and 40 C.F.R. sections 122.41(h), 122.41(j)-(l), 122.41(i), and 122.48 require that all NPDES permits specify monitoring and reporting requirements. Water Code sections 13267 and 13383 also authorize the Regional Water Board to establish monitoring, inspection, entry, reporting, and recordkeeping requirements. This MRP establishes monitoring, reporting, and recordkeeping requirements that implement federal and State laws and regulations.

I. GENERAL MONITORING PROVISIONS

A. The Discharger shall comply with this MRP. The Executive Officer may amend this MRP pursuant to 40 C.F.R. sections 122.62, 122.63, and 124.5. If any discrepancies exist between this MRP and the “Regional Standard Provisions, and Monitoring and Reporting Requirements (Supplement to Attachment D) for NPDES Wastewater Discharge Permits” (Attachment G), this MRP shall prevail.

B. The Discharger shall conduct all monitoring in accordance with Attachment D, section III, as supplemented by Attachment G. Equivalent test methods must be more sensitive than those specified in 40 C.F.R. section 136 and must be specified in this permit.

II. MONITORING LOCATIONS

The Discharger shall establish the following monitoring locations to demonstrate compliance with the effluent limitations, discharge specifications, and other requirements in this Order:

<table>
<thead>
<tr>
<th>Monitoring Location Type</th>
<th>Monitoring Location Name</th>
<th>Monitoring Location Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influent</td>
<td>INF-001</td>
<td>Any point in the plant’s headworks at which all waste tributary to treatment is present and preceding any phase of treatment.</td>
</tr>
<tr>
<td>Effluent</td>
<td>EFF-001</td>
<td>Any point in the discharge pipeline from the plant to Miller Creek (via either Discharge Point No. 001 or 002) where wastewater treatment is complete (i.e., after chlorination and dechlorination) and all flow tributary to the outfall is present.</td>
</tr>
<tr>
<td>Effluent (blending)</td>
<td>EFF-001B</td>
<td>Any point in the discharge pipeline from the plant to Miller Creek (via either Discharge Point No. 001 or 002) where all blended wastewater (i.e., fully-treated and primary-treated effluent combined) flow tributary to the outfall is present (may be the same as Monitoring Location No. EFF-001).</td>
</tr>
<tr>
<td>Effluent</td>
<td>REC-001</td>
<td>Any point in the discharge pipelines from the plant where wastewater treatment, including disinfection, is complete, and all flow tributary to water recycling facilities is represented (may be a calculated total from flow meters on individual recycled water streams).</td>
</tr>
<tr>
<td>Biosolids</td>
<td>BIO-001</td>
<td>Facility biosolids</td>
</tr>
<tr>
<td>Receiving Water</td>
<td>RSW-001 (formerly C-2)</td>
<td>A point in Miller Creek within 20 feet downstream of Discharge Point No. 002.</td>
</tr>
<tr>
<td>Receiving Water</td>
<td>RSW-002 (formerly C-3)</td>
<td>A point in Miller Creek within 1,000 feet upstream of Discharge Point No. 001 and representative of background water quality.</td>
</tr>
</tbody>
</table>
III. INFLUENT MONITORING REQUIREMENTS

The Discharger shall monitor influent at Monitoring Location INF-001 as follows:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Sample Type</th>
<th>Minimum Sampling Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>MGD</td>
<td>Continuous</td>
<td>Continuous/D</td>
</tr>
<tr>
<td>Biochemical Oxygen Demand</td>
<td>mg/L</td>
<td>C-24</td>
<td>1/Week</td>
</tr>
<tr>
<td>(5-day @ 20°C)(BOD₅)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Suspended Solids (TSS)</td>
<td>mg/L</td>
<td>C-24</td>
<td>1/Week</td>
</tr>
<tr>
<td>Cyanide, Total</td>
<td>µg/L</td>
<td>Grab</td>
<td>2/Year</td>
</tr>
</tbody>
</table>

Unit Abbreviations:
- MGD = million gallons per day
- mg/L = milligrams per liter
- µg/L = micrograms per liter

Sample Types:
- Continuous = measured continuously
- C-24 = 24-hour composite sample
- Grab = grab sample

Sampling Frequency:
- Continuous/D = measured continuously, and recorded and reported daily
- 1/Week = once per week
- 2/Year = twice per year

Footnote:
[1] Flow shall be monitored continuously and the following information shall be reported in monthly self-monitoring reports:
- Daily average flow (MGD)
- Monthly average flow (MGD)
- Total monthly flow volume (MG)
- Maximum and minimum daily average flow rates (MGD)

IV. EFFLUENT MONITORING REQUIREMENTS

A. Effluent Monitoring (Monitoring Locations EFF-001 and REC-001)

The Discharger shall monitor effluent at Monitoring Location EFF-001 as follows when discharging to Miller Creek (except when blending). Flow shall be monitored year round; effluent flows directed to all onsite and offsite water recycling facilities shall be reported separately under Monitoring Location REC-001. For necessary EFF-001 discharges during the non-discharge season (June 1 to October 31), the Discharger shall monitor flow, BOD₅, TSS, pH, chlorine residual, enterococcus bacteria, ammonia, and cyanide. Monitoring the other parameters is not required.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Sample Type</th>
<th>Minimum Sampling Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>MGD and MG</td>
<td>Continuous</td>
<td>Continuous/D</td>
</tr>
<tr>
<td>Temperature</td>
<td>°C</td>
<td>Grab</td>
<td>1/Day</td>
</tr>
<tr>
<td>BOD₅</td>
<td>mg/L</td>
<td>C-24</td>
<td>1/Week</td>
</tr>
<tr>
<td>TSS</td>
<td>mg/L</td>
<td>C-24</td>
<td>1/Week</td>
</tr>
<tr>
<td>Oil and Grease</td>
<td>mg/L</td>
<td>Grab</td>
<td>1/Quarter</td>
</tr>
<tr>
<td>pH [3]</td>
<td>standard units</td>
<td>Continuous or Grab</td>
<td>Continuous/D or 1/Day</td>
</tr>
</tbody>
</table>

Table E-3. Effluent Monitoring (Monitoring Location EFF-001)
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Sample Type</th>
<th>Minimum Sampling Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine Residual</td>
<td>mg/L</td>
<td>Continuous/H</td>
<td>Continuous/H</td>
</tr>
<tr>
<td>Enterococcus Bacteria</td>
<td>MPN/100mL</td>
<td>Grab</td>
<td>1/Week</td>
</tr>
<tr>
<td>Ammonia, Total</td>
<td>mg/L as N</td>
<td>C-24</td>
<td>1/Month</td>
</tr>
<tr>
<td>Copper</td>
<td>µg/L</td>
<td>C-24</td>
<td>1/Month</td>
</tr>
<tr>
<td>Nickel</td>
<td>µg/L</td>
<td>C-24</td>
<td>1/Month</td>
</tr>
<tr>
<td>Cyanide</td>
<td>µg/L</td>
<td>Grab</td>
<td>1/Month</td>
</tr>
<tr>
<td>Bis(2-Ethylhexyl)Phthalate</td>
<td>µg/L</td>
<td>Grab</td>
<td>1/Month</td>
</tr>
<tr>
<td>Dioxin-TEQ</td>
<td>µg/L</td>
<td>Grab</td>
<td>1/Year</td>
</tr>
<tr>
<td>Acute Toxicity</td>
<td>% survival</td>
<td>Flow through</td>
<td>1/Quarter</td>
</tr>
<tr>
<td>Chronic Toxicity</td>
<td>TU&lt;sub&gt;c&lt;/sub&gt;</td>
<td>C-24</td>
<td>1/Quarter</td>
</tr>
<tr>
<td>Standard observations</td>
<td>--</td>
<td>Observation</td>
<td>1/Month</td>
</tr>
</tbody>
</table>

**Unit Abbreviations:**
- MGD = million gallons per day
- MG = million gallons
- mg/L = milligrams per liter
- mg/L as N = milligrams per liter as nitrogen
- µg/L = micrograms per liter
- % survival = percent survival
- TU<sub>c</sub> = chronic toxicity units, equal to 100/NOEL, where NOEL = IC<sub>25</sub>, EC<sub>25</sub>, or NOEC
- °C = degrees Celcius
- MPN/100 mL = most probable number per 100 mL

**Sample Type:**
- Continuous = measured continuously
- Continuous/H = measured continuously (or, if infeasible, at least hourly), and recorded and reported daily
- C-24 = 24-hour composite sample
- Grab = grab sample
- Flow through = test organisms are exposed to continuous effluent flow

**Sampling Frequency:**
- Continuous/D = measured continuously, and recorded and reported daily
- 1/Hour = once per hour
- 1/Day = once per day
- 1/Week = once per week
- 1/Month = once per month
- 1/Quarter = once per quarter
- 1/Year = once per year

**Footnotes:**
1. The effluent flow shall be the sum of the discharge flows at Discharge Point Nos. 001 and 002. Flow shall be monitored continuously and the following information shall be reported in monthly self-monitoring reports:
   - Daily average flow (MGD)
   - Monthly average flow (MGD)
   - Total monthly flow volume (MG)
   - Estimated monthly flow volume (MG) at each discharge point
   - Maximum and minimum daily average flow rates (MGD)

   During dry weather months or the non-discharge season, flow shall be adjusted to prevent double counting of plant recycle flows.

2. Each oil and grease sampling and analysis event shall be conducted in accordance with U.S. EPA Method 1664A.

3. If pH is monitored continuously, the minimum and maximum pH values for each day shall be reported in self-monitoring reports.

4. Effluent residual chlorine concentrations shall be monitored continuously or, at a minimum, every hour. The Discharger shall describe all excursions of the chlorine limit in the transmittal letter of self-monitoring reports as required by Attachment G section V.C.1.a. If monitoring continuously, the Discharger shall report through data upload to CIWQS, from discrete readings of the continuous monitoring every hour on the hour, the maximum for each day and any other discrete hourly reading that exceeds the effluent limit, and, for the purpose of mandatory minimum penalties required by Water Code section 13385(i), compliance shall be based only on these discrete readings. The Discharger shall retain continuous monitoring readings for at least three years. The Regional Water Board reserves the right to use all continuous monitoring data for discretionary enforcement.
The Discharger may elect to use a continuous on-line monitoring system for determining that residual dechlorinating agent is present. This monitoring system may be used to prove that anomalous residual chlorine exceedances measured by on-line chlorine analyzers are false positives and are invalid total residual chlorine detections because it is chemically improbable to have chlorine present in the presence of sodium bisulfite. If Regional Water Board staff finds convincing evidence that chlorine residual exceedances are false positives, the exceedances are not violations of this Order’s total chlorine residual limit.

Effluent ammonia samples shall be collected on the same day as receiving water ammonia samples.

If after one full discharge season (November through May) the Discharger has demonstrated full compliance with the bis(2-ethylhexyl)phthalate effluent limitation, the minimum monitoring frequency shall be reduced to twice per year. If the bis(2-ethylhexyl)phthalate effluent limitation is later exceeded, the Discharger shall return to sampling once per month for at least six consecutive months. If full compliance is demonstrated at the end of the six-month period, the Discharger may return to sampling just twice per year.

Acute bioassay tests shall be performed in accordance with MRP section V.A.

Critical life stage toxicity tests shall be performed in accordance with MRP section V.B.

Standard observations are specified in Attachment G section III.C.

The Enterolert method may be used to demonstrate compliance. Results may be reported as Colony Forming Units (CFU)/100 mL if the laboratory used provides results in CFU/100 mL.

### B. Effluent Monitoring (Monitoring Locations EFF-001B)

When blending, the Discharger shall monitor effluent at Monitoring Location EFF-001B as follows when discharging to Miller Creek:

#### Table E-4. Effluent Monitoring (Monitoring Location EFF-001B)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Sample Type</th>
<th>Minimum Sampling Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow[^1]</td>
<td>MG</td>
<td>Continuous</td>
<td>Continuous/D</td>
</tr>
<tr>
<td>Duration of blending event[^2]</td>
<td>hours</td>
<td>Calculated</td>
<td>1/Event</td>
</tr>
<tr>
<td>TSS</td>
<td>mg/L</td>
<td>C-24</td>
<td>1/Day</td>
</tr>
<tr>
<td>Enterococcus Bacteria[^3]</td>
<td>MPN/100mL</td>
<td>Grab</td>
<td>1/Day</td>
</tr>
<tr>
<td>Chlorine Residual[^4]</td>
<td>mg/L</td>
<td>Continuous/H</td>
<td>Continuous/H</td>
</tr>
<tr>
<td>BOD₅</td>
<td>mg/L</td>
<td>Grab or C-24</td>
<td>1/Year[^6]</td>
</tr>
<tr>
<td>pH[^5]</td>
<td>standard units</td>
<td>Continuous or Grab</td>
<td>1/Year[^6]</td>
</tr>
<tr>
<td>Ammonia, Total</td>
<td>mg/L as N</td>
<td>Grab or C-24</td>
<td>1/Year[^6]</td>
</tr>
<tr>
<td>Copper</td>
<td>µg/L</td>
<td>Grab or C-24</td>
<td>1/Year[^6]</td>
</tr>
<tr>
<td>Nickel</td>
<td>µg/L</td>
<td>Grab or C-24</td>
<td>1/Year[^6]</td>
</tr>
<tr>
<td>Cyanide</td>
<td>µg/L</td>
<td>Grab</td>
<td>1/Year[^6]</td>
</tr>
<tr>
<td>Bis(2-Ethylhexyl)Phthalate</td>
<td>µg/L</td>
<td>Grab</td>
<td>1/Year[^6]</td>
</tr>
</tbody>
</table>

**Unit Abbreviations:**
- MG = million gallons
- mg/L = milligrams per liter
- mg/L as N = milligrams per liter as nitrogen
- µg/L = micrograms per liter

**Sample Type:**
- Continuous = measured continuously
- Continuous/H = measured continuously (or, if infeasible, at least hourly), and recorded and reported daily
- C-24 = 24-hour composite sample
- Grab = grab sample

**Sampling Frequency:**
- Continuous/D = measured continuously, and recorded and reported daily
- 1/Event = once per blending event
- 1/Day = once per day
1/Year = once per year

Footnotes:


[2] For each blending event, the Discharger shall report the date and time each event starts and ends.

[3] The Enterolert method may be used to demonstrate compliance. Results may be reported as Colony Forming Units (CFU)/100 mL if the laboratory method used provides results in CFR/100 mL.

[4] Effluent residual chloride concentrations shall be monitored continuously or, at a minimum, every hour. The Discharger shall describe all excursions of the chlorine limit in the transmittal letter of self-monitoring reports as required by Attachment G section V.C.1.a. If monitoring continuously, the Discharger shall report through data upload to CIWQS, from discrete readings of the continuous monitoring every hour on the hour, the maximum for each day and any other discrete hourly reading that exceed the effluent limit, and, for the purpose of mandatory minimum penalties required by Water Code section 13385(i), compliance shall be based only on these discrete readings. The Discharger shall retain continuous monitoring readings for at least three years. The Regional Water Board reserves the right to use all continuous monitoring data for discretionary enforcement.

The Discharger may elect to use a continuous on-line monitoring system for determining that residual dechlorinating agent is present. This monitoring system may be used to prove that anomalous residual chlorine exceedances measured by on-line chlorine analyzers are false positives and are invalid total residual chlorine detections because it is chemically improbable to have chlorine present in the presence of sodium bisulfite. If Regional Water Board staff finds convincing evidence that chlorine residual exceedances are false positives, the exceedances are not violations of this Order’s total chlorine residual limit.

[5] If pH is monitored continuously, the minimum and maximum pH values for each day shall be reported in self-monitoring reports.

[6] If a TSS sample collected on the same day exceeds 45 mg/L, the frequency shall be once per day.

V. WHOLE EFFLUENT TOXICITY TESTING REQUIREMENTS

The Discharger shall monitor whole effluent acute and chronic toxicity at Monitoring Location EFF-001 as follows when discharging to Miller Creek:

A. Whole Effluent Acute Toxicity

1. Compliance with the acute toxicity effluent limitations shall be evaluated by measuring survival of test organisms exposed to 96-hour continuous flow-through bioassays.

2. Test organisms shall be rainbow trout (Onchorhynchus mykiss). The Executive Officer may specify a more sensitive organism or, if testing a particular organism proves unworkable, the most sensitive organism available.

3. All bioassays shall be performed according to the most up-to-date protocols in 40 C.F.R. part 136, currently Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, 5th Edition (EPA-821-R-02-012).

4. If the Discharger demonstrates that specific identifiable substances in the discharge are rapidly rendered harmless upon discharge to the receiving water, compliance with the acute toxicity limit may be determined after test samples are adjusted to remove the influence of those substances. Written acknowledgement that the Executive Officer concurs with the Discharger’s demonstration and that the adjustment will not remove the influence of other substances must be obtained prior to any such adjustment. The Discharger may manually adjust the pH of whole effluent acute toxicity samples prior to performing bioassays to minimize ammonia toxicity interference.

5. Bioassay water monitoring shall include, on a daily basis, pH, dissolved oxygen, ammonia (if toxicity is observed), temperature, hardness, and alkalinity. These results shall be reported. If final or intermediate results of an acute bioassay test indicate a violation or threatened
violation (e.g., the percentage of surviving test organisms is less than 70 percent), the Discharger shall initiate a new test as soon as practical and shall investigate the cause of the mortalities and report its findings in the next self-monitoring report. The Discharger shall repeat the test until a test fish survival rate of 90 percent or greater is observed. If the control fish survival rate is less than 90 percent, the bioassay test shall be restarted with new fish and shall continue as soon as practical until an acceptable test is completed (i.e., control fish survival rate is 90 percent or greater).

B. Whole Effluent Chronic Toxicity

1. Monitoring Requirements

a. Sampling. The Discharger shall collect 24-hour composite effluent samples at Monitoring Location EFF-001 for critical life stage toxicity testing as indicated below. For toxicity tests requiring renewals, the Discharger shall collect 24-hour composite samples on alternating days.

b. Test Species. The test species shall be *Mysidopsis bahia*. If using this species proves unworkable, the Executive Officer may specify a different species in writing upon the Discharger’s request with justification.

The Discharger shall conduct a screening chronic toxicity test as described in Appendix E-1, or as described in applicable State Water Board plan provisions that become effective after adoption of this Order, following any significant change in the nature of the effluent. If there is no significant change in the nature of the effluent, the Discharger shall conduct a screening test and submit the results with its application for permit reissuance.

c. Frequency. Chronic toxicity monitoring shall be as specified below:

i. The Discharger shall monitor routinely once per quarter.

ii. The Discharger shall conduct a toxicity identification evaluation (TIE) when there is an exceedance of the chronic toxicity limitation.

iii. The Discharger shall accelerate monitoring to monthly if the TIE indicates that a pollutant or pollutants other than pyrethroids causes or contributes to the toxicity and routine monitoring exceeds either a three-sample median of 1 chronic toxicity unit (TUc) or a single-sample maximum of 2 TUc. Based on the TUc results, the Executive Officer may specify a different frequency for accelerated monitoring to ensure that accelerated monitoring provides useful information.

iv. The Discharger shall return to routine monitoring if accelerated monitoring does not exceed either trigger in iii, above.

v. If accelerated monitoring confirms consistent toxicity in excess of either trigger in iii, above, the Discharger shall initiate toxicity reduction evaluation (TRE) procedures in accordance with section V.B.3, below.
vi. The Discharger shall return to routine monitoring after implementing appropriate elements of the TRE, and either the toxicity drops below both triggers in iii, above, or, based on the TRE results, the Executive Officer determines that accelerated monitoring would no longer provide useful information.

Monitoring conducted pursuant to a TRE shall satisfy the requirements for accelerated monitoring while the TRE is underway.

d. **Methodology.** Sample collection, handling, and preservation shall be in accordance with U.S. EPA protocols. In addition, bioassays shall be conducted in compliance with the most recently promulgated test methods, as shown in Appendix E-1. These are *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms*, currently third edition (EPA-821-R-02-014). If these protocols prove unworkable, the Executive Officer and the Environmental Laboratory Accreditation Program may grant exceptions in writing upon the Discharger’s request with justification. If the Discharger demonstrates that specific identifiable substances in the discharge are rapidly rendered harmless upon discharge to the receiving water, compliance with the chronic toxicity limit may be determined after test samples are adjusted to remove the influence of those substances. Written acknowledgement that the Executive Officer concurs with the Discharger’s demonstration and that the adjustment will not remove the influence of other substances must be obtained prior to any such adjustment.

e. **Dilution Series.** The Discharger shall conduct tests at 100%, 70%, 40%, 20%, 10%, and 5%. The “%” represents percent effluent as discharged. Test sample pH may be controlled to the level of the effluent sample as received prior to being salted up.

2. **Reporting Requirements**

a. The Discharger shall provide toxicity test results for the current reporting period in the self-monitoring report and shall include the following, at a minimum, for each test:

   i. Sample date

   ii. Test initiation date

   iii. Test species

   iv. End point values for each dilution (e.g., number of young, growth rate, percent survival)

   v. No Observable Effect Level (NOEL) values in percent effluent. The NOEL shall equal the IC\(_{25}\) or EC\(_{25}\) (see MRP Appendix E-1). If the IC\(_{25}\) or EC\(_{25}\) cannot be statistically determined, the NOEL shall equal to the No Observable Effect Concentration (NOEC) derived using hypothesis testing. The NOEC is the maximum percent effluent concentration that causes no observable effect on test organisms based on a critical life stage toxicity test.

   vi. IC\(_{15}\), IC\(_{25}\), IC\(_{40}\), and IC\(_{50}\) values (or EC\(_{15}\), EC\(_{25}\), EC\(_{40}\), and EC\(_{50}\)) as percent effluent
vii. TU\textsubscript{c} values (100/NOEL, where NOEL = IC\textsubscript{25}, EC\textsubscript{25}, or NOEC)

viii. Mean percent mortality (±s.d.) after 96 hours in 100% effluent (if applicable)

ix. IC\textsubscript{50} or EC\textsubscript{50} values for reference toxicant tests

x. Available water quality measurements for each test (e.g., pH, dissolved oxygen, temperature, conductivity, hardness, salinity, and ammonia)

b. The Discharger shall provide the results of the most recent three chronic toxicity tests and the three-sample median in the self-monitoring report.

3. Toxicity Reduction Evaluation (TRE)

a. The Discharger shall prepare a generic TRE work plan within 90 days of the effective date of this Order to be ready to respond to toxicity events. The Discharger shall review and update the work plan as necessary so that it remains current and applicable to the discharge and discharge facilities.

b. Within 30 days of exceeding either chronic toxicity trigger in section V.B.1.c.iii, above, the Discharger shall submit a TRE work plan, which shall be the generic work plan revised as appropriate for this toxicity event after consideration of available discharge data.

c. Within 30 days of completing an accelerated monitoring test observed to exceed either trigger in section V.B.1.c.iii, above, the Discharger shall initiate a TRE in accordance with a TRE work plan that incorporates any and all comments from the Executive Officer.

d. The TRE shall be specific to the discharge and be in accordance with current technical guidance and reference materials, including U.S. EPA guidance materials. The Discharger shall conduct the TRE as a tiered evaluation as summarized below:

i. Tier 1 shall consist of basic data collection (routine and accelerated monitoring).

ii. Tier 2 shall consist of evaluation of treatment process optimization, including operational practices and in-plant process chemicals.

iii. Tier 3 shall consist of a toxicity identification evaluation (TIE).

iv. Tier 4 shall consist of evaluation of options for additional effluent treatment processes.

v. Tier 5 shall consist of evaluation of options for modifications of in-plant treatment processes.

vi. Tier 6 shall consist of implementation of selected toxicity control measures and followup monitoring and confirmation of implementation success.
e. The Discharger may end the TRE at any stage if monitoring finds there is no longer consistent toxicity above the triggers in section V.B.1.c.iii, above.

f. The objective of the TIE shall be to identify the substance or combination of substances causing the observed toxicity. The Discharger shall employ all reasonable efforts using currently available TIE methodologies.

g. As toxic substances are identified or characterized, the Discharger shall continue the TRE by determining the sources and evaluating alternative strategies for reducing or eliminating the toxic substances from the discharge. The Discharger shall take all reasonable steps to reduce toxicity to levels below the chronic toxicity limit.

h. Many recommended TRE elements parallel required or recommended efforts related to source control, pollution prevention, and stormwater control programs. TRE efforts should be coordinated with such efforts. To prevent duplication of efforts, evidence of complying with requirements or recommended efforts of such programs may be acceptable to demonstrate compliance with TRE requirements.

VI. RECEIVING WATER MONITORING REQUIREMENTS

The Discharger shall continue to participate in the Regional Monitoring Program, which collects data on pollutants and toxicity in San Francisco Bay’s water, sediment, and biota. The Discharger shall monitor receiving waters at Monitoring Locations RSW-001 and RSW-002 as follows when discharges to Miller Creek are occurring:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Sample Type</th>
<th>Minimum Sampling Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>standard units</td>
<td>Grab</td>
<td>1/month</td>
</tr>
<tr>
<td>Temperature</td>
<td>°C</td>
<td>Grab</td>
<td>1/month</td>
</tr>
<tr>
<td>Hardness</td>
<td>mg/L as CaCO₃</td>
<td>Grab</td>
<td>1/month</td>
</tr>
<tr>
<td>Salinity</td>
<td>ppt</td>
<td>Grab</td>
<td>1/month</td>
</tr>
<tr>
<td>Total Ammonia</td>
<td>mg/L as nitrogen</td>
<td>Grab</td>
<td>1/month</td>
</tr>
<tr>
<td>Standard observations [1]</td>
<td>---</td>
<td>Observations</td>
<td>1/month</td>
</tr>
</tbody>
</table>

Unit Abbreviations:
°C = degrees Celsius
mg/L = milligrams per liter
ppt = parts per thousand

Sample Type:
Grab = Grab sample

Sampling Frequency:
1/month = once per month

Footnote:
[1] Standard observations are specified in Attachment G section III.C.
VII. REPORTING REQUIREMENTS

A. General Monitoring and Reporting Requirements

The Discharger shall comply with all Standard Provisions (Attachments D and G) related to monitoring, reporting, and recordkeeping, with modifications shown in section VIII, below.

B. Self-Monitoring Reports (SMRs)

1. SMR Format. The Discharger shall electronically submit SMRs using the State Water Board's California Integrated Water Quality System (CIWQS) Web site (http://www.waterboards.ca.gov/ciwqs/index.html). The CIWQS website will provide additional information for SMR submittal in the event of a planned service interruption for electronic submittal.

2. SMR Due Dates and Contents. The Discharger shall submit SMRs by the due dates, and with the contents, specified below:

a. Monthly SMRs — Monthly SMRs shall be due 30 days after the end of each calendar month, covering that calendar month. The monthly SMR shall contain the applicable items described in sections V.B and V.C of both Attachments D and G of this Order. See Provision VI.C.2 (Effluent and Receiving Water Characterization Study and Report) of this Order for information that must also be reported with monthly SMRs.

Monthly SMRs shall include all new monitoring results obtained since the last SMR was submitted. If the Discharger monitors any pollutant more frequently than required by this Order, the Discharger shall include the results of such monitoring in the calculations and reporting for the SMR.

b. Annual SMR — Annual SMRs shall be due February 1 each year, covering the previous calendar year. The annual SMR shall contain the items described in sections V.C.1.f of Attachment G. See also Provisions VI.C.2 (Effluent and Receiving Water Characterization Study and Report) and VI.C.4.a (Sludge and Biosolids Management) of the Order for requirements to submit reports with the annual SMR.

c. Specifications for Submitting SMRs to CIWQS — The Discharger shall submit analytical results and other information using one of the following methods:

Table E-6. CIWQS Reporting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method of Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>All parameters identified in influent, effluent, and receiving water monitoring tables (except Dissolved Oxygen and Temperature)</td>
<td>EDF/CDF data upload or manual entry</td>
</tr>
<tr>
<td>Dissolved Oxygen Temperature</td>
<td>Required for all results</td>
</tr>
<tr>
<td></td>
<td>Attached File</td>
</tr>
<tr>
<td>Dissolved Oxygen Temperature</td>
<td>Required for monthly maximum and minimum results only[^1]</td>
</tr>
<tr>
<td></td>
<td>Discharger may use this method for all results or keep records</td>
</tr>
</tbody>
</table>

[^1]: Discharger may use this method for all results or keep records.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method of Reporting</th>
<th>Attached File</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimony</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Arsenic</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Beryllium</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Cadmium</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Chromium</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Cyanide</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Mercury</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Nickel</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Selenium</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Silver</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Thallium</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Zinc</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Dioxins and Furans (by U.S. EPA Method 1613)</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Other Pollutants (by U.S. EPA methods 601, 602, 608, 610, 614, 624, and 625)</td>
<td>Required for all results[2]</td>
<td></td>
</tr>
<tr>
<td>Volume and Duration of Blended Discharge[3]</td>
<td>Required for all blended effluent discharges</td>
<td></td>
</tr>
<tr>
<td>Analytical Method</td>
<td>Not required</td>
<td></td>
</tr>
<tr>
<td>Collection Time</td>
<td>Not required</td>
<td></td>
</tr>
<tr>
<td>Analysis Time</td>
<td>Not required</td>
<td></td>
</tr>
</tbody>
</table>

Footnotes:

[1] The Discharger shall continue to monitor at the minimum frequency specified in this MRP, keep records of the measurements, and make the records available upon request.

[2] These parameters require EDF/CDF data upload or manual entry regardless of whether monitoring is required by this MRP or other provisions of this Order (except for biosolids, sludge, or ash provisions).

[3] The requirement for volume and duration of blended discharge applies only if this Order authorizes the Discharger to discharge blended effluent.

The Discharger shall arrange all reported data in a tabular format and summarize data to clearly illustrate whether the Facility is operating in compliance with effluent limitations. The Discharger is not required to duplicate the submittal of data entered in a tabular format within CIWQS. When electronic submittal of data is required and CIWQS does not provide for entry into a tabular format, the Discharger shall electronically submit the data in a tabular format as an attachment.

### 3. Monitoring Periods

Monitoring periods for all required monitoring shall be as set forth below unless otherwise specified:

<table>
<thead>
<tr>
<th>Sampling Frequency</th>
<th>Monitoring Period Begins On[1]…</th>
<th>Monitoring Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>Permit effective date</td>
<td>All</td>
</tr>
<tr>
<td>1/Hour</td>
<td>Permit effective date</td>
<td>Hourly</td>
</tr>
<tr>
<td>1/Day</td>
<td>Permit effective date</td>
<td>Midnight through 11:59 p.m.</td>
</tr>
<tr>
<td>1/Week</td>
<td>Sunday following (or on) permit effective date</td>
<td>Sunday through Saturday</td>
</tr>
</tbody>
</table>

Table E-7. Monitoring Periods
4. **Reporting Level (RL) and Method Detection Limit (MDL) Reporting.** The Discharger shall report with each sample result the RL and MDL as determined by the procedure in 40 C.F.R. part 136. The Discharger shall report the results of analytical determinations for the presence of chemical constituents in a sample using the following reporting protocols:

   a. Sample results greater than or equal to the RL shall be reported as measured by the laboratory (i.e., the measured chemical concentration in the sample).

   b. Sample results less than the RL, but greater than or equal to the laboratory’s MDL, shall be reported as “Detected, but Not Quantified,” or DNQ. The estimated chemical concentration of the sample shall also be reported.

   For purposes of data collection, the laboratory shall write the estimated chemical concentration next to DNQ. The laboratory may, if such information is available, include numerical estimates of the data quality for the reported result. Numerical estimates of data quality may be percent accuracy (+/- a percentage of the reported value), numerical ranges (low to high), or any other means the laboratory considers appropriate.

   c. Sample results less than the laboratory’s MDL shall be reported as “Not Detected” or ND.

   d. The Discharger shall instruct laboratories to establish calibration standards so that the minimum level (ML) value (or its equivalent if there is differential treatment of samples relative to calibration standards) is the lowest calibration standard. At no time is the Discharger to use analytical data derived from extrapolation beyond the lowest point of the calibration curve.

5. **Compliance Determination**

   Compliance with effluent limitations for priority pollutants shall be determined using sample reporting protocols defined above and in the Fact Sheet and Attachments A, D, and G. For purposes of reporting and administrative enforcement by the Regional Water Board and State Water Board, the Discharger shall be deemed out of compliance with effluent limitations if
the concentration of the priority pollutant in the monitoring sample is greater than the effluent limitation and greater than or equal to the reporting level (RL).

C. Discharge Monitoring Reports (DMRs)

1. The State Water Board has notified the Discharger to electronically submit DMRs. If such notification is rescinded, the Discharger shall submit DMRs in accordance with the requirements described below.

2. The Discharger shall submit hard copy DMRs. The Discharger shall sign and certify DMRs as Attachment D requires. The Discharger shall submit DMRs to one of the addresses listed below:

<table>
<thead>
<tr>
<th>Standard Mail</th>
<th>FedEx/UPS/Other Private Carriers</th>
</tr>
</thead>
</table>
| State Water Resources Control Board  
Division of Water Quality  
c/o DMR Processing Center  
PO Box 100  
Sacramento, CA 95812-1000 | State Water Resources Control Board  
Division of Water Quality  
c/o DMR Processing Center  
1001 I Street, 15th Floor  
Sacramento, CA 95814 |

3. All discharge monitoring results shall be reported on official U.S. EPA pre-printed DMR forms (EPA Form 3320-1) or self-generated forms that follow the exact same format as EPA Form 3320-1.

VIII. MODIFICATIONS TO ATTACHMENT G

This MRP modifies Attachment G as indicated below:

A. Attachment G section V.C.1.c.2 is revised as follows:

2) When determining compliance with an average monthly effluent limitation or maximum daily effluent limitation, and more than one sample result is available, the Discharger shall compute the arithmetic mean unless the data set contains one or more reported determinations of detected but not quantified (DNQ) or nondetect (ND). In those cases, the Discharger shall compute the median in place of the arithmetic mean in accordance with the following procedure:

i. The data set shall be ranked from low to high, reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.

ii. The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

If a sample result, or the arithmetic mean or median of multiple sample results, is below the reporting limit, and there is evidence that the priority pollutant is present in
the effluent above an effluent limitation and the Discharger conducts a Pollutant
Minimization Program, the Discharger shall not be deemed out of compliance.

B. Attachment G sections V.C.1.f and V.C.1.g are revised as follows, and section V.C.1.h
(Reporting data in electronic format) is deleted.

f. Annual self-monitoring report requirements

By the date specified in the MRP, the Discharger shall submit an annual report
to the Regional Water Board covering the previous calendar year. The report
shall contain the following:

1) Annual compliance summary table of treatment plant performance,
including documentation of any blending events (this summary table is not
required if the Discharger has submitted the year’s monitoring results to
CIWQS in electronic reporting format by EDF/CDF upload or manual
entry);

2) Comprehensive discussion of treatment plant performance and compliance
with the permit (This discussion shall include any corrective actions taken
or planned, such as changes to facility equipment or operation practices
that may be needed to achieve compliance, and any other actions taken or
planned that are intended to improve performance and reliability of the
Discharger’s wastewater collection, treatment, or disposal practices.);

3) Both tabular and graphical summaries of the monitoring data for the
previous year if parameters are monitored at a frequency of monthly or
greater (this item is not required if the Discharger has submitted the year’s
monitoring results to CIWQS in electronic reporting format by EDF/CDF
upload or manual entry);

4) List of approved analyses, including the following:
   (i) List of analyses for which the Discharger is certified;
   (ii) List of analyses performed for the Discharger by a separate certified
        laboratory (copies of reports signed by the laboratory director of that
        laboratory shall not be submitted but be retained onsite); and
   (iii) List of “waived” analyses, as approved;

5) Plan view drawing or map showing the Discharger’s facility, flow routing,
and sampling and observation station locations;

6) Results of annual facility inspection to verify that all elements of the
SWPP Plan are accurate and up to date (only required if the Discharger
does not route all stormwater to the headworks of its wastewater treatment
plant); and
7) Results of facility report reviews (The Discharger shall regularly review, revise, and update, as necessary, the O&M Manual, the Contingency Plan, the Spill Prevention Plan, and Wastewater Facilities Status Report so that these documents remain useful and relevant to current practices. At a minimum, reviews shall be conducted annually. The Discharger shall include, in each Annual Report, a description or summary of review and evaluation procedures, recommended or planned actions, and an estimated time schedule for implementing these actions. The Discharger shall complete changes to these documents to ensure they are up-to-date.).

g. Report submittal

The Discharger shall submit SMRs addressed as follows, unless the Discharger submits SMRs electronically to CIWQS:

California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612
Attn: NPDES Wastewater Division

h. Reporting data in electronic format – Deleted

C. Attachment G sections V.E.2, V.E.2.a, and V.E.2.c are revised as follows, and sections V.E.2.b (24-hour Certification) and V.E.2.d (Communication Protocol) are deleted.

2. Unauthorized Discharges from Municipal Wastewater Treatment Plants

The following requirements apply to municipal wastewater treatment plants that experience an unauthorized discharge at their treatment facilities and supersede requirements imposed on the Discharger by the Executive Officer by letter of May 1, 2008:

a. Two (2)-Hour Notification

For any unauthorized discharges that enter a drainage channel or a surface water, the Discharger shall, as soon as possible, but not later than two (2) hours after becoming aware of the discharge, notify the California Emergency Management Agency (CalEMA, currently 800-852-7550), the local health officers or directors of environmental health with jurisdiction over the affected water bodies, and the Regional Water Board. Timely notification by the Discharger to CalEMA also satisfies notification to the Regional Water Board. Notification shall include the following:

1) Incident description and cause;

2) Location of threatened or involved waterway(s) or storm drains;

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1 California Code of Regulations, Title 23, Section 2250(b), defines an unauthorized discharge to be a discharge, not regulated by waste discharge requirements, of treated, partially treated, or untreated wastewater resulting from the intentional or unintentional diversion of wastewater from a collection, treatment or disposal system.
3) Date and time the unauthorized discharge started;

4) Estimated quantity and duration of the unauthorized discharge (to the extent known), and the estimated amount recovered;

5) Level of treatment prior to discharge (e.g., raw wastewater, primary treated, undisinfected secondary treated, and so on); and

6) Identity of the person reporting the unauthorized discharge.

b. 24-hour Certification – Deleted

c. 5-day Written Report

Within five business days, the Discharger shall submit a written report that includes, in addition to the information required above, the following:

1) Methods used to delineate the geographical extent of the unauthorized discharge within receiving waters;

2) Efforts implemented to minimize public exposure to the unauthorized discharge;

3) Visual observations of the impacts (if any) noted in the receiving waters (e.g., fish kill, discoloration of water) and the extent of sampling if conducted;

4) Corrective measures taken to minimize the impact of the unauthorized discharge;

5) Measures to be taken to minimize the chances of a similar unauthorized discharge occurring in the future;

6) Summary of Spill Prevention Plan or O&M Manual modifications to be made, if necessary, to minimize the chances of future unauthorized discharges; and

7) Quantity and duration of the unauthorized discharge, and the amount recovered.

d. Communication Protocol – Deleted
APPENDIX E-1
CHRONIC TOXICITY
DEFINITION OF TERMS AND SCREENING PHASE REQUIREMENTS

I. Definition of Terms

A. No observed effect level (NOEL) for compliance determination is equal to IC_{25} or EC_{25}. If the IC_{25} or EC_{25} cannot be statistically determined, the NOEL shall be equal to the NOEC derived using hypothesis testing.

B. Effective concentration (EC) is a point estimate of the toxicant concentration that would cause an adverse effect on a quantal, "all or nothing," response (such as death, immobilization, or serious incapacitation) in a given percent of the test organisms. If the effect is death or immobility, the term lethal concentration (LC) may be used. EC values may be calculated using point estimation techniques such as probit, logit, and Spearman-Karber. EC_{25} is the concentration of toxicant (in percent effluent) that causes a response in 25 percent of the test organisms.

C. Inhibition concentration (IC) is a point estimate of the toxicant concentration that would cause a given percent reduction in a nonlethal, nonquantal biological measurement, such as growth. For example, an IC_{25} is the estimated concentration of toxicant that would cause a 25 percent reduction in average young per female or growth. IC values may be calculated using a linear interpolation method such as U.S. EPA’s Bootstrap Procedure.

D. No observed effect concentration (NOEC) is the highest tested concentration of an effluent or a toxicant at which no adverse effects are observed on the aquatic test organisms at a specific time of observation. It is determined using hypothesis testing.

II. Chronic Toxicity Screening Phase Requirements

A. The Discharger shall perform screening phase monitoring:
   1. Subsequent to any significant change in the nature of the effluent discharged through changes in sources or treatment, except those changes resulting from reductions in pollutant concentrations attributable to source control efforts, or
   2. Prior to permit reissuance. Screening phase monitoring data shall be included in the NPDES permit application for reissuance. The information shall be as recent as possible, but may be based on screening phase monitoring conducted within 5 years before the permit expiration date.

B. Design of the screening phase shall, at a minimum, consist of the following elements:
   1. Use of test species specified in Appendix E-2, attached, and use of the protocols referenced in those tables.
2. Two stages:
   
a. **Stage 1** shall consist of a minimum of one battery of tests conducted concurrently. Selection of the type of test species and minimum number of tests shall be based on Appendix E-2 (attached).

b. **Stage 2** shall consist of a minimum of two test batteries conducted at a monthly frequency using the three most sensitive species based on the Stage 1 test results.

3. Appropriate controls.


5. Dilution series of 100%, 50%, 25%, 12.5%, 6.25%, and 0 %, where “%” is percent effluent as discharged, or as otherwise approved the Executive Officer if different dilution ratios are needed to reflect discharge conditions.

C. The Discharger shall submit a screening phase proposal. The proposal shall address each of the elements listed above. If within 30 days, the Executive Officer does not comment, the Discharger shall commence with screening phase monitoring.
## APPENDIX E-2
### SUMMARY OF TOXICITY TEST SPECIES REQUIREMENTS

<table>
<thead>
<tr>
<th>Species</th>
<th>(Scientific Name)</th>
<th>Effect</th>
<th>Test Duration</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alga</td>
<td><em>Skeletonema costatum</em> <em>(Thalassiosira pseudonana)</em></td>
<td>Growth rate</td>
<td>4 days</td>
<td>1</td>
</tr>
<tr>
<td>Red alga</td>
<td><em>Champia parvula</em></td>
<td>Number of cystocarps</td>
<td>7–9 days</td>
<td>3</td>
</tr>
<tr>
<td>Giant kelp</td>
<td><em>Macrocystis pyriforma</em></td>
<td>Percent germination; germ tube length</td>
<td>48 hours</td>
<td>2</td>
</tr>
<tr>
<td>Abalone</td>
<td><em>Haliotis rufescens</em></td>
<td>Abnormal shell development</td>
<td>48 hours</td>
<td>2</td>
</tr>
<tr>
<td>Oyster Mussel</td>
<td><em>(Crassostrea gigas)</em> <em>(Mytilus edulis)</em></td>
<td>Abnormal shell development; percent survival</td>
<td>48 hours</td>
<td>2</td>
</tr>
<tr>
<td>Echinoderms -</td>
<td><em>(Strongylocentrotus purpuratus, S. franciscanus)</em></td>
<td>Percent fertilization</td>
<td>1 hour</td>
<td>2</td>
</tr>
<tr>
<td>Urchins Sand</td>
<td><em>(Dendraster excentricus)</em></td>
<td>Larval development</td>
<td>72 hour</td>
<td>2</td>
</tr>
<tr>
<td>Shrimp</td>
<td><em>(Americamysis bahia)</em></td>
<td>Percent survival; growth</td>
<td>7 days</td>
<td>3</td>
</tr>
<tr>
<td>Shrimp</td>
<td><em>(Holmesimysis costata)</em></td>
<td>Percent survival; growth</td>
<td>7 days</td>
<td>2</td>
</tr>
<tr>
<td>Topsmelt</td>
<td><em>(Atherinops affinis)</em></td>
<td>Percent survival; growth</td>
<td>7 days</td>
<td>2</td>
</tr>
<tr>
<td>Silversides</td>
<td><em>(Menidia beryllina)</em></td>
<td>Larval growth rate; percent survival</td>
<td>7 days</td>
<td>3</td>
</tr>
</tbody>
</table>

**Toxicity Test References:**


Table AE-2. Critical Life Stage Toxicity Tests for Fresh Waters

<table>
<thead>
<tr>
<th>Species</th>
<th>(Scientific Name)</th>
<th>Effect</th>
<th>Test Duration</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fathead minnow</td>
<td><em>Pimephales promelas</em></td>
<td>Survival; growth rate</td>
<td>7 days</td>
<td>4</td>
</tr>
<tr>
<td>Water flea</td>
<td><em>Ceriodaphnia dubia</em></td>
<td>Survival; number of young</td>
<td>7 days</td>
<td>4</td>
</tr>
<tr>
<td>Alga</td>
<td><em>Selenastrum capricornutum</em></td>
<td>Final cell density</td>
<td>4 days</td>
<td>4</td>
</tr>
</tbody>
</table>

**Toxicity Test Reference:**

Table AE-3. Toxicity Test Requirements for Stage One Screening Phase

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Receiving Water Characteristics</th>
<th>Discharges to Coast</th>
<th>Discharges to San Francisco Bay[^1]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ocean</td>
<td>Marine/Estuarine</td>
</tr>
<tr>
<td>Taxonomic diversity</td>
<td></td>
<td>1 plant</td>
<td>1 plant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 invertebrate</td>
<td>1 invertebrate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 fish</td>
<td>1 fish</td>
</tr>
<tr>
<td>Number of tests of each salinity type: Freshwater[^2]</td>
<td>0</td>
<td>1 or 2</td>
<td>3</td>
</tr>
<tr>
<td>Marine/Estuarine</td>
<td>4</td>
<td>3 or 4</td>
<td>0</td>
</tr>
<tr>
<td>Total number of tests</td>
<td>4</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

[^1]: Marine refers to receiving water salinities greater than 1 part per thousand (ppt) at least 95 percent of the time during a normal water year.
(b) Freshwater refers to receiving water with salinities less than 1 ppt at least 95 percent of the time during a normal water year.
(c) Estuarine refers to receiving water salinities that fall between those of marine and freshwater, as described above.
[^2]: The freshwater species may be substituted with marine species if:
(a) The salinity of the effluent is above 1 ppt greater than 95 percent of the time, or
(b) The ionic strength (TDS or conductivity) of the effluent at the test concentration used to determine compliance is documented to be toxic to the test species.
ATTACHMENT F - FACT SHEET

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ATTACHMENT F – FACT SHEET

This Fact Sheet includes the legal requirements and technical rationale that serve as the basis for the requirements of this Order. As described in section II.B of the Order, the Regional Water Board incorporates this Fact Sheet as its findings supporting the issuance of the Order.

I. PERMIT INFORMATION

The following table summarizes administrative information related to the facility:

| Table F-1. Facility Information
| WDID | 2 215012001 |
| CIWQS Place ID | 236598 |
| Discharger | Las Gallinas Valley Sanitary District |
| Facility Name | Las Gallinas Valley Sanitary District Sewage Treatment Plant and its wastewater collection system |
| Facility Address | 300 Smith Ranch Road<br>San Rafael, CA 94903<br>Marin County |
| Facility Contact, Title, Phone | Mark Williams, General Manager, 415-472-1734 |
| Authorized Person to Sign and Submit Reports | Same as above |
| Mailing Address | 300 Smith Ranch Road<br>San Rafael, CA 94903 |
| Billing Address | Same as Mailing Address |
| Facility Type | Publicly-Owned Treatment Works (POTW) |
| Major or Minor Facility | Major |
| Threat to Water Quality | 2 |
| Complexity | A |
| Pretreatment Program | No |
| Reclamation Requirements | Order Nos. 89-127, 92-064, and 96-011 |
| Mercury and PCBs Requirements | NPDES Permit No. CA0038849 |
| Nutrients Requirements | NPDES Permit No. CA0038873 |
| Permitted Flow | 2.92 million gallons per day (MGD) |
| Design Flow | 2.92 MGD – Average dry weather treatment capacity<br>8.0 MGD – Peak wet weather secondary treatment capacity<br>25 MGD – Peak wet weather hydraulic capacity |
| Watershed | San Pablo Bay |
| Receiving Water | Miller Creek |
| Receiving Water Type | Estuarine |

A. The Las Gallinas Valley Sanitary District (Discharger) is the owner and operator of the Las Gallinas Valley Sanitary District Sewage Treatment Plant and its wastewater collection system (collectively, the Facility), which provide secondary treatment of the wastewater collected from its service area. During the wet season, the Facility discharges treated effluent to Miller Creek, a water of the United States within the San Pablo Bay watershed. During the dry season, the Discharger stores effluent onsite or reclaims it (i.e., does not discharge it to Miller Creek).
For the purposes of this Order, references to the “discharger” or “permittee” in applicable federal and State laws, regulations, plans, or policy are held to be equivalent to references to the Discharger herein.

B. The Discharger is regulated pursuant to National Pollutant Discharge Elimination System (NPDES) Permit No. CA0037851. It was previously subject to Order No. R2-2009-0070 (previous order), which was adopted on October 14, 2009, expired on November 30, 2014, and was administratively extended by operation of law. The Discharger was also subject to Cease and Desist Order No. R2-2009-0071, which addressed the Discharger’s inability to comply with the previous order’s copper effluent limits.

C. The Discharger filed a Report of Waste Discharge and submitted an application for reissuance of its WDRs and NPDES permit on June 3, 2014.

D. The Discharger is also regulated under Water Reuse Order No. 89-127, Water Reuse Order No. 92-064, and General Water Reuse Order No. 96-011, which establish requirements on water reclamation and reuse. This Order does not affect those orders.

E. The discharge is also regulated under NPDES Permit Nos. CA0038849 and CA0038873, which establish requirements on mercury and polychlorinated biphenyls (PCBs), and nutrients. This Order does not affect those permits.

II. FACILITY DESCRIPTION

A. Wastewater and Biosolids Treatment and Controls

1. Location and Service Area. The treatment plant is located at 300 Smith Ranch Road in San Rafael. It provides primary and secondary treatment of domestic wastewater collected from the northern area of the City of San Rafael and unincorporated portions of Marin County. The service area population is approximately 30,000. Attachment B provides a map of the area around the Facility.

2. Collection System. The collection system consists of 105 miles of gravity-flow sanitary sewer lines and 6.7 miles of pressure sewers, which range in diameter from 6 to 30 inches. There are 28 lift stations. Several small satellite collection systems connect to the Facility. The largest are two mobile home parks that contribute approximately 2.6 percent and 2.0 percent of the treatment plant flow. The remaining satellite systems are much smaller.

3. Wastewater Treatment. The plant has a dry weather flow design capacity of 2.92 million gallons per day (MGD) and can treat up to approximately 9 MGD with full secondary treatment (although its reliable process capacity is 8 MGD). From December 2009 through October 2014, the average dry weather effluent flow was 2.11 MGD (determined from July through September) and its average wet weather effluent flow was 3.23 MGD (determined from November through April). The maximum daily effluent flow was 12.36 MGD.

Treatment processes include two mechanically-cleaned fine screens, two aerated grit chambers, one 80-foot diameter primary clarifier/flow equalization basin, two 65-foot diameter primary clarifiers, two trickling filters, a secondary clarifier, a fixed film reactor for nitrification, eight coarse media (anthracite) deep-bed filters, and two underground chlorine contact basins.
Disinfection occurs using sodium hypochlorite and dechlorination using sodium bisulfite. Treated effluent is discharged to Miller Creek during the wet season. During the dry season, treated effluent is routed to an onsite reclamation system and re-used (see Fact Sheet section II.A.4). In the event of high wastewater flows resulting from early or late season storms, treated and dechlorinated effluent may be discharged to Miller Creek. Attachment C provides Facility flow schematics.

Due to high inflow and infiltration during wet weather, the Discharger sometimes blends primary-treated wastewater with secondary-treated wastewater prior to discharge. Flows up to 8 MGD (and potentially up to 9 MGD) receive full secondary treatment. Any additional flows are diverted around the secondary treatment units and blended with secondary-treated effluent. After disinfection, the blended flow is dechlorinated prior to discharge. The following summarizes operations at varying influent flows:

a. Flows up to approximately 6.9 MGD receive secondary treatment, plus nitrification, deep bed filtration, and disinfection. (The maximum flow rate through the deep bed filters can be less than 6.9 MGD depending on loads and other operating conditions.)

b. Flows above approximately 6.9 MGD and up to 8 MGD (and possibly 9 MGD) receive secondary treatment and disinfection.

c. Flows above 8 or 9 MGD and up to 21.6 MGD receive primary treatment, and partial deep bed filtration, and disinfection before blending with secondary-treated flows.

d. Flows above 21.6 and up to 25 MGD (the plant’s peak hydraulic capacity) receive primary treatment and disinfection before blending.

4. Water Recycling Activities. During dry weather (June through October, plus May when conditions allow), treated effluent is reclaimed onsite in accordance with Order No. 92-064. The onsite reclamation system consists of two 20-acre storage ponds, a 20-acre freshwater marsh/wildlife pond, and 200 acres of irrigated pasture. The storage ponds dechlorinate the effluent through natural processes. The Discharger returns surplus water remaining in the storage ponds at the end of the reclamation season to the plant for treatment before discharge to Miller Creek.

Plant effluent and water from the storage ponds are also used by the Marin Municipal Water District as feedstock in its recycled water plant, which produces disinfected tertiary recycled water during summer for distribution throughout its northern San Rafael service area. The recycled water is used for landscape irrigation and other approved uses. From 2010 through 2013, the average effluent volume recycled was 170 million gallons per year, approximately 16.5 percent of the Discharger’s annual effluent volume. The recycled water project is permitted under Water Reuse Order No. 89-127, issued jointly to the Marin Municipal Water District and the Discharger.

Since 2012, the Discharger has begun operating its own onsite water recycling facility. The Las Gallinas Recycled Water Facility produces disinfected tertiary recycled water by further treating the secondary effluent using ultrafiltration and ultraviolet disinfection. The North Marin Water District transmits and distributes this recycled water for irrigation in the southern Novato area. During 2013, the first full year of its operation, 47 million gallons of the effluent (4.6 percent of annual effluent volume) was recycled through the North Marin Water District system.
Discharger and the North Marin Water District are permitted separately (as producer and distributor) under General Reuse Order No. 96-011.

5. **Sludge and Biosolids Management.** Grit, screenings, and a portion of the skimmed material is placed in the Redwood Sanitary Landfill. Other solids are treated by gravity thickening and anaerobic digestion in primary and secondary digesters and then pumped to three sludge storage lagoons. Solids from the Marin Municipal Water District recycled water plant are also pumped through the plant or directly to the sludge storage lagoons. The sludge storage lagoons are double-lined and have a total capacity of approximately 3.2 million gallons. Biosolids are ultimately disposed of onsite at the Discharger’s 9-acre land disposal site.

6. **Stormwater Management.** All stormwater within the plant boundaries, excluding the reclamation area, is directed to the plant headworks; therefore, coverage under the statewide permit for discharge of stormwater associated with industrial activities (NPDES General Permit No. CAS000001) is not required. Stormwater accumulated in the storage ponds at the reclamation area may be recycled as described above or routed to the headworks. Direct discharge to Miller Creek is prohibited (see Discharge Prohibition III.B).

**B. Discharge Points and Receiving Waters**

There are two discharge points (001 and 002) to Miller Creek, which flows to San Pablo Bay. The plant is located slightly over 1 mile upstream from San Pablo Bay. Under normal conditions, plant effluent is split between Discharge Point Nos. 001 and 002, with the majority discharged at Discharge Point No. 002, which is located about 1,200 feet downstream of Discharge Point No. 001 and 4,600 feet upstream from San Pablo Bay. Under higher flow conditions, the majority of treated effluent is discharged at Discharge Point No. 001.

**C. Summary of Existing Requirements and Monitoring Data**

Effluent limitations contained in the previous order and representative monitoring data from the previous order term are presented below:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Period</th>
<th>Effluent Limitations</th>
<th>Monitoring Data (12/09–05/14)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Monthly Average</td>
<td>Weekly Average</td>
</tr>
<tr>
<td>Biochemical Oxygen Demand, 5-day @ 20°C (BOD₃)</td>
<td>mg/L</td>
<td>November – April</td>
<td>30</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Total Suspended Solids (TSS)</td>
<td>mg/L</td>
<td>November – April</td>
<td>30</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Oil and Grease</td>
<td>mg/L</td>
<td>November – April</td>
<td>10</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May</td>
<td>5</td>
<td>---</td>
</tr>
<tr>
<td>Ammonia</td>
<td>mg/L as N</td>
<td>November – April</td>
<td>10</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May</td>
<td>6</td>
<td>---</td>
</tr>
</tbody>
</table>

Attachment F – Fact Sheet F-6
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Period</th>
<th>Effluent Limitations</th>
<th>Monitoring Data (12/09–05/14)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Monthly Average</td>
<td>Weekly Average</td>
</tr>
<tr>
<td>BOD₃ Percent Removal</td>
<td>%</td>
<td></td>
<td>85 (minimum)</td>
<td>---</td>
</tr>
<tr>
<td>TSS Percent Removal</td>
<td>%</td>
<td></td>
<td>85 (minimum)</td>
<td>---</td>
</tr>
<tr>
<td>pH</td>
<td>s.u.</td>
<td>November–May</td>
<td></td>
<td>6.5 – 8.5 ²</td>
</tr>
<tr>
<td>Chlorine Residual</td>
<td>mg/L</td>
<td></td>
<td>0.0 ³</td>
<td>---</td>
</tr>
<tr>
<td>Enterococcus Bacteria</td>
<td>MPN/100 mL</td>
<td></td>
<td>35 ⁴[²]</td>
<td>---</td>
</tr>
<tr>
<td>Copper</td>
<td>µg/L</td>
<td></td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Lead</td>
<td>µg/L</td>
<td></td>
<td>4.1</td>
<td>---</td>
</tr>
<tr>
<td>Nickel</td>
<td>µg/L</td>
<td></td>
<td>11</td>
<td>---</td>
</tr>
<tr>
<td>Selenium</td>
<td>µg/L</td>
<td></td>
<td>3.6</td>
<td>---</td>
</tr>
<tr>
<td>Cyanide</td>
<td>µg/L</td>
<td></td>
<td>6.9</td>
<td>---</td>
</tr>
<tr>
<td>Dioxin-TEQ</td>
<td>µg/L</td>
<td></td>
<td>1.4x10⁻⁸</td>
<td>---</td>
</tr>
<tr>
<td>Acute Toxicity</td>
<td>% survival</td>
<td></td>
<td>70⁶</td>
<td>---</td>
</tr>
<tr>
<td>Chronic Toxicity</td>
<td>TUₖ</td>
<td></td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**Unit Abbreviations:**

- mg/L = milligrams per liter
- µg/L = micrograms per liter
- s.u. = standard units
- MPN/100 mL = most probable number per 100 milliliters
- mg/L as N = milligrams per liter as nitrogen
- % = percent
- TUₖ = chronic toxicity units, equal to 100/NOEL, where NOEL = IC₂₅, EC₂₅, or NOEC

**Footnotes:**

[2] Instantaneous minimum and maximum.
[5] Interim copper effluent limit pursuant to Cease and Desist Order No. R2-2009-0071 (previous order’s copper effluent limits were an average monthly limit of 8.6 µg/L and a maximum daily limit of 11 µg/L).
[6] The limitations were an 11-sample median greater than 90% survival, and an 11-sample 90th percentile greater than 70% survival.
[7] The limitation was “no chronic toxicity in the discharge.”

**D. Compliance Summary**

The Discharger violated its effluent limitation once during the previous order term on November 30, 2013, when it reported an instantaneous maximum total residual chlorine concentration of 0.13 mg/L that lasted no more than three minutes due to flow spiking and bisulfite analyzer malfunctioning. The effluent limitation was 0.0 mg/L. The Regional Water Board will consider an appropriate enforcement for this violation, which will include at a minimum a mandatory minimum penalty of $3,000.

As a result of observed chronic toxicity, the Discharger accelerated monitoring and conducted toxicity identification evaluations as required by the previous order. Further details of the results
of these efforts as well as the Discharger’s actions in response are provided in section III.C.1.e.ii, below.

To the extent that some sanitary sewer overflows (SSOs) reached waters of the U.S., the Discharger would have violated Prohibition III.D of the Order. The table below shows the Discharger’s SSO rates (total SSOs per 100 miles of collection system for each of the past three years) and other information together with those for the county and region:

**Table F-3. Collection System and SSO Rates (SSOs/100 miles)**
*(Values based on CIWQS data analysis completed in January 2014)*

<table>
<thead>
<tr>
<th></th>
<th>Length (miles)</th>
<th>Average Age (years)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Las Gallinas Valley Sanitary District</td>
<td>111.7</td>
<td>52</td>
<td>1.8</td>
<td>7.2</td>
<td>2.7</td>
</tr>
<tr>
<td>Marin County median of 4 large systems (≥100 miles)</td>
<td>173</td>
<td>55</td>
<td>11.5</td>
<td>12.4</td>
<td>7.4</td>
</tr>
<tr>
<td>San Francisco Bay Region median of 45 large systems (≥100 miles)</td>
<td>230</td>
<td>50</td>
<td>5.1</td>
<td>5.0</td>
<td>4.5</td>
</tr>
<tr>
<td>San Francisco Bay Region median of all 132 systems</td>
<td>41</td>
<td>45</td>
<td>4.0</td>
<td>4.6</td>
<td>4.5</td>
</tr>
</tbody>
</table>

The SSO rate of the Discharger’s collection system is, by and large, low when compared to Marin County and the San Francisco Bay Region medians. During the previous order term, the Discharger spent approximately $4.8 million in collection system capital projects, which rehabilitated approximately 3 miles, or 2.7 percent, of the Discharger’s 111.7-mile system. The Discharger plans to budget $1.5-2 million annually over the next five years for collection system improvements. Because of the average age of the system, Regional Water Board staff will be monitoring the adequacy of the Discharger’s collection system capital improvement activities yearly during this Order’s term.

**E. Planned Changes**

The Discharger is in the process of implementing treatment alternatives it envisioned in 2012 to reduce blending during wet weather. The conceptual design is still in progress, but the alternatives will likely include construction of an additional secondary clarifier, a flow equalization basin (1.0 to 1.2 million gallons), and an activated sludge process unit. The new facilities would be at a higher elevation than the existing facilities in anticipation of sea-level rise. These projects, with an anticipated cost of $30 million, will not affect the discharge location or quantity, or decrease discharge quality.

**F. Blending Summary**

Blending occurred 51 times over the previous order term, totaling approximately 138 million gallons or 4.6 percent of total influent flow during the last five years. Based on available data, no violation of effluent limitations occurred when blending.

In compliance with the previous order, the Discharger implemented various corrective measures identified in its May 1, 2010, *Wet Weather Improvement Report* to reduce blending, including the following:

- Conversion and rehabilitation of two existing intermediate clarifiers to serve as parallel primary clarifiers #2 and #3, increasing the secondary treatment capacity from 8 MGD to approximately 9 MGD (completed in 2012);
• Rehabilitation of over three miles of sewer mains and associated manholes and lower laterals, providing in-system storage and reducing inflow and infiltration (additional rehabilitation ongoing);

• Implementation of the Capacity, Management, Operation and Maintenance (CMOM) Program, including video inspections (112 miles between 2009-2013) and smoke testing (>15 miles) of sewer mains (project ongoing);

• Creation of the Private Sewer Lateral Rehabilitation Assistance Program through the adoption of Ordinance No. 153 (completed in 2012).

In 2012, the Discharger retained the consulting firm Brown and Caldwell to perform a broader evaluation of future secondary treatment alternatives and to develop a preferred path to minimize blending. Provision VI.C.5.b of the Order and Fact Sheet section VI.C.5.b describes activities the Regional Water Board deems feasible to be undertaken within the term of this Order to improve management of wet weather flows and reduce blending.

III. APPLICABLE PLANS, POLICIES, AND REGULATIONS

The requirements in this Order are based on the requirements and authorities described below:

A. Legal Authorities

This Order serves as WDRs pursuant to California Water Code article 4, chapter 4, division 7 (commencing with § 13260). This Order is also issued pursuant to Clean Water Act (CWA) section 402 and implementing regulations adopted by U.S. EPA, and Water Code chapter 5.5, division 7 (commencing with § 13370). It shall serve as an NPDES permit for point source discharges from this facility to surface waters.

B. California Environmental Quality Act

Under Water Code section 13389, this action to adopt an NPDES permit is exempt from the provisions of the California Environmental Quality Act, Public Resources Code division 13, chapter 3 (commencing with § 21100).

C. State and Federal Regulations, Policies, and Plans

1. Water Quality Control Plan. The Regional Water Board adopted the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan), which designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan. Requirements in this Order implement the Basin Plan. In addition, this Order implements State Water Board Resolution No. 88-63, which established State policy that all waters, with certain exceptions, should be considered suitable or potentially suitable for municipal or domestic supply. Because of the marine influence on Miller Creek, total dissolved solids levels commonly exceed 3,000 mg/L; therefore, these waters meet an exception to State Water Board Resolution No. 88-63. The Basin Plan identifies the beneficial uses of Miller Creek as follows:
Table F-4. Beneficial Uses

<table>
<thead>
<tr>
<th>Discharge Points</th>
<th>Receiving Water</th>
<th>Beneficial Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>001 and 002</td>
<td>Miller Creek</td>
<td>Cold Freshwater Habitat (COLD)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish Migration (MIGR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preservation of Rare and Endangered Species (RARE)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water Contact Recreation (REC1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-Contact Water Recreation (REC2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fish Spawning (SPWN)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Warm Freshwater Habitat (WARM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wildlife Habitat (WILD)</td>
</tr>
</tbody>
</table>

2. **Thermal Plan.** The State Water Board adopted the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan) on January 7, 1971, and amended this plan on September 18, 1975. This plan contains temperature objectives for surface waters. Under the Thermal Plan, the discharge is considered an existing estuarine discharge of elevated temperature waste. Requirements of this Order implement the Thermal Plan.

3. **Sediment Quality.** The State Water Board adopted the *Water Quality Control Plan for Enclosed Bays and Estuaries – Part I, Sediment Quality* on September 16, 2008, and it became effective on August 25, 2009. This plan supersedes other narrative sediment quality objectives, and establishes new sediment quality objectives and related implementation provisions for specifically defined sediments in most bays and estuaries. This Order implements the sediment quality objectives of this plan.


5. **State Implementation Policy.** On March 2, 2000, the State Water Board adopted the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy or SIP). The SIP became effective on April 28, 2000, with respect to the priority pollutant criteria U.S. EPA promulgated for California through the NTR and the priority pollutant objectives the Regional Water Board established in the Basin Plan. The SIP became effective on May 18, 2000, with respect to the priority pollutant criteria U.S. EPA promulgated through the CTR. The State Water Board adopted amendments to the SIP on February 24, 2005, that became effective on July 13, 2005. The SIP establishes implementation provisions for priority pollutant criteria and objectives, and provisions for chronic toxicity control. Requirements of this Order implement the SIP.

6. **Antidegradation Policy.** Federal regulations at 40 C.F.R. section 131.12 requires that state water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California’s antidegradation policy through State Water Board Resolution 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," which is deemed to incorporate the federal antidegradation policy where
the federal policy applies under federal law. Resolution 68-16 requires that existing water quality be maintained unless degradation is justified based on specific findings. The Basin Plan implements, and incorporates by reference, both the State and federal antidegradation policies. Permitted discharges must be consistent with the antidegradation provisions of 40 C.F.R. section 131.12 and State Water Board Resolution 68-16.

7. **Anti-Backsliding Requirements.** CWA sections 402(o) and 303(d)(4) and 40 C.F.R. section 122.44(l) restrict backsliding in NPDES permits. These anti-backsliding provisions require that effluent limitations in a reissued permit be as stringent as those in the previous permit, with some exceptions in which limitations may be relaxed.

8. **Endangered Species Act Requirements.** This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code §§ 2050 to 2097) or the federal Endangered Species Act (16 U.S.C.A. §§ 1531 to 1544). This Order requires compliance with effluent limits, receiving water limits, and other requirements to protect the beneficial uses of waters of the State, including protecting rare, threatened, or endangered species. The Discharger is responsible for meeting all applicable endangered species act requirements.

9. **Recycled Water Policy.** The State Water Board adopted Resolution No. 2009-0011 on February 3, 2009, titled *Policy for Water Quality Control for Recycled Water*, which is intended to promote sustainable local water supplies by increasing acceptance and promoting the uses of recycled water. The policy sets a goal to increase the use of recycled water statewide by at least one million acre feet per year over 2002 levels by 2020 and by at least two million acre feet per year by 2030. The policy also requires Regional Water Boards to exercise their authority to the fullest extent possible to encourage the use of recycled water and to develop watershed-based salt and nutrient management plans to ensure the use of recycled water does not degrade groundwater resources.

**D. Impaired Waters on CWA 303(d) List**

In October 2011, U.S. EPA approved a revised list of impaired waters prepared pursuant to CWA section 303(d), which requires identification of specific water bodies where it is expected that water quality standards will not be met after implementation of technology-based effluent limitations on point sources. Where it has not done so already, the Regional Water Board plans to adopt Total Maximum Daily Loads (TMDLs) for pollutants on the 303(d) list. TMDLs establish wasteload allocations for point sources and load allocations for non-point sources, and are established to achieve the water quality standards for the impaired waters.

Miller Creek is a tributary to San Pablo Bay, which in turn is part of San Francisco Bay. San Francisco Bay is listed as impaired by chlordane, DDT, dieldrin, dioxins and furans, exotic species, mercury, PCBs and dioxin-like PCBs, selenium, and nickel. On February 12, 2008, U.S. EPA approved a TMDL for mercury in San Francisco Bay. On March 29, 2010, U.S. EPA approved a TMDL for PCBs in San Francisco Bay. The TMDLs for mercury and PCBs are incorporated into the Basin Plan and apply to this discharge; however, mercury and PCBs discharges are not covered by this Order. Instead, they are regulated under NPDES Permit No. CA0038849.
Miller Creek is listed as impaired by diazinon, a pesticide found in urban runoff. Basin Plan section 7.1.1 contains a TMDL for diazinon and pesticide-related toxicity in urban creeks, including Miller Creek. The TMDL does not apply to the Facility because the Facility does not discharge urban runoff.

IV. RATIONALE FOR EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

The CWA requires point source dischargers to control the amount of conventional, non-conventional, and toxic pollutants discharged into waters of the United States. The control of pollutants discharged is established through effluent limitations and other requirements in NPDES permits. There are two principal bases for effluent limitations: 40 C.F.R. section 122.44(a) requires that permits include applicable technology-based limitations and standards; and 40 C.F.R. section 122.44(d) requires that permits include water quality-based effluent limitations to attain and maintain applicable numeric and narrative water quality criteria to protect the beneficial uses of receiving waters.

A. Discharge Prohibitions

1. Prohibitions in this Order

   a. Discharge Prohibition III.A (No discharge other than as described in this Order): This prohibition is based on 40 C.F.R. section 122.21(a) and Water Code section 13260, which require filing an application and Report of Waste Discharge before a discharge can occur. Discharges not described in the application and Report of Waste Discharge, and subsequently in this Order, are prohibited.

   b. Discharge Prohibition III.B (Discharge to Miller Creek is prohibited from June 1 through October 31): The Basin Plan (Chapter 4, Table 4-1, Discharge Prohibition No. 1) prohibits discharges not receiving a minimum 10:1 initial dilution or to dead-end sloughs. Miller Creek is a tidally-influenced perennial stream. While there may be some dilution of the discharge from tidal flushing, the Discharger has not demonstrated that the discharge receives 10:1 initial dilution. Moreover, during the dry season, dilution would be lower because of low creek flows. Therefore, this Order prohibits discharges to Miller Creek during this period with the exception of discharges that are necessary as a result of wet weather that would also increase ambient flows in the creek. As explained in Fact Sheet section IV.A.2 below, this Order grants an exception to Discharge Prohibition No. 1 for wet weather discharges.

   c. Discharge Prohibition III.C (No bypass of untreated wastewater): This prohibition is based on 40 C.F.R. section 122.41(m) (see Attachment D section I.G). This Order allows bypass of secondary treatment when the influent flow exceeds 8 MGD (the reliable process capacity of the secondary treatment system) and onsite storage and equalization facilities have been optimized. Under such conditions, excess flows are permitted to bypass secondary (biological) treatment and be blended with the secondary-treated flow. All flows must be disinfected prior to discharge and comply with all effluent limitations. Such blending is allowed because the Discharger has shown through a No Feasible Alternatives Analysis, dated June 3, 2014, that it meets the three criteria specified in 40 C.F.R. section 122.41(m)(4)(i)(A)-(C):
i. *Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage.* The reliable process capacity of the secondary treatment system is 8 MGD. Above 8 MGD, washout of microbial populations critical to complying with secondary treatment standards is possible. Blending also prevents sewer backups and overflows in basements and streets.

ii. *There are no feasible alternatives to the bypass.* The Discharger has no feasible alternative at this time but to continue wet weather blending. During the previous order term, the Discharger implemented feasible measures to reduce the volume, duration, and occurrence of wet weather blending events (see Fact Sheet section II.F). The Discharger has evaluated the following alternatives for future actions:

(a) Reduce peak flows to less than 8 MGD by reducing inflow and infiltration to the collection system;

(b) Construct new secondary treatment facilities with capacity up to 18 MGD;

(c) Construct a 1.2 million-gallon onsite flow equalization basin; and

(d) Continue ongoing collection system improvements.

The first alternative is infeasible because it would involve replacing thousands of privately-owned sewer laterals at a cost of approximately $30 million to $50 million with uncertain results. The other alternatives are feasible; therefore, the Discharger will increase the plant’s flow equalization capacity and secondary treatment capacity and continue its collection system improvement projects. These actions are expected to cost $30 million to $40 million or more. Provision VI.C.5.b of this Order sets forth specific requirements to accomplish these actions.

iii. *The Discharger submitted notice at least ten days before the date of the bypass.* The Discharger provided notice of its ongoing need to blend during wet weather with its Report of Waste Discharge and *No Feasible Alternatives Analysis.* It provided these documents more than ten days prior to any bypass subject to this Order.

d. *Discharge Prohibition III.D (Average dry weather influent flow not to exceed dry weather design capacity of 2.92 MGD):* This prohibition is based on the plant’s design treatment capacity. Exceeding the average dry weather design capacity could lower the reliability of complying with this Order’s requirements.

e. *Discharge Prohibition III.E (No sewer overflows):* The CWA and Basin Plan (Chapter 4, Table 4-1, Discharge Prohibition No. 15) prohibit the discharge of wastewater to surface waters, except as authorized under an NPDES permit. Publicly-owned treatment works must achieve secondary treatment standards at a minimum and any more stringent limitations necessary to meet water quality standards (33 U.S.C. § 1311[b][1][B] and [C]). A sanitary sewer overflow that results in the discharge of raw sewage or wastewater not meeting this Order’s effluent limitations to surface waters is therefore prohibited under the CWA and the Basin Plan.
2. Exception to Shallow Water Discharge Prohibition

The Basin Plan (Chapter 4, Table 4-1, Discharge Prohibition 1) prohibits discharges not receiving a minimum initial dilution of at least 10:1 and discharges into shallow waters or dead-end sloughs. Basin Plan section 4.2 provides for exceptions under certain circumstances:

- An inordinate burden would be placed on the Discharger relative to the beneficial uses protected and an equivalent level of environmental protection can be achieved by alternate means;

- A discharge is approved as part of a reclamation project;

- Net environmental benefits will be derived as a result of the discharge; or

- A discharge is approved as part of a groundwater cleanup project.

The Basin Plan states:

Significant factors to be considered by the Regional Water Board in reviewing requests for exceptions will be the reliability of the discharger’s system in preventing inadequately treated wastewater from being discharged to the receiving water and the environmental consequence of such discharges.

This Order continues to grant an exception to Basin Plan Discharge Prohibition 1 during the wet season (and wet weather conditions) based on the following:

a. Moving the Discharger’s outfall to deep water (i.e., offshore into San Pablo Bay at a depth adequate to achieve 10:1 initial dilution) would be an inordinate burden because such relocation would require pipeline construction through wetlands, which would not only be costly but would also inevitably disturb the wetland habitats.

b. From November through April, the Discharger provides an equivalent level of environmental protection by providing advanced secondary treatment through nitrification and deep bed filtration. During authorized wet weather discharge events outside November through April, the Discharger meets more stringent ammonia limits, and more stringent biochemical oxygen demand (BOD) and total suspended solids (TSS) limits than federal secondary treatment standards require. Moreover, Provision VI.C.5.a of this Order provides additional assurance by requiring the Discharger to develop and maintain a Facility Reliability Assurance Plan that describes, among other things, measures or safeguards in place to ensure the reliability of the system in preventing inadequately treated wastewater from being discharged.

The Discharger continues to reduce the discharges by maintaining and implementing various water reclamation and recycling projects.
B. Technology-Based Effluent Limitations

1. Scope and Authority

CWA section 301(b) and 40 C.F.R. section 122.44 require that permits include conditions meeting technology-based requirements at a minimum and any more stringent effluent limitations necessary to meet water quality standards. The discharges authorized by this Order must meet minimum federal technology-based requirements based on secondary treatment standards at 40 C.F.R. section 133 as summarized below. In addition, the 30-day average percent removal for BOD₅ and TSS, by concentration, is not to be less than 85 percent. The Basin Plan contains additional requirements for certain pollutants.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Monthly Average</th>
<th>Weekly Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD₃[^1]</td>
<td>30 mg/L</td>
<td>45 mg/L</td>
</tr>
<tr>
<td>CBOD₅[^1]</td>
<td>25 mg/L</td>
<td>40 mg/L</td>
</tr>
<tr>
<td>TSS</td>
<td>30 mg/L</td>
<td>45 mg/L</td>
</tr>
<tr>
<td>pH</td>
<td>6.0 – 9.0 standard units</td>
<td></td>
</tr>
</tbody>
</table>

[^1]: CBOD₅ effluent limitations may be substituted for BOD₃ limitations.

Table F-5. Secondary Treatment Requirements

Unit Abbreviation:
mg/L = milligrams per liter

Footnote:
[^1]: CBOD₅ effluent limitations may be substituted for BOD₃ limitations.

2. Effluent Limitations

a. BOD₅ and TSS. BOD₅ and TSS effluent limitations between November and April, including the 85 percent removal requirements, are based on the secondary treatment standards and Basin Plan Table 4-2. BOD₅ and TSS effluent limitations for May and other wet weather periods are more stringent than those that the federal secondary treatment standards and Basin Plan require. They represent advanced secondary treatment and serve as a basis for this Order’s exception to Basin Plan Discharge Prohibition 1 (see Fact Sheet section IV.A.2). They are unchanged from the previous order.

b. Oil and Grease. The oil and grease effluent limitations between November and April are based on Basin Plan Table 4-2. Those for May and other wet weather periods are more stringent than those the Basin Plan requires. They represent a higher level of treatment and serve as a basis for this Order’s exception to Basin Plan Discharge Prohibition 1 (see Fact Sheet section IV.A.2). They are unchanged from the previous order.

c. pH. The pH effluent limitations are based on the Basin Plan Table 4-2 for discharge to shallow water.

d. Chlorine Residual. The chlorine residual effluent limitation is based on Basin Plan Table 4-2. The MRP provides an allowance for determining false positives when using continuous devices based on the fact that continuous instruments occasionally have anomalous spikes and it is chemically improbable to have free chlorine present in the presence of sulfur dioxide.

e. Enterococcus. The enterococcus effluent limitation is based on Basin Plan Table 4-2A.
f. **Ammonia.** The total ammonia effluent limitations are retained from the previous order to avoid backsliding and to ensure that the Discharger maintains its nitrification performance. They serve as a basis for this Order’s exception to Basin Plan Discharge Prohibition 1 (see Fact Sheet section IV.A.2).

C. **Water Quality-Based Effluent Limitations**

1. **Scope and Authority**

   For toxic pollutants, this Order contains Water Quality Based Effluent Limitations (WQBELs) that implement water quality objectives that protect beneficial uses. CWA section 301(b) and 40 C.F.R. section 122.44(d) require that permits include limitations more stringent than federal technology-based requirements where necessary to achieve applicable water quality standards. According to 40 C.F.R. section 122.44(d)(1)(i), permits must include effluent limitations for all pollutants that are or may be discharged at levels that have a reasonable potential to cause or contribute to an exceedance of a water quality standard, including numeric and narrative objectives within a standard. Where reasonable potential has been established for a pollutant, but there is no numeric criterion or objective, WQBELs must be established using (1) U.S. EPA criteria guidance under CWA section 304(a), supplemented where necessary by other relevant information; (2) an indicator parameter for the pollutant of concern; or (3) a calculated numeric water quality criterion, such as a proposed state criterion or policy interpreting a narrative criterion, supplemented with relevant information (40 C.F.R. § 122.44[d][1][vi]). The process for determining reasonable potential and calculating WQBELs is intended to achieve applicable water quality objectives and criteria and protect designated beneficial uses of receiving waters as specified in the Basin Plan. This Order imposes numeric effluent limitations for toxic pollutants with reasonable potential to cause or contribute to exceedances of water quality standards.

2. **Water Quality Criteria and Objectives**

   a. **Basin Plan Objectives.** The Basin Plan specifies numeric water quality objectives for 10 priority pollutants and narrative water quality objectives for toxicity and bioaccumulation. The narrative toxicity objective states, “All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms.” The narrative bioaccumulation objective states, “Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered.”

   b. **CTR Criteria.** The CTR specifies numeric aquatic life and human health criteria for numerous priority pollutants. These criteria apply to inland surface waters and enclosed bays and estuaries. Some human health criteria are for consumption of “water and organisms” and others are for consumption of “organisms only.” The criteria applicable to “organisms only” apply to Miller Creek and San Pablo Bay because these waters do not support the MUN beneficial use (i.e., they are not drinking water sources).

   c. **NTR Criteria.** The NTR establishes numeric aquatic life and human health criteria for a number of toxic pollutants for San Francisco Bay waters upstream to and including Suisun Bay and the Sacramento-San Joaquin Delta. The NTR criteria apply to Miller Creek and San Pablo Bay.
d. **Sediment Quality Objectives.** The *Water Quality Control Plan for Enclosed Bays and Estuaries – Part I, Sediment Quality* contains a narrative water quality objective: “Pollutants in sediments shall not be present in quantities that, alone or in combination, are toxic to benthic communities in bays and estuaries of California.” This objective is to be implemented by integrating three lines of evidence: sediment toxicity, benthic community condition, and sediment chemistry. The policy requires that if the Regional Water Board determines that a discharge has reasonable potential to cause or contribute to an exceedance of this objective, it is to impose the objective as a receiving water limit.

e. **Receiving Water Salinity.** Basin Plan section 4.6.2 (like the CTR and NTR) states that the salinity characteristics (i.e., freshwater vs. saltwater) of the receiving water are to be considered in determining the applicable water quality objectives. Freshwater criteria apply to discharges to waters with salinities equal to or less than one part per thousand (ppt) at least 95 percent of the time. Saltwater criteria apply to discharges to waters with salinities equal to or greater than 10 ppt at least 95 percent of the time in a normal water year. For discharges to waters with salinities between these two categories, or tidally-influenced freshwaters that support estuarine beneficial uses, the water quality objectives are the lower of the salt or freshwater objectives (the latter calculated based on ambient hardness) for each substance.

San Pablo Bay is an estuarine environment based on salinity data generated through the Regional Monitoring Program (RMP). Salinity data collected at the BD20 sampling location between 1993 and 2001 indicate that the salinity was greater than 10 ppt 68 percent of the time. San Pablo Bay is therefore classified as estuarine.

Miller Creek is also an estuarine environment based on the Discharger’s *Receiving Water Ammonia Characterization Study Final Report*, dated August 28, 2012, which indicates that Miller Creek has an average salinity of 2.7 ppt at receiving water monitoring location RSW-001, located 20 feet downstream from Discharge Point No. 002; and an average salinity of 8.7 ppt at the PG&E Bridge receiving water station, located approximately 4,000 feet downstream from Discharge Point No. 002.

Because both San Pablo Bay and Miller Creek are estuarine waters, the reasonable potential analysis and WQBELs are based on the lower of the freshwater and saltwater criteria and objectives.

f. **Site-Specific Metals Translators.** Effluent limitations for metals must be expressed as total recoverable metal (40 C.F.R. § 122.45[c]). Since the water quality objectives for metals are typically expressed as dissolved metal, translators must be used to convert metals concentrations from dissolved to total recoverable and vice versa. The CTR contains default translators; however, site-specific conditions, such as water temperature, pH, suspended solids, and organic carbon may affect the form of metal (dissolved, non-filterable, or otherwise) present and therefore available to cause toxicity. In general, dissolved metals are more available and more toxic to aquatic life than other forms. Site-specific translators can account for site-specific conditions, thereby preventing overly stringent or under-protective water quality objectives. This Order incorporates site-specific translators for copper, nickel and zinc based on the Discharger’s *Translator Study Report*, dated November 14, 2001, and *Zinc Translator Study Data Update*, dated
May 21, 2002. The following table shows these translators; default CTR translators were used for all other metals:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Acute</th>
<th>Chronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>0.83</td>
<td>0.56</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.82</td>
<td>0.56</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.80</td>
<td>0.44</td>
</tr>
</tbody>
</table>

**g. Receiving Water Hardness.** Ambient hardness values are used to calculate freshwater criteria and objectives that are hardness dependent. The objectives for this Order are based on a hardness value of 240 mg/L as CaCO₃. This is the geometric mean of 61 hardness values obtained from Miller Creek monitoring locations RSW-001 and RSW-002 from December 2009 through March 2014. The data were censored by capping 19 hardness values above 400 mg/L at 400 mg/L.

3. **Need for Water Quality-Based Effluent Limitations (Reasonable Potential Analysis)**

a. **Available Information.** The reasonable potential analysis for this Order is based on effluent monitoring data the Discharger collected from December 2009 through April 2014 (for copper, monitoring data from October 2010 through April 2014 were used because corrective measures to improve copper removal efficiency, in compliance with Order No. R2-2009-0071, were not implemented until October 2010). For ambient background data, the RMP database was queried on August 15, 2014, to obtain the most up-to-date RMP data. The reasonable potential analysis is based on the data collected at the San Pablo Bay RMP station (BD20) from 1993 through 2001, and additional Bay Area Clean Water Agencies data from *San Francisco Bay Ambient Water Monitoring Interim Report (2003)* and *Ambient Water Monitoring: Final CTR Sampling Update (2004)*. These reports contain monitoring results from 2002 and 2003 for priority pollutants the RMP did not monitor at the time. For ammonia, the ambient concentration data from the Discharger’s *Receiving Water Ammonia Characterization Study Final Report (2012)* were used.

In some cases, reasonable potential cannot be determined because effluent data are limited or ambient background concentrations are unavailable. Provision VI.C.2 of the Order requires the Discharger to continue monitoring for these constituents in its effluent using analytical methods that provide the best feasible detection limits. When additional data become available, further analysis will be conducted to determine whether numeric effluent limitations are necessary.

b. **Toxic Pollutants**

1. **Methodology.** SIP section 1.3 sets forth the methodology used for this Order to assess whether a toxic pollutant has reasonable potential to exceed a water quality objective. The analysis begins with identifying the maximum effluent concentration (MEC) observed for each pollutant based on available effluent concentration data and the ambient background concentration (B). SIP section 1.4.3 states that ambient background concentrations are either the maximum ambient concentration observed or, for water quality objectives intended to protect human health, the arithmetic mean
of observed concentrations. There are three triggers in determining reasonable potential:

- **Trigger 1** is activated if the maximum effluent concentration is greater than or equal to the lowest applicable water quality objective (MEC ≥ water quality objective).

- **Trigger 2** is activated if the ambient background concentration observed in the receiving water is greater than the water quality objective (B > water quality objective) and the pollutant is detected in any effluent sample.

- **Trigger 3** is activated if a review of other information indicates that a WQBEL is needed to protect beneficial uses.

ii. **Analysis.** The maximum effluent concentrations, most stringent applicable water quality criteria and objectives, and ambient background concentrations used in the analysis are presented in the following table, along with the reasonable potential analysis results (yes or no) for each pollutant. Reasonable potential was not determined for all pollutants because there are not water quality objectives for all pollutants.

Cyanide and bis(2-ethylhexyl)phthalate exhibit reasonable potential by Trigger 1. Basin Plan section 4.7.2.2 also requires cyanide WQBELs for individual NPDES permits for all municipal and most industrial wastewater treatment facilities. Copper, nickel, and dioxin-TEQ exhibit reasonable potential by Trigger 2 (see Fact Sheet section IV.C.3.c for further discussion of dioxin-TEQ). Basin Plan section 4.7.2.1 also requires copper WQBELs for all individual NPDES permits for municipal wastewater treatment facilities.

<table>
<thead>
<tr>
<th>CTR #</th>
<th>Priority Pollutant</th>
<th>Governing WQC (µg/L)</th>
<th>MEC or Minimum DL (µg/L)</th>
<th>B or Minimum DL (µg/L)</th>
<th>RPA Result[2]</th>
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<tbody>
<tr>
<td>1</td>
<td>Antimony</td>
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<td>B or Minimum DL(^{(1)}) ((\mu g/L))</td>
<td>RPA Result(^{(2)})</td>
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<td>Governing WQC (µg/L)</td>
<td>MEC or Minimum DL [1] (µg/L)</td>
<td>B or Minimum DL [1] (µg/L)</td>
<td>RPA Result [2]</td>
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<td>72</td>
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<td>96</td>
<td>N-Nitrosodimethylamine</td>
<td>8.1</td>
<td>1.1</td>
<td>&lt; 0.3</td>
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<td>97</td>
<td>N-Nitrosodi-n-Propylamine</td>
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<td>&lt; 0.97</td>
<td>&lt; 0.001</td>
<td>No</td>
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<td>98</td>
<td>N-Nitrosodiphenylamine</td>
<td>16</td>
<td>&lt; 0.83</td>
<td>&lt; 0.001</td>
<td>No</td>
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<tr>
<td>99</td>
<td>Phenanthrene</td>
<td>No Criteria</td>
<td>&lt; 0.03</td>
<td>0.0078</td>
<td>U</td>
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<tr>
<td>100</td>
<td>Pyrene</td>
<td>11,000</td>
<td>&lt; 0.03</td>
<td>0.03</td>
<td>No</td>
</tr>
<tr>
<td>101</td>
<td>1,2,4-Trichlorobenzene</td>
<td>No Criteria</td>
<td>&lt; 0.19</td>
<td>&lt; 0.3</td>
<td>U</td>
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<tr>
<td>102</td>
<td>Aldrin</td>
<td>0.00014</td>
<td>&lt; 0.004</td>
<td>0.00000014</td>
<td>No</td>
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<td>103</td>
<td>Alpha-BHC</td>
<td>0.013</td>
<td>&lt; 0.005</td>
<td>0.0008</td>
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<td>104</td>
<td>Beta-BHC</td>
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<td>&lt; 0.003</td>
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<td>Gamma-BHC</td>
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<td>0.00079</td>
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<td>106</td>
<td>Delta-BHC</td>
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<td>&lt; 0.004</td>
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<td>107</td>
<td>Chlordane (303(d) listed)</td>
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<td>&lt; 0.005</td>
<td>0.00034</td>
<td>No</td>
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<td>108</td>
<td>4,4'-DDT (303(d) listed)</td>
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<td>&lt; 0.004</td>
<td>0.000075</td>
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<td>4,4'-DDE (linked to DD/T)</td>
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<td>&lt; 0.003</td>
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<td>110</td>
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<td>&lt; 0.004</td>
<td>0.000313</td>
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<td>111</td>
<td>Dieldrin (303d listed)</td>
<td>0.00014</td>
<td>&lt; 0.004</td>
<td>0.000237</td>
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<tr>
<td>112</td>
<td>Alpha-Endosulfan</td>
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<td>0.000035</td>
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<td>&lt; 0.005</td>
<td>0.000059</td>
<td>No</td>
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<td>No</td>
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<td>0.000073</td>
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<td>116</td>
<td>Endrin Aldehyde</td>
<td>0.81</td>
<td>&lt; 0.005</td>
<td>---</td>
<td>No</td>
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<tr>
<td>117</td>
<td>Heptachlor</td>
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<td>118</td>
<td>Heptachlor Epoxide</td>
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<td>&lt; 0.005</td>
<td>0.000121</td>
<td>No</td>
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<tr>
<td>119-125</td>
<td>PCBs sum (303(d) listed) [3]</td>
<td>---</td>
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</tr>
<tr>
<td>126</td>
<td>toxaphene</td>
<td>0.0002</td>
<td>&lt; 0.004</td>
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<td>No</td>
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<tr>
<td>127</td>
<td>Tributyltin</td>
<td>0.0074</td>
<td>&lt; 0.005</td>
<td>0.002</td>
<td>No</td>
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</table>

**Abbreviations:**

- **WQC** = water quality objective
- **MEC** = maximum effluent concentration

Attachment F – Fact Sheet F-21
c. Dioxin-TEQ

i. Water Quality Objective. The Basin Plan narrative water quality objective for bioaccumulative substances states, "Many pollutants can accumulate on particulates, in sediments, or bioaccumulate in fish and other aquatic organisms. Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered."

Because it is the consensus of the scientific community that dioxins and furans associate with particulates, accumulate in sediments, and bioaccumulate in the fatty tissue of fish and other organisms, the Basin Plan’s narrative bioaccumulation water quality objective applies to these pollutants. Elevated levels of dioxins and furans in San Francisco Bay fish tissue demonstrate that the narrative bioaccumulation water quality objective is not being met. U.S. EPA has therefore placed San Francisco Bay on its 303(d)-list of receiving waters where water quality objectives are not being met after imposition of applicable technology-based requirements.

When the CTR was promulgated, U.S. EPA stated its support of the regulation of dioxin and dioxin-like compounds through the use of toxicity equivalencies (TEQs). U.S. EPA stated, "For California waters, if the discharge of dioxin or dioxin-like compounds has reasonable potential to cause or contribute to a violation of a narrative criterion, numeric WQBELs for dioxin or dioxin-like compounds should be included in NPDES permits and should be expressed using a TEQ scheme" (65 Fed. Reg. 31695-31696, May 18, 2000). This Order uses a TEQ scheme based on a set of toxicity equivalency factors (TEFs) the World Health Organization developed in 1998, and a set of bioaccumulation equivalency factors (BEFs) U.S. EPA developed for the Great Lakes region (40 C.F.R. part 132, Appendix F) to convert the concentration of any congener of dioxin or furan into an equivalent concentration of 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (2,3,7,8-TCDD). Although the 1998 World Health Organization scheme includes TEFs for dioxin-like PCBs, they are not included in this Order’s TEQ scheme. The CTR has established a specific water quality criterion for PCBs, and dioxin-like PCBs are included in the analysis of total PCBs.

The CTR establishes a numeric water quality objective for 2,3,7,8-TCDD of $1.4 \times 10^{-8} \mu g/L$ for the protection of human health when aquatic organisms are consumed. The CTR criterion is used as a criterion for dioxin-TEQ because dioxin-
TEQ represents a toxicity weighted concentration equivalent to 2,3,7,8-TCDD, thus translating the narrative bioaccumulation objective into a numeric criterion.

ii. **Analysis.** TEFs and BEFs were used to express measured concentrations of 17 dioxin congeners in effluent and background samples as equivalent 2,3,7,8-TCDD concentrations. For each sample, the sum of these equivalent concentrations is the dioxin-TEQ concentration. This Order establishes dioxin-TEQ WQBELs because the site-specific ambient background receiving water dioxin-TEQ concentration (5.3 x 10^{-8} \text{ mg/L}) exceeds the CTR numeric criterion for 2,3,7,8-TCDD (1.4 x 10^{-8} \text{ mg/L}) and San Pablo Bay is listed as an impaired water body pursuant to CWA section 303(d). Moreover, dioxin-TEQ was detected in the effluent, demonstrating reasonable potential by Trigger 2.

d. **Ammonia**

i. **Methodology.** Ammonia is a toxic pollutant but not a priority pollutant as defined by the CTR; therefore, the procedure outlined in the Technical Support Document for Water Quality-based Toxics Control (Technical Support Document) (EPA/505/2-90-001, March 1991) is used to determine if ammonia in the discharge has a reasonable potential to cause water quality objectives to be exceeded in the receiving water. The Technical Support Document allows the use of measured receiving water concentrations or receiving water concentrations projected from effluent data to perform reasonable potential analyses. The following summarizes the steps using effluent data:

- **Step 1.** Determine the number of observations (n) for a set of effluent data and determine the highest value from that data set (the maximum effluent concentration or MEC).

- **Step 2.** Determine the coefficient of variation (CV) from the data set. For a data set where n<10, the CV is estimated to equal 0.6. For a data set where n≥10, the CV is calculated as the standard deviation divided by the mean.

- **Step 3.** Determine an appropriate ratio, R, for projecting a selected upper bound concentration (e.g., the 99th or 95th percentile) assuming a lognormal distribution. To do this, the percentile represented by the MEC in a data set of “n” samples, p_n, needs to be determined based on the desired confidence interval, e.g., 95% or 99%. This Order is based on the 95% confidence interval.

\[
P_n = (1 - \text{confidence interval})^{1/n}
\]

\[C_{p_n} \text{ and } C_{\text{upper bound}} \text{ corresponding to the MEC percentile } (p_n) \text{ and the selected upper bound percentile (typically 99th percentile) are calculated using the following equation:}
\]

\[C_p = \exp(Z_p\sigma - 0.5\sigma^2)
\]

In this equation, \(\sigma^2 = \ln(CV^2 + 1)\), p is the percentile (upper bound or p_n), and \(Z_p\) is the standard normal distribution value for the percentile p (available from statistical references).
The ratio, \( R \), is then determined as follows:

\[
R = \frac{C_{\text{upperbound}}}{C_{\text{p}}}
\]

Step 4. Multiply the MEC by the ratio, \( R \), determined in Step 3, and use this value with the appropriate dilution to project the receiving water concentration (RWC):

\[
\text{RWC} = \text{MEC} \times R \div \text{dilution ratio}
\]

Step 5. Compare the projected receiving water concentration to the applicable water quality objective. If a receiving water concentration is greater than or equal to the objective, then there is reasonable potential.

ii. Analysis

(a) **Water Quality Objective.** Basin Plan section 3.3.20 contains water quality objectives for un-ionized ammonia of 0.025 mg/L as an annual median and 0.16 mg/L as a maximum for San Francisco Bay north of the Golden Gate Channel.

(b) **Ammonia Data Translation.** Effluent and receiving water data are available for total ammonia, but not un-ionized ammonia because (1) sampling and laboratory methods are unavailable to analyze for un-ionized ammonia, and (2) the fraction of total ammonia that exists in the toxic un-ionized form depends on pH, salinity, and temperature. Total ammonia concentrations (as nitrogen) were translated into un-ionized ammonia concentrations for comparison with the Basin Plan un-ionized objectives based on the following equations (U.S. EPA, 1989, *Ambient Water Quality Criteria for Ammonia (Saltwater)—1989*, EPA Publication 440/5-88-004):

For salinity > 10 ppt: fraction of NH\(_3\) = \( \frac{1}{1 + 10^{(pK - pH)}} \)

Where:

\[
pK = 9.245 + 0.116(I) + 0.0324(298-T) + 0.0415(P)/T
\]

\( I = \text{the molal ionic strength of saltwater} = 19.9273(S)/(1000-1.005109*S) \)

\( S = \text{salinity (parts per thousand)} \)

\( T = \text{temperature in Kelvin} \)

\( P = \text{pressure (one atmosphere)} \)

For salinity < 1 ppt: fraction of NH\(_3\) = \( \frac{1}{1 + 10^{(pK - pH)}} \)

Where:

\[
pK = 0.09018 + 2729.92/T
\]

\( T = \text{temperature in Kelvin} \)

For this Order, paired salinity data were unavailable. The effluent was assumed to be freshwater, and the equation for waters of salinity less than 1 ppt was used.
(c) **Dilution.** For purpose of this analysis, no dilution was assumed, and the receiving water concentration was assumed to be the same as the projected upper bound concentration, i.e., RWC = MEC x R (see Step 4 above).

(d) **Two Approaches.** According to the Technical Support Document, the reasonable potential analysis can be performed based on the receiving water concentration projected using effluent data (the steps summarized above) or actual measured receiving concentrations. Both values may be compared directly with the Basin Plan un-ionized objectives:

(1) **Analysis Based on Effluent Data.** Effluent data do not indicate reasonable potential. There were 107 effluent sample results for un-ionized ammonia from December 4, 2009, through April 10, 2014. The MEC was 0.070 mg/L expressed as un-ionized ammonia (as nitrogen). The confidence interval was set at 95%. The percentile represented by the MEC (P_n) was calculated to be 0.972, indicating that the MEC represented the 97.2\textsuperscript{th} percentile of all observed ammonia effluent data. With the upper bound set at the 90\textsuperscript{th} percentile, the R value was determined to be 1.3 (C_{P_n} was 3.0 and C_{upper\ bound} was 3.9), and the projected receiving water concentration was 0.093 mg/L, which is less than the Basin Plan’s acute un-ionized ammonia objective of 0.16 mg/L.

The annual medians of the effluent data were used for direct comparison with the annual median chronic objective. The highest running annual median from the effluent data was calculated and compared with the annual median objective. No projection is needed to establish the central tendency of the data. The maximum annual median, 0.0073 mg/L, is less than the annual median objective of 0.025 mg/L.

(2) **Analysis Based on Receiving Water.** There is no reasonable potential for ammonia based on Miller Creek receiving water data. The Discharger submitted a report titled *Receiving Water Ammonia Characterization Study—Final Report* on August 28, 2012. The study examined receiving water data collected between April 2010 and May 2012 from four monitoring stations in Miller Creek, including monitoring locations RSW-002 (located 1,900 feet upstream of Discharge Point No. 002, the main discharge point), RSW-001 (20 feet downstream from Discharge Point No. 002), C-2A (500 feet downstream from Discharge Point No. 002), and PG&E Bridge (approximately 4,000 feet downstream from Discharge Point No. 002). The highest un-ionized ammonia concentration observed in the vicinity of the outfall was 0.09 mg/L (as nitrogen) at monitoring location RSW-001, which was less than the maximum water quality objective of 0.16 mg/L. The highest annual median observed was 0.011 mg/L, also at monitoring location C-2, which was less than the annual median water quality objective of 0.025 mg/L.

This analysis does not include receiving water data collected on April 27, 2011, during a mechanical failure of the plant’s fixed film reactor because:
(1) the data is not representative of the plant’s typical operating condition and
(2) the Discharger has since installed an on-line ammonia analyzer to provide...
an immediate measure of nitrification performance and allow it to avoid discharging inadequately-treated effluent. In addition, this analysis does not include receiving water data collected on November 15, 2011, during the plant’s discharge of surplus water from the reclamation storage ponds. The Discharger has ceased discharging from the storage ponds to Miller Creek. Going forward, all surplus water remaining in the storage ponds at the end of the reclamation season will be returned to the plant for treatment before discharge (see Fact Sheet section II.A.4).

iii. Potential Changes to Ammonia Analysis as an Outgrowth of Nutrients Regulation. The Regional Water Board issued a watershed permit (NPDES Permit No. CA0038873) for all municipal wastewater dischargers to San Francisco Bay, including the Discharger, as an element of its San Francisco Bay Nutrient Management Strategy. This strategy addresses growing concerns about nutrients in the San Francisco Bay estuary. The strategy’s goal is nutrient numeric endpoints that will inform WQBELs that the Regional Water Board may impose through NPDES Permit No. CA0038873.

e. Whole Effluent Chronic Toxicity

i. Water Quality Objective. Basin Plan section 3.3.18 contains the following water quality objective for toxicity: “All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms... There shall be no chronic toxicity in ambient waters. Chronic toxicity is a detrimental biological effect on growth rate, reproduction, fertilization success, larval development, population abundance, community composition, or any other relevant measure of the health of an organism, population, or community. Attainment of this objective will be determined by analyses of indicator organisms, species diversity, population density, growth anomalies, or toxicity tests..., or other methods selected by the Water Board.”

For this Order, this narrative objective is translated into a numeric criterion of 1.0 chronic toxicity unit (TUc). At 1.0 TUc, there is no observable detrimental effect when the indicator organism is exposed to 100 percent effluent; therefore, 1.0 TUc is a direct translation of the narrative objective into a number. Moreover, in the Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001) (see section 3.3.3, “Step 3: Decision Criteria for Permit Limit Development”), U.S. EPA recommends that 1.0 TUc be used as a criterion continuous concentration (typically a four-day average). It further states that reasonable potential is shown where an effluent is projected to cause an excursion above the criterion continuous concentration. The Technical Support Document is applicable here as guidance because it directly addresses effluent characterization for whole effluent toxicity.

ii. Analysis. The previous order required quarterly chronic toxicity tests using Mysisopsis bahia. Throughout most of the previous order term, the Discharger regularly observed some chronic toxicity. Out of 27 chronic toxicity tests, one exceeded 2 TUc. That result was 8 TUc and occurred on November 13, 2013. Twenty-one out of the 27 tests (78%) found chronic toxicity greater than 1 TUc.
The Discharger conducted toxicity identification evaluation (TIE) work in 2011, which identified pyrethroid pesticides as the likely toxicity source. Followup investigations failed to identify any potential sources but determined that permethrin (one type of pyrethroid) was often present at very low concentrations in the wastewater, including wastewater from residential areas. This finding is consistent with U.S. EPA studies (http://www.epa.gov/oppsrrd1/reevaluation/pyrethroids-pyrethrins.html) that document that pyrethroids are widely used in consumer products, such as mosquito resistant clothing and pet and pharmaceutical shampoos. The Discharger has since engaged in public outreach efforts aiming to limit pyrethroid discharges to the sanitary sewer. The Discharger also joined the Pyrethroids Working Group, sponsored by the California Association of Sanitation Agencies. As a participant, the Discharger conducts periodic pyrethroid sampling and shares its results with the group, which helps to inform the California Department of Pesticide Regulation and the U.S.EPA Office of Pesticide Programs (the agencies responsible for regulating pesticide use) of the presence of pyrethroids in municipal wastewater.

Although the Discharger has been engaging in community outreach to reduce pyrethroids in plant influent, there remains a reasonable potential for the discharge to cause chronic toxicity in the receiving water during discharge because toxicity has been observed in the discharge repeatedly in the recent past. (Discharge is generally prohibited from June through October when receiving water flows are low.)

Using the reasonable potential analysis methodology of the Technical Support Document (described in Fact Sheet section IV.C.3.d) results in the same conclusion. The effluent has reasonable potential for chronic toxicity because the projected maximum toxicity expected in the effluent when discharged is 15 TUe. Allowing for a mixing zone and dilution credit as described in Fact Sheet section IV.C.4.c (3.25:1), the projected toxicity in the receiving water at the edge of the mixing zone would be 4.5 TUe. Both values are above the numeric criterion of 1.0 TUe (Liao, M. April 15, 2015, Chronic Toxicity Reasonable Potential Analysis Using the Technical Support Document Approach, Las Gallinas Valley Sanitary District).

f. Temperature

i. Water Quality Objectives. The Basin Plan lists Miller Creek as supporting the cold freshwater habitat beneficial use. The Basin Plan requires that the temperature of cold freshwater habitat not be increased by more than 5°F above the natural receiving water temperature. The Thermal Plan objectives for existing discharges to estuaries include the following:

(a) The maximum temperature shall not exceed the natural receiving water temperature by more than 20°F.

(b) Discharges, either individually or combined, shall not create a zone, defined by water temperatures of more than 1°F above natural receiving water temperature, which exceeds 25 percent of the cross-sectional area of a main river channel at any point.

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(e) No discharge shall cause a surface water temperature rise greater than 4°F above the natural temperature of the receiving waters at any time or place.

ii. **Analysis.** There is no reasonable potential for temperature to exceed water quality objectives based on data the Discharger provided in its *Miller Creek Temperature Study—Final Report*, dated December 31, 2013. The report contains temperature data collected between January 2010 and December 2013 for the discharge and Miller Creek receiving water upstream (monitoring location RSW-002) and downstream (monitoring location RSW-001) of the discharge and at two other farther downstream locations (monitoring locations C-2A and PG&E Bridge). The maximum difference in temperature between the discharge and the upstream natural receiving water at monitoring location RSW-002 was 14°F, which is less than the Thermal Plan objective of 20°F. The average temperature differences between the downstream and the upstream receiving water were 0.4°F (monitoring location RSW-001 versus monitoring location RSW-002), 0.8°F (monitoring location C-2A versus monitoring location RSW-002), and -1°F (monitoring location PG&E Bridge versus monitoring location RSW-002), which were all less than the Thermal Plan objective of 4°F.

The thermal objective applicable to major river channels does not apply to Miller Creek because Miller Creek is not a river, much less a major river. It measures no more than 10 feet across in the vicinity of the discharge outfalls.

g. **Sediment Quality.** Pollutants in some receiving water sediments may be present in quantities that alone or in combination are toxic to benthic communities. Efforts are underway to identify stressors causing such conditions. However, to date there is no evidence directly linking compromised sediment conditions to the discharges subject to this Order; therefore, the Regional Water Board cannot draw a conclusion about reasonable potential for these discharges to cause or contribute to exceedances of the sediment quality objectives. Nevertheless, the Discharger continues to participate in the RMP, which monitors San Francisco Bay sediment and seeks to identify stressors responsible for degraded sediment quality. Thus far, the monitoring has provided only limited information about potential stressors and sediment transport. The Regional Water Board is exploring options for obtaining additional information that may inform future analyses.

4. **Water Quality-Based Effluent Limitations (WQBELs)**

WQBELs were developed for the pollutants or pollutant parameters determined to have reasonable potential to cause or contribute to exceedances of water quality objectives. The WQBELs are based on the procedures in SIP section 1.4. Average monthly effluent limitations (AMELs) and maximum daily effluent limitations (MDELs) were calculated as shown in the table below.

This Order does not contain WQBELs for constituents that do not demonstrate reasonable potential; however, Provision VI.C.2 of the Order still requires monitoring for those pollutants. If concentrations are found to have increased significantly, Provision VI.C.2 of the Order requires the Discharger to investigate the sources of the increases and implement remedial measures if the increases pose a threat to receiving water quality.
a. **Need for Numeric Chronic Toxicity WQBELs.** This Order contains numeric WQBELs for chronic toxicity. Numeric WQBELs are necessary and appropriate because the chemical-specific WQBELs and narrative chronic toxicity WQBEL (with triggers for prescriptive accelerated monitoring and toxicity reduction evaluation) in the previous order were insufficient to attain and maintain the narrative chronic toxicity water quality objective, as evidenced by the regularly observed chronic toxicity in the discharge during the previous order term and described in the reasonable potential analysis above. Numeric WQBELs are consistent with the intent of the federal regulations requiring whole effluent toxicity effluent limitations at 40 C.F.R. section 122.44(d). As set forth in the preamble to these regulations, “A limit on whole effluent toxicity refers to a numeric effluent limitation expressed in terms such as toxic units, no observed effect level (NOEL), LC50, or percent mortality.” (54 Fed. Reg. 23871, emphasis added). Numeric toxicity WQBELs are an efficient and effective regulatory tool because the measurement of compliance is clearly defined.

State Water Board Order Nos. WQ 2003-0012 and 2003-0013 do not preclude the Regional Water Board from imposing numeric effluent limitations for chronic toxicity. In those orders, the State Water Board questioned the propriety of numeric chronic toxicity effluent limitations in NPDES permits for publicly-owned treatment works that discharge into inland waters and decided to address the issue by modifying the SIP within one year. It expressly declined to determine the propriety of final numeric effluent limitations for chronic toxicity for the permits under review (Order No. WQ 2003-0012, p. 9). Pending SIP modification, it replaced the numeric toxicity effluent limitations of the specific permits under review with narrative ones similar to those in the previous Las Gallinas order. Almost 12 years have passed and the State Water Board has not modified the SIP. Meanwhile, notwithstanding the narrative chronic toxicity effluent limitations, discharges that do not ensure compliance with the narrative toxicity water quality objective continue. Based on these developments and differing facts since adoption of the State Water Board orders, the Regional Water Board exercises its own discretion and finds that numeric chronic toxicity WQBELs are necessary and appropriate at this time and that they are consistent with federal regulations as they apply to whole effluent toxicity. Moreover, U.S. EPA has indicated its intent to object to reissuance of this permit if there is reasonable potential for chronic toxicity to exceed water quality standards and the Order does not contain WQBELs as stringent as necessary to meet water quality standards, including numeric WQBELs as needed (Jane Diamond, U.S. EPA, January 15, 2015).

b. **WQBEL Expression.** NPDES regulations at 40 C.F.R. section 122.45(d) require that permit limits for publicly-owned treatment works be expressed as average weekly and average monthly limits, unless impracticable. This Order contains MDELs instead of weekly limits because MDELs better protect against acute water quality effects and are necessary to prevent fish kills or mortality to aquatic organisms. Weekly limits could allow acute and chronic toxicity to occur over shorter periods (acute and chronic aquatic life criteria are typically expressed as one-hour and four-day averages).

Daily WQBELs are appropriate for chronic toxicity. U.S.EPA discusses permit limit expression for chronic toxicity in *EPA Regions 8, 9 and 10 Toxicity Training Tool* (January 2010). It acknowledges that NPDES regulations at 40 C.F.R. section 122.45(d) require weekly limits for publicly-owned treatment works but indicates that weekly limits
are inappropriate for toxic pollutants and water quality permitting. According to U.S. EPA, the requirement for weekly limits is based on the secondary treatment requirements, which are unrelated to water quality. Section 5.2.3 of the Technical Support Document for Water Quality-based Toxics Control (Technical Support Document), (EPA/505/2-90-001, March 1991) also states that weekly limits are inappropriate for whole effluent toxicity. In lieu of weekly limits, U.S. EPA recommends daily limits. Since chronic toxicity tests may take several takes to complete, Table 4 of the Order contains a note indicating that the maximum daily WQBEL is to be interpreted as the maximum test result for the month, as U.S. EPA recommends in Technical Support Document section 5.2.3.

c. **Mixing Zones and Dilution Credits.** The Discharger’s effluent is discharged to Miller Creek, a shallow water discharge. Due to the tidal nature of the creek, and limited upstream freshwater flows, no dilution credit (D=0) was used to calculate WQBELs for most pollutants with the exception of cyanide and chronic toxicity. Cyanide attenuates in receiving waters due to both degradation and dilution. For discharges to Miller Creek, Basin Plan Table 4-6 allows a cyanide dilution credit of 3.25:1 (D=2.25). For chronic toxicity, Basin Plan 4.5.5.3.2 states, “[allow] credit for dilution comparable to those allowed for numeric chemical specific objectives, effluent variability, and intent to protect against consistent chronic toxicity and severe episodic toxic events.” For this reason, and as discussed below, this Order authorizes a mixing zone for chronic toxicity that also corresponds to a dilution credit of 3.25:1.

Miller Creek discharges are tidally-influenced at the discharge points. Data from November 2009 through April 2010 (selected to represent a typical discharge season) indicates that the mixing zone corresponding to 3.25:1 dilution extended less than one third mile downstream from the discharge points. During a dry or “drought” year (such as from November 2011 through April 2012), the mixing zone could extend as much as one mile downstream from the discharge points.

The mixing zone protects against chronic toxicity and severe episodic toxic events in the receiving water because it would not allow any of the following to occur:

i. **Compromise the integrity of the entire water body.** The mixing zone will not compromise the integrity of the entire water body because it extends one third mile, or up to one mile during drought years, between the discharge points and San Pablo Bay. Miller Creek extends upstream from the discharge points for about another eight miles. Moreover, this Order prohibits most dry season discharges, preserving the integrity of the entire water body during those periods.

ii. **Cause acute toxicity to aquatic life passing through the mixing zone.** The mixing zone will not cause acutely toxic conditions to aquatic life passing through it because the mixing zone relates to chronic toxicity, not acute toxicity. Section IV.D of this Order contains acute toxicity limits that reflect no mixing zone and no dilution credit.

iii. **Restrict the passage of aquatic life.** The mixing zone will not restrict passage of aquatic life because it relates to chronic toxicity, not acute toxicity. Aquatic life will be able to pass through the mixing zone before any chronic effects can occur.
Moreover, the mixing zone will not create a physical or visual barrier that could restrict the passage of aquatic life.

iv. **Adversely impact biologically-sensitive or critical habitats.** The mixing zone will not adversely affect any biologically-sensitive or critical habitats because it is confined to a stretch of Miller Creek and is unlikely to harm special-status species living in or around the creek. Two protected birds may occupy saltwater marshes adjacent to (but not within) the mixing zone: the State and federally-endangered California clapper rail, and the State-threatened California black rail. Other sensitive birds nearby include the San Pablo song sparrow. The State and federally-endangered saltmarsh harvest mouse may also occupy nearby saltwater marshes (http://marinwatersheds.org/miller_creek.html). None of these species is likely to spend significant time within the mixing zone.

Steelhead trout, a federally-threatened aquatic species, has been observed within the Miller Creek watershed (http://www.dfg.ca.gov/biogeodata/cnndb/pdfs/TEAnimals.pdf). Steelhead trout is likely to migrate through the mixing zone quickly on route to upstream spawning beds. Steelhead trout would not attempt to spawn inside the mixing zone because the stream bed there is smooth mud containing no gravel appropriate for spawning. Exposure would be limited to short periods. The Discharger conducts acute toxicity tests in 100 percent effluent using rainbow trout and results consistently show no acute toxicity. Steelhead trout are the anadromous form of rainbow trout.

v. **Produce undesirable or nuisance aquatic life.** The mixing zone will not produce undesirable or nuisance aquatic life because this Order specifically prohibits bottom deposits or aquatic growths in the receiving water to the extent that such deposits or growths cause nuisance or adversely affect beneficial uses.

vi. **Result in floating debris, oil, or scum.** The mixing zone will not result in floating debris, oil, or scum because this Order specifically prohibits floating debris, oil, or scum in the receiving water. The plant is equipped with scum and debris collection devices that remove these materials.

vii. **Produce objectionable color, odor, taste, or turbidity.** The mixing zone will not produce objectionable color, odor, taste, or turbidity because the plant provides advanced secondary treatment and disinfects effluent prior to discharge. Advanced secondary treatment generally addresses objectionable odor, taste, and turbidity through the biological degradation of organic compounds and clarification. Moreover, this Order specifically prohibits alteration of color or turbidity beyond natural background levels. The Discharger conducts regular effluent monitoring that includes standard observations to ensure that objectionable color, odor, and turbidity are not present.

viii. **Cause objectionable bottom deposits.** The mixing zone will not cause objectionable bottom deposits because the plant provides advanced secondary treatment, which biologically degrades and removes suspended particles that could contribute to receiving water bottom deposits. Moreover, this Order specifically
prohibits bottom deposits or aquatic growths in the receiving water to the extent that such deposits or growths cause nuisance or adversely affect beneficial uses.

**ix. Cause nuisance.** The mixing zones will not cause a nuisance because the effluent receives advanced secondary treatment and is disinfected prior to discharge. Moreover, this Order specifically prohibits discharges from causing a nuisance. The Discharger conducts regular effluent monitoring that includes standard observations to confirm that nuisance conditions are not present.

**x. Overlap a mixing zone from a different outfall.** The mixing zone does not overlap any other mixing zone because the Regional Water Board has not established any other mixing zone nearby.

**xi. Exist at or near any drinking water intake.** The mixing zone is not located near any drinking water intake because no such intake is nearby. The receiving water is a marine environment not generally suitable as a drinking water supply.

**d. WQBEL Calculations.** The following table shows the WQBEL calculations. Calculations for chemical-specific pollutants are in accordance with the SIP. Calculations for chronic toxicity use the SIP methodology as guidance because U.S. EPA recommends that toxicity WQBELs be derived using a statistical approach (see Technical Support Document, section 5.4.2), and the SIP-based procedure is one such approach.

<table>
<thead>
<tr>
<th>Table F-8. WQBEL Calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRIORITY POLLUTANTS</strong></td>
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<tr>
<td><strong>Units</strong></td>
</tr>
<tr>
<td><strong>Basis and Criteria type</strong></td>
</tr>
<tr>
<td><strong>Criteria - Acute</strong></td>
</tr>
<tr>
<td><strong>Criteria - Chronic</strong></td>
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<tr>
<td><strong>SSO Criteria -Acute</strong></td>
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<td><strong>SSO Criteria -Chronic</strong></td>
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<tr>
<td><strong>Water Effects ratio (WER)</strong></td>
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<tr>
<td><strong>Lowest WQO</strong></td>
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<tr>
<td><strong>Site Specific Translator - MDEL</strong></td>
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<tr>
<td><strong>Site Specific Translator - AMEL</strong></td>
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<tr>
<td><strong>Dilution Factor (D) (if applicable)</strong></td>
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<tr>
<td><strong>No. of samples per month</strong></td>
</tr>
<tr>
<td><strong>Aquatic life criteria analysis required? (Y/N)</strong></td>
</tr>
<tr>
<td><strong>HH criteria analysis required? (Y/N)</strong></td>
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<tr>
<td><strong>Applicable Acute WQO</strong></td>
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<tr>
<td><strong>Applicable Chronic WQO</strong></td>
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<tr>
<td><strong>HH criteria</strong></td>
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<tr>
<td>PRIORITY POLLUTANTS</td>
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<tr>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Background (Maximum Conc for Aquatic Life calc)</td>
</tr>
<tr>
<td>Background (Average Conc for Human Health calc)</td>
</tr>
<tr>
<td>Is the pollutant on the 303d list and/or bioaccumulative (Y/N)?</td>
</tr>
<tr>
<td>ECA acute</td>
</tr>
<tr>
<td>ECA chronic</td>
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<tr>
<td>ECA HH</td>
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<tr>
<td>No. of data points &lt;10 or at least 80% of data reported non detect? (Y/N)</td>
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<tr>
<td>Avg of effluent data points</td>
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<tr>
<td>Std Dev of effluent data points</td>
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<tr>
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<tr>
<td>CV (Selected) - Final</td>
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<tr>
<td>ECA acute multi99</td>
</tr>
<tr>
<td>ECA chronic multi99</td>
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<tr>
<td>LTA acute</td>
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<tr>
<td>LTA chronic</td>
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<tr>
<td>minimum of LTAs</td>
</tr>
<tr>
<td>AMEL multi95</td>
</tr>
<tr>
<td>MDEI multi99</td>
</tr>
<tr>
<td>AMEL (aq life)</td>
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<tr>
<td>MDEI(aq life)</td>
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<tr>
<td>MDEI/AMEL Multiplier</td>
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<tr>
<td>AMEL (human hltln)</td>
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<td>MDEI (human hltln)</td>
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<tr>
<td>minimum of AMEL for Aq. life vs HH</td>
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<tr>
<td>minimum of MDEI for Aq. Life vs HH</td>
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<tr>
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<tr>
<td>Previous order limit (MDEI)</td>
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<tr>
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<tr>
<td>Final limit - MDEI</td>
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</table>
Unit Abbreviations:

- $\mu g/L = \text{micrograms per liter}$
- $TU_c = \text{chronic toxicity units, equal to } 100/\text{NOEL, where NOEL = IC}_{25}, \text{EC}_{25}, \text{or NOEC}$

e. **Feasibility of Compliance with Copper WQBELs.** The Water Board adopted Cease and Desist Order No. R2-2009-0071 because the Discharger could not comply with the copper WQBELs in the previous order. In compliance with Order No. R2-2009-0071, the Discharger implemented several measures aimed at reducing copper concentrations in plant effluent, including installation of a polymer feed system to the secondary clarifier to enhance copper removal before the beginning of the 2010-2011 discharge season. From October 2010 through April 2014, the 95th percentile of the effluent copper concentration, 8.5 $\mu g/L$, was less than this Order’s AMEL, 8.6 $\mu g/L$, and the 99th percentile of the effluent copper concentration, 9.6 $\mu g/L$, was less than this Order’s MDEL, 11 $\mu g/L$, indicating that the Discharger is able to comply with this Order’s WQBELs. Therefore, Cease and Desist Order No. R2-2009-0071 is unnecessary and may be rescinded.

5. **Whole Effluent Acute Toxicity**

This Order includes effluent limitations for whole effluent acute toxicity based on Basin Plan Table 4-3. All bioassays are to be performed according to the U.S. EPA approved method in 40 C.F.R. section 136, currently *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 5th Edition* (EPA-821-R-02-012). The approved test species specified in the Monitoring and Reporting Program (MRP) is rainbow trout (*Onchorhynchus mykiss*).

Based on Basin Plan section 3.3.20, if the Discharger can demonstrate that ammonia causes acute toxicity in excess of the acute toxicity limitations in this Order and that the ammonia in the discharge complies with the ammonia effluent limitations in this Order, then such toxicity does not constitute a violation of the effluent limitations for whole effluent acute toxicity.

D. **Effluent Limitation Considerations**

1. **Anti-backsliding.** This Order complies with the anti-backsliding provisions of CWA sections 402(o) and 303(d)(4) and 40 C.F.R. section 122.44(l), which generally require effluent limitations in a reissued permit to be as stringent as those in the previous permit. Newly calculated copper, nickel, and cyanide limits are less stringent than those in the previous order; therefore, this Order retains the previous limits to avoid backsliding.

This Order does not retain lead and selenium limits from the previous order because data no longer indicate that these pollutants have reasonable potential to exceed water quality objectives. This is consistent with State Water Board Order WQ 2001-16.

2. **Antidegradation.** This Order complies with the antidegradation provisions of 40 C.F.R. section 131.12 and State Water Board Resolution No. 68-16. It continues the status quo with respect to the level of discharge authorized in the previous order, which is the baseline by which to measure whether degradation will occur. This Order does not allow for a reduced level of treatment or increase effluent limitations relative to those in the previous order.

3. **Stringency of Requirements for Individual Pollutants.** This Order contains both technology-based and water quality-based effluent limitations for individual pollutants. This
Order’s technology-based requirements implement minimum, applicable federal technology-based requirements. In addition, this Order contains more stringent effluent limitations as necessary to meet water quality standards. Collectively, this Order’s restrictions on individual pollutants are no more stringent than required to implement CWA requirements.

This Order’s WQBELs have been derived to implement water quality objectives that protect beneficial uses. The beneficial uses and water quality objectives have been approved pursuant to federal law and are the applicable federal water quality standards. To the extent that WQBELs were derived from the CTR, the CTR is the applicable standard pursuant to 40 C.F.R. section 131.38. The procedures for calculating these WQBELs are based on the CTR, as implemented in accordance with the SIP, which U.S. EPA approved on May 18, 2000. U.S. EPA approved most Basin Plan beneficial uses and water quality objectives prior to May 30, 2000. Beneficial uses and water quality objectives submitted to U.S. EPA prior to May 30, 2000, but not approved by U.S. EPA before that date, are nonetheless “applicable water quality standards for purposes of the CWA” pursuant to 40 C.F.R. section 131.21(c)(1). U.S. EPA approved the remaining beneficial uses and water quality objectives so they are applicable water quality standards pursuant to 40 C.F.R. section 131.21(c)(2).

V. RATIONALE FOR RECEIVING WATER LIMITATIONS

The receiving water limitations in sections V.A and V.B of the Order are based on Basin Plan narrative and numeric water quality objectives. The receiving water limitation in section V.C of the Order requires compliance with federal and State water quality standards.

VI. RATIONALE FOR PROVISIONS

A. Standard Provisions

Attachment D contains standard provisions that apply to all NPDES permits in accordance with 40 C.F.R. section 122.41 and additional conditions applicable to specific categories of permits in accordance with 40 C.F.R. section 122.42. The Discharger must comply with these provisions. The conditions set forth in 40 C.F.R. sections 122.41(a)(1) and (b) through (n) apply to all state-issued NPDES permits and must be incorporated into the permits either expressly or by reference.

In accordance with 40 C.F.R. section 123.25(a)(12), states may omit or modify conditions to impose more stringent requirements. Attachment G contains standard provisions that supplement the federal standard provisions in Attachment D.

This Order omits federal conditions that address enforcement authority specified in 40 C.F.R. sections 122.41(j)(5) and (k)(2) because the State’s enforcement authority under the Water Code is more stringent. In lieu of these conditions, this Order incorporates Water Code section 13387(e) by reference.

B. Monitoring and Reporting

CWA section 308 and 40 C.F.R. sections 122.41(h), 122.41(j)-(l), 122.44(i), and 122.48 require that NPDES permits specify monitoring and reporting requirements. Water Code sections 13267 and 13383 also authorize the Regional Water Board to establish monitoring, inspection, entry,
reporting, and recordkeeping requirements. The Monitoring and Reporting Program (Attachment E) of this Order establishes monitoring, reporting, and recordkeeping requirements that implement federal and State requirements. For more background regarding these requirements, see Fact Sheet section VII.

C. Special Provisions

1. Reopener Provisions

These provisions are based on 40 C.F.R. sections 122.62 and 122.63 and allow modification of this Order and its effluent limitations as necessary in response to updated water quality objectives, regulations, or other new and relevant information that may become available in the future, and other circumstances as allowed by law.

2. Effluent Characterization Study and Report

This Order does not include effluent limitations for priority pollutants that do not demonstrate reasonable potential, but this provision requires the Discharger to continue monitoring for these pollutants as described in the MRP and Attachment G. Monitoring data are necessary to verify that the “no” and “cannot determine” reasonable potential analysis conclusions of this Order remain valid. This requirement is authorized pursuant to Water Code section 13267 and is necessary to inform the next permit reissuance and to ensure that the Discharger takes timely steps in response to any unanticipated change in effluent quality during the term of this Order.

3. Pollutant Minimization Program

This provision is based on Basin Plan section 4.13.2 and SIP section 2.4.5.

4. Special Provisions for Municipal Facilities

a. Sludge and Biosolids Management. Provision VI.C.4.a of the Order is based on Basin Plan section 4.17 and 40 C.F.R. parts 257 and 503. “Sludge” refers to the solid, semisolid, and liquid residue removed during primary, secondary, and advanced wastewater treatment processes. “Biosolids” refers to sludge that has been treated and may be beneficially reused.

b. Collection System Management. Provision VI.C.4.b of the Order explains this Order’s requirements as they relate to the Discharger’s collection system, and promotes consistency with the State Water Board’s Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (General Collection System WDRs), Order No. 2006-0003-DWQ, as amended by Order No. WQ 2013-0058-EXEC. The General Collection System WDRs require public agencies that own or operate sanitary sewer systems with greater than one mile of pipes or sewer lines to enroll for coverage under the General Collection System WDRs. The General Collection System WDRs contain requirements for collection system operation and maintenance, and for reporting and mitigating sanitary sewer overflows. They also require agencies to develop sanitary sewer management plans and report all sanitary sewer overflows. The Discharger must comply with both the General Collection System WDRs and this Order.
5. Other Special Provisions

a. **Reliability and Assurance Plan and Status Report.** Provision VI.C.5.a of the Order is required to justify an exception to Basin Plan Discharge Prohibition 1 (see Fact Sheet section IV.A.2). Basin Plan Discharge Prohibition 1 is intended to protect shallow waters from the effects of abnormal discharges caused by temporary upsets and malfunctions.

b. **Corrective Measures to Minimize Blending.** This provision is based on 40 C.F.R. section 122.41(m) and guidance provided by U.S. EPA’s proposed Peak Wet Weather Policy (December 2005). The previous order required the Discharger to submit a No Feasible Alternatives Analysis. Table 5 of this Order contains specific tasks to reduce blending, which, in part, are tasks the Discharger identified in its No Feasible Alternative Analysis, dated June 3, 2014. These tasks are feasible for the Discharger to undertake within the term of this Order to improve wet weather management and reduce blending.

This provision requires the Discharger to submit a new No Feasible Alternatives Analysis (Utility Analysis) with its application for permit reissuance. The primary purposes of the Utility Analysis are to demonstrate that there are currently no feasible alternatives to blending (i.e., all feasible actions that could have been implemented have been implemented) and to identify all feasible actions that can be implemented within the next permit reissuance cycle. U.S. EPA’s Proposed Wet Weather Policy suggests specific analyses for the Discharger to complete in order to determine whether its peak wet weather flow blending discharges should be approved under 40 C.F.R. section 122.41(m) and whether any feasible alternatives to blending are available. These analyses are intended to address the criteria for approving a bypass under 40 C.F.R. section 122.41(m)(4)(i)(A)-(C). The Utility Analysis may be used to review and approve or deny future wet weather blending-related bypasses. If these criteria are met and no feasible alternative exists, the Regional Water Board may approve peak wet weather flow diversions around secondary treatment units as an anticipated bypass under 40 C.F.R. section 122.41(m)(4)(ii).

c. **Copper Action Plan.** This provision is based on Basin Plan section 7.2.1.2 and is necessary to ensure that use of copper site-specific objectives is consistent with antidegradation policies. Data that the San Francisco Estuary Institute compiled for 2009-2011 indicate no degradation of San Francisco Bay water quality with respect to copper (http://www.sfei.org/content/copper-site-specific-objective-3-year-rolling-averages).

d. **Cyanide Action Plan.** This provision is based on Basin Plan section 4.7.2.2 and is necessary to ensure that use of cyanide site-specific objectives is consistent with antidegradation policies. The threshold for considering influent cyanide concentrations to indicate a possible “significant cyanide discharge” in the Discharger’s service area is set at 18 μg/L. This concentration is about 1.5 times the maximum cyanide concentration (12 μg/L) found in the plant’s influent during the previous order term. Because the Discharger has not observed influent cyanide concentrations greater than 12 μg/L, if influent concentrations 1.5 times this level were observed, there could be a significant cyanide source.
e. **Standard Operating Procedures for Resource Recovery (Optional).** Standard Operating Procedures are required for dischargers that accept hauled waste fats, oil, and grease for injection into anaerobic digesters. The development and implementation of Standard Operating Procedures for management of these materials is intended to allow the California Department of Resources Recycling and Recovery to exempt operations from separate and redundant permitting programs. If the Discharger does not accept fats, oil, and grease for resource recovery purposes, it is not required to develop and implement Standard Operating Procedures.

**VII. MONITORING AND REPORTING PROGRAM (MRP)**

Attachment E contains the MRP for this Order. It specifies sampling stations, pollutants to be monitored (including all parameters for which effluent limitations are specified), monitoring frequencies, and reporting requirements. The following provides the rationale for the MRP requirements.

**A. MRP Requirements Rationale**

1. **Influent Monitoring.** Influent flow monitoring is necessary to understand facility operations. BOD$_5$ and TSS monitoring is necessary to evaluate compliance with this Order's 85 percent removal requirement. Basin Plan section 4.7.2.2 requires cyanide monitoring because this Order is based on site-specific cyanide water quality objectives.

2. **Effluent Monitoring.** Effluent flow monitoring is necessary to evaluate compliance with Prohibition III.D (average dry weather flow) and to understand facility operations. Effluent monitoring at Monitoring Locations EFF-001 and EFF-001B (if blending) is necessary to evaluate compliance with this Order's effluent limitations and to support the reasonable potential analysis and development of effluent limitations for the next permit reissuance. Provision VI.C.2.a of the Order requires monitoring for priority pollutants for which there are no effluent limits to inform the next permit reissuance (e.g., to support the reasonable potential analysis) and to ensure that the Discharger takes timely steps in response to any unanticipated change in effluent quality.

3. **Whole Effluent Toxicity Testing.** Acute and chronic whole effluent toxicity tests are necessary to evaluate compliance with the acute and chronic toxicity effluent limitations. Chronic toxicity tests are also necessary to evaluate whether chronic toxicity triggers the need for accelerated monitoring and a Toxicity Reduction Evaluation. The accelerated monitoring triggers are based on Basin Plan Table 4-5, except that accelerated monitoring is not triggered if future monitoring continues to show that toxicity is due only to pyrethroids because such accelerated monitoring would not provide useful information regarding the Discharger's ongoing efforts to reduce pyrethroids.

The MRP requires the Discharger to conduct a chronic toxicity screening phase study prior to permit reissuance to ensure that chronic toxicity tests are conducted on the most sensitive species possible. The Discharger's May 2014 *Chronic Toxicity Screening Study*, supplemented by its July 2014 *Addendum to Effluent Chronic Toxicity Screening Study*, concluded that red abalone (*Haliotis rufescens*) was the most sensitive species. However, abalone is highly sensitive to zinc, a substance usually present in plant influent red abalone's...
No Observed Effect Level (NOEC) concentration of 32 ug/L. The Marin Municipal Water District, the water purveyor for the plant service area, uses zinc orthophosphate as a corrosion inhibitor, a practice over which the Discharger has no control. The Discharger removes about 70 percent of the zinc present in its influent, and Table F-7 demonstrates that there is no reasonable potential for effluent zinc to exceed the water quality objectives. Therefore, the Discharger will use *Mysisipis bahia*, the most sensitive test species not subject to zinc interference, for chronic toxicity monitoring.

4. **Receiving Water Monitoring.** The Discharger is required to continue participating in the RMP, which involves collecting data on pollutants and toxicity in San Francisco Bay water, sediment, and biota. This monitoring is necessary to characterize the receiving water and the effects of the discharges authorized in this Order. The Discharger is also required to monitor receiving waters at monitoring locations RSW-001 and RSW-002 to provide data necessary for reasonable potential analysis for ammonia and temperature. Monitoring location RSW-001 is the point where the highest un-ionized ammonia would be expected based on the Discharger’s *Receiving Water Ammonia Characterization Study – Final Report*, dated August 28, 2012. Monitoring location RSW-002 is upstream of both Discharge Points Nos. 001 and 002, and represents ambient Miller Creek conditions.

B. **Monitoring Requirements Summary.** The table below summarizes this Order’s monitoring requirements. This table is for informational purposes only. The actual requirements are specified in the MRP and elsewhere in this Order:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Influent INF-001</th>
<th>Effluent EFF-001</th>
<th>Effluent EFF-001B (Blending)</th>
<th>Sludge and Biosolids BIO-001</th>
<th>Receiving Water RSW-001 RSW-002</th>
</tr>
</thead>
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<td>Flow</td>
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<td>Continuous/D</td>
<td>Continuous/D</td>
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<td>Volume of partially treated wastewater</td>
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<td>1/Year</td>
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<td>1/Year</td>
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<td>1/Month</td>
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<td>Salinity</td>
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<td>Standard Observations</td>
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<tr>
<td>Metric tons/year</td>
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<td>1/Month</td>
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<tr>
<td>Paint filter test</td>
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<td>See Att. G section III.B.1</td>
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</tbody>
</table>

[1] Flow shall be monitored year round. For necessary discharges during the non-discharge season (June 1 to October 31), the Discharger shall monitor for flow, BOD₅, TSS, pH, chlorine residual, enterococcus bacteria, ammonia, and cyanide. Monitoring the other parameters is not required.

VIII. PUBLIC PARTICIPATION

The Regional Water Board considered the issuance of WDRs that will serve as an NPDES permit for the Facility. As a step in the WDR adoption process, Regional Water Board staff developed tentative WDRs and encouraged public participation in the WDR adoption process.

A. Notification of Interested Parties. The Regional Water Board notified the Discharger and interested agencies and persons of its intent to prescribe WDRs for the discharge and provided an opportunity to submit written comments and recommendations. Notification was provided through Marin Independent Journal. The public had access to the agenda and any changes in dates and locations through the Regional Water Board’s website at http://www.waterboards.ca.gov/sanfranciscobay.

B. Written Comments. Interested persons were invited to submit written comments concerning the tentative WDRs as explained through the notification process. Comments were due either in person or by mail at the Regional Water Board office at 1515 Clay Street, Suite 1400, Oakland, California 94612, to the attention of Marcia Liao.

For full staff response and Regional Water Board consideration, the written comments were due at the Regional Water Board office by 5:00 p.m. on March 9, 2015.

C. Public Hearing. The Regional Water Board held a public hearing on the tentative WDRs during its regular meeting at the following date and time, and at the following location:
Date: May 13, 2015  
Time: 9:00 a.m.  
Location: Elihu Harris State Office Building  
1515 Clay Street, 1st Floor Auditorium  
Oakland, CA 94612  

Contact: Marcia Liao, (510) 622-2377, Marcia.Liao@waterboards.ca.gov

Interested persons were invited to attend. At the public hearing, the Regional Water Board heard testimony pertinent to the discharge, WDRs, and permit. For accuracy of the record, important testimony was requested to be in writing.

Dates and venues change. The Regional Water Board web address is http://www.waterboards.ca.gov/sanfranciscobay, where one could access the current agenda for changes in dates and locations.

D. Reconsideration of Waste Discharge Requirements. Any aggrieved person may petition the State Water Board to review the Regional Water Board decision regarding the final WDRs. The State Water Board must receive the petition at the following address within 30 calendar days of the Regional Water Board action:

State Water Resources Control Board  
Office of Chief Counsel  
P.O. Box 100, 1001 I Street  
Sacramento, CA 95812-0100

For instructions on how to file a petition for review, see http://www.waterboards.ca.gov/public_notices/petitions/water_quality/wqpetition_instr.shtml.

E. Information and Copying. The Report of Waste Discharge, related supporting documents, and comments received are on file and may be inspected at the address above at any time between 9:00 a.m. and 5:00 p.m., Monday through Friday. Copying of documents may be arranged by calling (510) 622-2300.

F. Register of Interested Persons. Any person interested in being placed on the mailing list for information regarding the WDRs and NPDES permit should contact the Regional Water Board, reference the Facility, and provide a name, address, and phone number.

G. Additional Information. Requests for additional information or questions regarding this Order should be directed to Marcia Liao at (510) 622-2377 or Marcia.Liao@waterboards.ca.gov.
ATTACHMENT G
REGIONAL STANDARD PROVISIONS, AND MONITORING AND REPORTING REQUIREMENTS
(SUPPLEMENT TO ATTACHMENT D)

For

NPDES WASTEWATER DISCHARGE PERMITS

March 2010
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Attachment G
Regional Standard Provisions, and Monitoring and Reporting Requirements (March 2010)
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

REGIONAL STANDARD PROVISIONS, AND MONITORING AND REPORTING REQUIREMENTS
(SUPPLEMENT TO ATTACHMENT D)

FOR

NPDES WASTEWATER DISCHARGE PERMITS

APPLICABILITY

This document applies to dischargers covered by a National Pollutant Discharge Elimination System (NPDES) permit. This document does not apply to Municipal Separate Storm Sewer System (MS4) NPDES permits.

The purpose of this document is to supplement the requirements of Attachment D, Standard Provisions. The requirements in this supplemental document are designed to ensure permit compliance through preventative planning, monitoring, recordkeeping, and reporting. In addition, this document requires proper characterization of issues as they arise, and timely and full responses to problems encountered. To provide clarity on which sections of Attachment D this document supplements, this document is arranged in the same format as Attachment D.

I. STANDARD PROVISIONS - PERMIT COMPLIANCE

A. Duty to Comply – Not Supplemented

B. Need to Halt or Reduce Activity Not a Defense – Not Supplemented

C. Duty to Mitigate – This supplements I.C. of Standard Provisions (Attachment D)

1. Contingency Plan - The Discharger shall maintain a Contingency Plan as originally required by Regional Water Board Resolution 74-10 and as prudent in accordance with current municipal facility emergency planning. The Contingency Plan shall describe procedures to ensure that existing facilities remain in, or are rapidly returned to, operation in the event of a process failure or emergency incident, such as employee strike, strike by suppliers of chemicals or maintenance services, power outage, vandalism, earthquake, or fire. The Discharger may combine the Contingency Plan and Spill Prevention Plan into one document. Discharge in violation of the permit where the Discharger has failed to develop and implement a Contingency Plan as described below will be the basis for considering the discharge a willful and negligent violation of the permit pursuant to California Water Code Section 13387. The Contingency Plan shall, at a minimum, contain the provisions of a. through g. below.

a. Provision of personnel for continued operation and maintenance of sewerage facilities during employee strikes or strikes against contractors providing services.
b. Maintenance of adequate chemicals or other supplies and spare parts necessary for continued operations of sewerage facilities.

c. Provisions of emergency standby power.

d. Protection against vandalism.

e. Expedient action to repair failures of, or damage to, equipment and sewer lines.

f. Report of spills and discharges of untreated or inadequately treated wastes, including measures taken to clean up the effects of such discharges.

g. Programs for maintenance, replacement, and surveillance of physical condition of equipment, facilities, and sewer lines.

2. Spill Prevention Plan - The Discharger shall maintain a Spill Prevention Plan to prevent accidental discharges and minimize the effects of such events. The Spill Prevention Plan shall:

   a. Identify the possible sources of accidental discharge, untreated or partially treated waste bypass, and polluted drainage;

   b. Evaluate the effectiveness of present facilities and procedures, and state when they became operational; and

   c. Predict the effectiveness of the proposed facilities and procedures, and provide an implementation schedule containing interim and final dates when they will be constructed, implemented, or operational.

This Regional Water Board, after review of the Contingency and Spill Prevention Plans or their updated revisions, may establish conditions it deems necessary to control accidental discharges and to minimize the effects of such events. Such conditions may be incorporated as part of the permit upon notice to the Discharger.

D. Proper Operation & Maintenance – This supplements 1.D of Standard Provisions (Attachment D)

1. Operation and Maintenance (O&M) Manual - The Discharger shall maintain an O&M Manual to provide the plant and regulatory personnel with a source of information describing all equipment, recommended operational strategies, process control monitoring, and maintenance activities. To remain a useful and relevant document, the O&M Manual shall be kept updated to reflect significant changes in treatment facility equipment and operational practices. The O&M Manual shall be maintained in usable condition and be available for reference and use by all relevant personnel and Regional Water Board staff.

2. Wastewater Facilities Status Report - The Discharger shall regularly review, revise, or update, as necessary, its Wastewater Facilities Status Report. This report shall document how the Discharger operates and maintains its wastewater collection, treatment, and disposal facilities to ensure that all facilities are adequately staffed, supervised, financed, operated, maintained, repaired, and upgraded as necessary to provide adequate and reliable transport, treatment, and disposal of all wastewater from both existing and planned future wastewater sources under the Discharger's service responsibilities.
3. Proper Supervision and Operation of Publicly Owned Treatment Works (POTWs) - POTWs shall be supervised and operated by persons possessing certificates of appropriate grade pursuant to Division 4, Chapter 14, Title 23 of the California Code of Regulations.

E. Property Rights – Not Supplemented

F. Inspection and Entry – Not Supplemented

G. Bypass – Not Supplemented

H. Upset – Not Supplemented

I. Other – This section is an addition to Standard Provisions (Attachment D)

1. Neither the treatment nor the discharge of pollutants shall create pollution, contamination, or nuisance as defined by California Water Code Section 13050.

2. Collection, treatment, storage, and disposal systems shall be operated in a manner that precludes public contact with wastewater, except in cases where excluding the public is infeasible, such as private property. If public contact with wastewater could reasonably occur on public property, warning signs shall be posted.

3. If the Discharger submits a timely and complete Report of Waste Discharge for permit reissuance, this permit continues in force and effect until a new permit is issued or the Regional Water Board rescinds the permit.

J. Storm water – This section is an addition to Standard Provisions (Attachment D)

These provisions apply to facilities that do not direct all storm water flows from the facility to the wastewater treatment plant headworks.

1. Storm water Pollution Prevention Plan (SWPP Plan)

   The SWPP Plan shall be designed in accordance with good engineering practices and shall address the following objectives:

   a. To identify pollutant sources that may affect the quality of storm water discharges; and

   b. To identify, assign, and implement control measures and management practices to reduce pollutants in storm water discharges.

   The SWPP Plan may be combined with the existing Spill Prevention Plan as required in accordance with Section C.2. The SWPP Plan shall be retained on-site and made available upon request of a representative of the Regional Water Board.
2. Source Identification

The SWPP Plan shall provide a description of potential sources that may be expected to add significant quantities of pollutants to storm water discharges, or may result in non-storm water discharges from the facility. The SWPP Plan shall include, at a minimum, the following items:

a. A topographical map (or other acceptable map if a topographical map is unavailable), extending one-quarter mile beyond the property boundaries of the facility, showing the wastewater treatment facility process areas, surface water bodies (including springs and wells), and discharge point(s) where the facility’s storm water discharges to a municipal storm drain system or other points of discharge to waters of the State. The requirements of this paragraph may be included in the site map required under the following paragraph if appropriate.

b. A site map showing the following:
   1) Storm water conveyance, drainage, and discharge structures;
   2) An outline of the storm water drainage areas for each storm water discharge point;
   3) Paved areas and buildings;
   4) Areas of actual or potential pollutant contact with storm water or release to storm water, including but not limited to outdoor storage and process areas; material loading, unloading, and access areas; and waste treatment, storage, and disposal areas;
   5) Location of existing storm water structural control measures (i.e., berms, coverings, etc.);
   6) Surface water locations, including springs and wetlands; and
   7) Vehicle service areas.

c. A narrative description of the following:
   1) Wastewater treatment process activity areas;
   2) Materials, equipment, and vehicle management practices employed to minimize contact of significant materials of concern with storm water discharges;
   3) Material storage, loading, unloading, and access areas;
   4) Existing structural and non-structural control measures (if any) to reduce pollutants in storm water discharges; and
   5) Methods of on-site storage and disposal of significant materials.

d. A list of pollutants that have a reasonable potential to be present in storm water discharges in significant quantities.
3. Storm water Management Controls

The SWPP Plan shall describe the storm water management controls appropriate for the facility and a time schedule for fully implementing such controls. The appropriateness and priorities of controls in the SWPP Plan shall reflect identified potential sources of pollutants. The description of storm water management controls to be implemented shall include, as appropriate:

a. Storm water pollution prevention personnel

Identify specific individuals (and job titles) that are responsible for developing, implementing, and reviewing the SWPP Plan.

b. Good housekeeping

Good housekeeping requires the maintenance of clean, orderly facility areas that discharge storm water. Material handling areas shall be inspected and cleaned to reduce the potential for pollutants to enter the storm drain conveyance system.

c. Spill prevention and response

Identify areas where significant materials can spill into or otherwise enter storm water conveyance systems and their accompanying drainage points. Specific material handling procedures, storage requirements, and cleanup equipment and procedures shall be identified, as appropriate. The necessary equipment to implement a cleanup shall be available, and personnel shall be trained in proper response, containment, and cleanup of spills. Internal reporting procedures for spills of significant materials shall be established.

d. Source control

Source controls include, for example, elimination or reduction of the use of toxic pollutants, covering of pollutant source areas, sweeping of paved areas, containment of potential pollutants, labeling of all storm drain inlets with “No Dumping” signs, isolation or separation of industrial and non-industrial pollutant sources so that runoff from these areas does not mix, etc.

e. Storm water management practices

Storm water management practices are practices other than those that control the sources of pollutants. Such practices include treatment or conveyance structures, such as drop inlets, channels, retention and detention basins, treatment vaults, infiltration galleries, filters, oil/water separators, etc. Based on assessment of the potential of various sources to contribute pollutants to storm water discharges in significant quantities, additional storm water management practices to remove pollutants from storm water discharges shall be implemented and design criteria shall be described.

f. Sediment and erosion control

Measures to minimize erosion around the storm water drainage and discharge points, such as riprap, revegetation, slope stabilization, etc., shall be described.
g. Employee training

Employee training programs shall inform all personnel responsible for implementing the SWPP Plan. Training shall address spill response, good housekeeping, and material management practices. New employee and refresher training schedules shall be identified.

h. Inspections

All inspections shall be done by trained personnel. Material handling areas shall be inspected for evidence of, or the potential for, pollutants entering storm water discharges. A tracking or follow up procedure shall be used to ensure appropriate response has been taken in response to an inspection. Inspections and maintenance activities shall be documented and recorded. Inspection records shall be retained for five years.

i. Records

A tracking and follow-up procedure shall be described to ensure that adequate response and corrective actions have been taken in response to inspections.

4. Annual Verification of SWPP Plan

An annual facility inspection shall be conducted to verify that all elements of the SWPP Plan are accurate and up-to-date. The results of this review shall be reported in the Annual Report to the Regional Water Board described in Section V.C.f.

K. Biosolids Management – This section is an addition to Standard Provisions (Attachment D)

Biosolids must meet the following requirements prior to land application. The Discharger must either demonstrate compliance or, if it sends the biosolids to another party for further treatment or distribution, must give the recipient the information necessary to ensure compliance.

1. Exceptional quality biosolids meet the pollutant concentration limits in Table III of 40 CFR Part 503.13, Class A pathogen limits, and one of the vector attraction reduction requirements in 503.33(b)(1)-(b)(8). Such biosolids do not have to be tracked further for compliance with general requirements (503.12) and management practices (503.14).

2. Biosolids used for agricultural land, forest, or reclamation shall meet the pollutant limits in Table I (ceiling concentrations) and Table II or Table III (cumulative loadings or pollutant concentration limits) of 503.13. They shall also meet the general requirements (503.12) and management practices (503.14) (if not exceptional quality biosolids) for Class A or Class B pathogen levels with associated access restrictions (503.32) and one of the 10 vector attraction reduction requirements in 503.33(b)(1)-(b)(10).

3. Biosolids used for lawn or home gardens must meet exceptional quality biosolids limits.

4. Biosolids sold or given away in a bag or other container must meet the pollutant limits in either Table III or Table IV (pollutant concentration limits or annual pollutant loading rate limits) of 503.13. If Table IV is used, a label or information sheet must be attached to the biosolids packaging that explains Table IV (see 503.14). The biosolids must also meet the Class A pathogen limits and one of the vector attraction reduction requirements in 503.33(b)(1)-(b)(8).

II. STANDARD PROVISIONS – PERMIT ACTION – Not Supplemented
III. STANDARD PROVISIONS – MONITORING

A. Sampling and Analyses – This section is a supplement to III.A and III.B of Standard Provisions (Attachment D)

1. Use of Certified Laboratories

   Water and waste analyses shall be performed by a laboratory certified for these analyses in accordance with California Water Code Section 13176.

2. Use of Appropriate Minimum Levels

   Table C lists the suggested analytical methods for the 126 priority pollutants and other toxic pollutants that should be used, unless a particular method or minimum level (ML) is required in the MRP.

   For priority pollutant monitoring, when there is more than one ML value for a given substance, the Discharger may select any one of the analytical methods cited in Table C for compliance determination, or any other method described in 40 CFR part 136 or approved by U.S. EPA (such as the 1600 series) if authorized by the Regional Water Board. However, the ML must be below the effluent limitation and water quality objective. If no ML value is below the effluent limitation and water quality objective, then the method must achieve an ML no greater than the lowest ML value indicated in Table C. All monitoring instruments and equipment shall be properly calibrated and maintained to ensure accuracy of measurements.

3. Frequency of Monitoring

   The minimum schedule of sampling analysis is specified in the MRP portion of the permit.

   a. Timing of Sample Collection

      1) The Discharger shall collect samples of influent on varying days selected at random and shall not include any plant recirculation or other sidestream wastes, unless otherwise stipulated by the MRP.

      2) The Discharger shall collect samples of effluent on days coincident with influent sampling unless otherwise stipulated by the MRP or the Executive Officer. The Executive Officer may approve an alternative sampling plan if it is demonstrated to be representative of plant discharge flow and in compliance with all other permit requirements.

      3) The Discharger shall collect grab samples of effluent during periods of day-time maximum peak effluent flows (or peak flows through secondary treatment units for facilities that recycle effluent flows).

      4) Effluent sampling for conventional pollutants shall occur on at least one day of any multiple-day bioassay test the MRP requires. During the course of the test, on at least one day, the Discharger shall collect and retain samples of the discharge. In the event a bioassay test does
not comply with permit limits, the Discharger shall analyze these retained samples for pollutants that could be toxic to aquatic life and for which it has effluent limits.

i. The Discharger shall perform bioassay tests on final effluent samples; when chlorine is used for disinfection, bioassay tests shall be performed on effluent after chlorination-dechlorination; and

ii. The Discharger shall analyze for total ammonia nitrogen and calculate the amount of un-ionized ammonia whenever test results fail to meet the percent survival specified in the permit.

b. Conditions Triggering Accelerated Monitoring

1) If the results from two consecutive samples of a constituent monitored in a 30-day period exceed the monthly average limit for any parameter (or if the required sampling frequency is once per month and the monthly sample exceeds the monthly average limit), the Discharger shall, within 24 hours after the results are received, increase its sampling frequency to daily until the results from the additional sampling show that the parameter is in compliance with the monthly average limit.

2) If any maximum daily limit is exceeded, the Discharger shall increase its sampling frequency to daily within 24 hours after the results are received that indicate the exceedance of the maximum daily limit until two samples collected on consecutive days show compliance with the maximum daily limit.

3) If final or intermediate results of an acute bioassay test indicate a violation or threatened violation (e.g., the percentage of surviving test organisms of any single acute bioassay test is less than 70 percent), the Discharger shall initiate a new test as soon as practical, and the Discharger shall investigate the cause of the mortalities and report its findings in the next self monitoring report (SMR).

4) The Discharger shall calibrate chlorine residual analyzers against grab samples as frequently as necessary to maintain accurate control and reliable operation. If an effluent violation is detected, the Discharger shall collect grab samples at least every 30 minutes until compliance with the limit is achieved, unless the Discharger monitors chlorine residual continuously. In such cases, the Discharger shall continue to conduct continuous monitoring as required by its permit.

5) When a bypass occurs (except one subject to provision III.A.3.b.6 below), the Discharger shall monitor flows and collect samples on a daily basis for all constituents at affected discharge points that have effluent limits for the duration of the bypass (including acute toxicity using static renewals), except chronic toxicity, unless otherwise stipulated by the MRP.

6) Unless otherwise stipulated by the MRP, when a bypass approved pursuant to Attachment D, Standard Provisions, Sections I.G.2 or I.G.4, occurs, the Discharger shall monitor flows and, using appropriate procedures as specified in the MRP, collect and retain samples for affected discharge points on a daily basis for the duration of the bypass. The Discharger shall analyze for total suspended solids (TSS) using 24-hour composites (or more frequent increments) and for bacteria indicators with effluent limits using grab samples. If TSS exceeds 45 mg/L in any composite sample, the Discharger shall also analyze the retained samples for that discharge for all other constituents that have effluent limits, except oil and grease, mercury, dioxin-
TEQ, and acute and chronic toxicity. Additionally, at least once each year, the Discharger shall analyze the retained samples for one approved bypass discharge event for all other constituents that have effluent limits, except oil and grease, mercury, dioxin-TEQ, and acute and chronic toxicity. This monitoring shall be in addition to the minimum monitoring specified in the MRP.

c. Storm water Monitoring

The requirements of this section only apply to facilities that are not covered by an NPDES permit for storm water discharges and where not all site storm drainage from process areas (i.e., areas of the treatment facility where chemicals or wastewater could come in contact with storm water) is directed to the headworks. For storm water not directed to the headworks during the wet season (October 1 to April 30), the Discharger shall:

1) Conduct visual observations of the storm water discharge locations during daylight hours at least once per month during a storm event that produces significant storm water discharge to observe the presence of floating and suspended materials, oil and grease, discoloration, turbidity, and odor, etc.

2) Measure (or estimate) the total volume of storm water discharge, collect grab samples of storm water discharge from at least two storm events that produce significant storm water discharge, and analyze the samples for oil and grease, pH, TSS, and specific conductance.

The grab samples shall be taken during the first 30 minutes of the discharge. If collection of the grab samples during the first 30 minutes is impracticable, grab samples may be taken during the first hour of the discharge, and the Discharger shall explain in the Annual Report why the grab sample(s) could not be taken in the first 30 minutes.

3) Testing for the presence of non-storm water discharges shall be conducted no less than twice during the dry season (May 1 to September 30) at all storm water discharge locations. Tests may include visual observations of flows, stains, sludges, odors, and other abnormal conditions; dye tests; TV line surveys; or analysis and validation of accurate piping schematics. Records shall be maintained describing the method used, date of testing, locations observed, and test results.

4) Samples shall be collected from all locations where storm water is discharged. Samples shall represent the quality and quantity of storm water discharged from the facility. If a facility discharges storm water at multiple locations, the Discharger may sample a reduced number of locations if it establishes and documents through the monitoring program that storm water discharges from different locations are substantially identical.

5) Records of all storm water monitoring information and copies of all reports required by the permit shall be retained for a period of at least three years from the date of sample, observation, or report.

d. Receiving Water Monitoring

The requirements of this section only apply when the MRP requires receiving water sampling.
1) Receiving water samples shall be collected on days coincident with effluent sampling for conventional pollutants.

2) Receiving water samples shall be collected at each station on each sampling day during the period within one hour following low slack water. Where sampling during lower slack water is impractical, sampling shall be performed during higher slack water. Samples shall be collected within the discharge plume and down current of the discharge point so as to be representative, unless otherwise stipulated in the MRP.

3) Samples shall be collected within one foot of the surface of the receiving water, unless otherwise stipulated in the MRP.

**B. Biosolids Monitoring** – This section supplements III.B of Standard Provisions (Attachment D)

When biosolids are sent to a landfill, sent to a surface disposal site, or applied to land as a soil amendment, they must be monitored as follows:

1. **Biosolids Monitoring Frequency**

   Biosolids disposal must be monitored at the following frequency:

<table>
<thead>
<tr>
<th>Metric tons biosolids/365 days</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-290</td>
<td>Once per year</td>
</tr>
<tr>
<td>290-1500</td>
<td>Quarterly</td>
</tr>
<tr>
<td>1500-15,000</td>
<td>Six times per year</td>
</tr>
<tr>
<td>Over 15,000</td>
<td>Once per month</td>
</tr>
</tbody>
</table>

   (Metric tons are on a dry weight basis)

2. **Biosolids Pollutants to Monitor**

   Biosolids shall be monitored for the following constituents:

   - Land Application: Arsenic, cadmium, copper, mercury, molybdenum, nickel, lead, selenium, and zinc
   - Municipal Landfill: Paint filter test (pursuant to 40 CFR 258)
   - Biosolids-only Landfill or Surface Disposal Site (if no liner and leachate system): arsenic, chromium, and nickel

**C. Standard Observations** – This section is an addition to III of Standard Provisions (Attachment D)

1. **Receiving Water Observations**

   The requirements of this section only apply when the MRP requires standard observations of the receiving water. Standard observations shall include the following:
a. *Floating and suspended materials* (e.g., oil, grease, algae, and other macroscopic particulate matter): presence or absence, source, and size of affected area.

b. *Discoloration and turbidity*: description of color, source, and size of affected area.

c. *Odor*: presence or absence, characterization, source, distance of travel, and wind direction.

d. *Beneficial water use*: presence of water-associated waterfowl or wildlife, fisherpeople, and other recreational activities in the vicinity of each sampling station.

e. *Hydrographic condition*: time and height of corrected high and low tides (corrected to nearest National Oceanic and Atmospheric Administration location for the sampling date and time of sample collection).

f. *Weather conditions*:

1) Air temperature; and

2) Total precipitation during the five days prior to observation.

2. **Wastewater Effluent Observations**

The requirements of this section only apply when the MRP requires wastewater effluent standard observations. Standard observations shall include the following:

a. *Floating and suspended material of wastewater origin* (e.g., oil, grease, algae, and other macroscopic particulate matter): presence or absence.

b. *Odor*: presence or absence, characterization, source, distance of travel, and wind direction.

3. **Beach and Shoreline Observations**

The requirements of this section only apply when the MRP requires beach and shoreline standard observations. Standard observations shall include the following:

a. *Material of wastewater origin*: presence or absence, description of material, estimated size of affected area, and source.

b. *Beneficial use*: estimate number of people participating in recreational water contact, non-water contact, or fishing activities.

4. **Land Retention or Disposal Area Observations**

The requirements of this section only apply to facilities with on-site surface impoundments or disposal areas that are in use. This section applies to both liquid and solid wastes, whether confined or unconfined. The Discharger shall conduct the following for each impoundment:

a. Determine the amount of freeboard at the lowest point of dikes confining liquid wastes.

b. Report evidence of leaching liquid from area of confinement and estimated size of affected area. Show affected area on a sketch and volume of flow (e.g., gallons per minute [gpm]).
c. Regarding odor, describe presence or absence, characterization, source, distance of travel, and wind direction.

d. Estimate number of waterfowl and other water-associated birds in the disposal area and vicinity.

5. Periphery of Waste Treatment and/or Disposal Facilities Observations

The requirements of this section only apply when the MRP specifies periphery standard observations. Standard observations shall include the following:

a. Odor: presence or absence, characterization, source, and distance of travel.

b. Weather conditions: wind direction and estimated velocity.

IV. STANDARD PROVISIONS – RECORDS

A. Records to be Maintained – This supplements IV.A of Standard Provisions (Attachment D)

The Discharger shall maintain records in a manner and at a location (e.g., wastewater treatment plant or Discharger offices) such that the records are accessible to Regional Water Board staff. The minimum period of retention specified in Section IV, Records, of the Federal Standard Provisions shall be extended during the course of any unresolved litigation regarding the subject discharge, or when requested by the Regional Water Board or Regional Administrator of U.S. EPA, Region IX.

A copy of the permit shall be maintained at the discharge facility and be available at all times to operating personnel.

B. Records of monitoring information shall include – This supplements IV.B of Standard Provision (Attachment D)

1. Analytical Information

Records shall include analytical method detection limits, minimum levels, reporting levels, and related quantification parameters.

2. Flow Monitoring Data

For all required flow monitoring (e.g., influent and effluent flows), the additional records shall include the following, unless otherwise stipulated by the MRP:

a. Total volume for each day; and

b. Maximum, minimum, and average daily flows for each calendar month.
3. Wastewater Treatment Process Solids

a. For each treatment unit process that involves solids removal from the wastewater stream, records shall include the following:

1) Total volume or mass of solids removed from each collection unit (e.g., grit, skimmings, undigested biosolids, or combination) for each calendar month or other time period as appropriate, but not to exceed annually; and

2) Final disposition of such solids (e.g., landfill, other subsequent treatment unit).

b. For final dewatered biosolids from the treatment plant as a whole, records shall include the following:

1) Total volume or mass of dewatered biosolids for each calendar month;

2) Solids content of the dewatered biosolids; and

3) Final disposition of dewatered biosolids (disposal location and disposal method).

4. Disinfection Process

For the disinfection process, these additional records shall be maintained documenting process operation and performance:

a. For bacteriological analyses:

1) Wastewater flow rate at the time of sample collection; and

2) Required statistical parameters for cumulative bacterial values (e.g., moving median or geometric mean for the number of samples or sampling period identified in this Order).

b. For the chlorination process, when chlorine is used for disinfection, at least daily average values for the following:

1) Chlorine residual of treated wastewater as it enters the contact basin (mg/L);

2) Chlorine dosage (kg/day); and

3) Dechlorination chemical dosage (kg/day).

5. Treatment Process Bypasses

A chronological log of all treatment process bypasses, including wet weather blending, shall include the following:

a. Identification of the treatment process bypassed;

b. Dates and times of bypass beginning and end;

c. Total bypass duration;
d. Estimated total bypass volume; and

e. Description of, or reference to other reports describing, the bypass event, the cause, the corrective actions taken (except for wet weather blending that is in compliance with permit conditions), and any additional monitoring conducted.

6. Treatment Facility Overflows

This section applies to records for overflows at the treatment facility. This includes the headworks and all units and appurtenances downstream. The Discharger shall retain a chronological log of overflows at the treatment facility and records supporting the information provided in section V.E.2.

C. Claims of Confidentiality – Not Supplemented

V. STANDARD PROVISIONS – REPORTING

A. Duty to Provide Information – Not Supplemented

B. Signatory and Certification Requirements – Not Supplemented

C. Monitoring Reports – This section supplements V.C of Standard Provisions (Attachment D)

1. Self Monitoring Reports

For each reporting period established in the MRP, the Discharger shall submit an SMR to the Regional Water Board in accordance with the requirements listed in this document and at the frequency the MRP specifies. The purpose of the SMR is to document treatment performance, effluent quality, and compliance with the waste discharge requirements of this Order.

a. Transmittal letter

Each SMR shall be submitted with a transmittal letter. This letter shall include the following:

1) Identification of all violations of effluent limits or other waste discharge requirements found during the reporting period;

2) Details regarding violations: parameters, magnitude, test results, frequency, and dates;

3) Causes of violations;

4) Discussion of corrective actions taken or planned to resolve violations and prevent recurrences, and dates or time schedule of action implementation (if previous reports have been submitted that address corrective actions, reference to the earlier reports is satisfactory);

5) Data invalidation (Data should not be submitted in an SMR if it does not meet quality assurance/quality control standards. However, if the Discharger wishes to invalidate any measurement after it was submitted in an SMR, a letter shall identify the measurement suspected to be invalid and state the Discharger’s intent to submit, within 60 days, a formal request to invalidate the measurement. This request shall include the original measurement in question, the reason for invalidating the measurement, all relevant documentation that supports invalidation [e.g., laboratory sheet, log entry, test results, etc.], and discussion of the
corrective actions taken or planned [with a time schedule for completion] to prevent recurrence of the sampling or measurement problem.);

6) If the Discharger blends, the letter shall describe the duration of blending events and certify whether blended effluent was in compliance with the conditions for blending; and

7) Signature (The transmittal letter shall be signed according to Section V.B of this Order, Attachment D – Standard Provisions.).

b. Compliance evaluation summary

Each report shall include a compliance evaluation summary. This summary shall include each parameter for which the permit specifies effluent limits, the number of samples taken during the monitoring period, and the number of samples that exceed applicable effluent limits.

c. Results of analyses and observations

1) Tabulations of all required analyses and observations, including parameter, date, time, sample station, type of sample, test result, method detection limit, method minimum level, and method reporting level, if applicable, signed by the laboratory director or other responsible official.

2) When determining compliance with an average monthly effluent limitation and more than one sample result is available in a month, the Discharger shall compute the arithmetic mean unless the data set contains one or more reported determinations of detected but not quantified (DNQ) or nondetect (ND). In those cases, the Discharger shall compute the median in place of the arithmetic mean in accordance with the following procedure:

   i. The data set shall be ranked from low to high, reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.

   ii. The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

If a sample result, or the arithmetic mean or median of multiple sample results, is below the reporting limit, and there is evidence that the priority pollutant is present in the effluent above an effluent limitation and the Discharger conducts a Pollutant Minimization Program, the Discharger shall not be deemed out of compliance.

3) Dioxin-TEQ Reporting: The Discharger shall report for each dioxin and furan congener the analytical results of effluent monitoring, including the quantifiable limit (reporting level), the method detection limit, and the measured concentration. The Discharger shall report all measured values of individual congeners, including data qualifiers. When calculating dioxin-TEQ, the Discharger shall set congener concentrations below the minimum levels (ML) to zero. The Discharger shall calculate and report dioxin-TEQs using the following formula, where the MLs, toxicity equivalency factors (TEFs), and bioaccumulation equivalency factors (BEFs) are as provided in Table A:
Dioxin-TEQ = Σ (C_x x TEF_x x BEF_x)

where:  
C_x = measured or estimated concentration of congener x  
TEF_x = toxicity equivalency factor for congener x  
BEFx = bioaccumulation equivalency factor for congener x

### Table A
Minimum Levels, Toxicity Equivalency Factors, and Bioaccumulation Equivalency Factors

<table>
<thead>
<tr>
<th>Dioxin or Furan Congener</th>
<th>Minimum Level (pg/L)</th>
<th>1998 Toxicity Equivalency Factor (TEF)</th>
<th>Bioaccumulation Equivalency Factor (BEF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,3,7,8-TCDD</td>
<td>10</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>1,2,3,7,8-PeCDD</td>
<td>50</td>
<td>1.0</td>
<td>0.9</td>
</tr>
<tr>
<td>1,2,3,4,7,8-HxCDD</td>
<td>50</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>1,2,3,6,7,8-HxCDD</td>
<td>50</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>1,2,3,7,8,9-HxCDD</td>
<td>50</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>1,2,3,4,6,7,8-HpCDD</td>
<td>50</td>
<td>0.01</td>
<td>0.05</td>
</tr>
<tr>
<td>OCDD</td>
<td>100</td>
<td>0.0001</td>
<td>0.01</td>
</tr>
<tr>
<td>2,3,7,8-TCDF</td>
<td>10</td>
<td>0.1</td>
<td>0.8</td>
</tr>
<tr>
<td>1,2,3,7,8-PeCDF</td>
<td>50</td>
<td>0.05</td>
<td>0.2</td>
</tr>
<tr>
<td>2,3,4,7,8-PeCDF</td>
<td>50</td>
<td>0.5</td>
<td>1.6</td>
</tr>
<tr>
<td>1,2,3,4,7,8-HxCDF</td>
<td>50</td>
<td>0.1</td>
<td>0.08</td>
</tr>
<tr>
<td>1,2,3,6,7,8-HxCDF</td>
<td>50</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>1,2,3,7,8,9-HxCDF</td>
<td>50</td>
<td>0.1</td>
<td>0.6</td>
</tr>
<tr>
<td>2,3,4,6,7,8-HxCDF</td>
<td>50</td>
<td>0.1</td>
<td>0.7</td>
</tr>
<tr>
<td>1,2,3,4,6,7,8-HpCDF</td>
<td>50</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>1,2,3,4,7,8,9-HpCDF</td>
<td>50</td>
<td>0.01</td>
<td>0.4</td>
</tr>
<tr>
<td>OCDF</td>
<td>100</td>
<td>0.0001</td>
<td>0.02</td>
</tr>
</tbody>
</table>

d. Data reporting for results not yet available

The Discharger shall make all reasonable efforts to obtain analytical data for required parameter sampling in a timely manner. Certain analyses require additional time to complete analytical processes and report results. For cases where required monitoring parameters require additional time to complete analytical processes and reports, and results are not available in time to be included in the SMR for the subject monitoring period, the Discharger shall describe such circumstances in the SMR and include the data for these parameters and relevant discussions of any observed exceedances in the next SMR due after the results are available.
e. Flow data

The Discharger shall provide flow data tabulation pursuant to Section IV.B.2.

f. Annual self monitoring report requirements

By the date specified in the MRP, the Discharger shall submit an annual report to the Regional Water Board covering the previous calendar year. The report shall contain the following:

1) Annual compliance summary table of treatment plant performance, including documentation of any blending events;

2) Comprehensive discussion of treatment plant performance and compliance with the permit (This discussion shall include any corrective actions taken or planned, such as changes to facility equipment or operation practices that may be needed to achieve compliance, and any other actions taken or planned that are intended to improve performance and reliability of the Discharger’s wastewater collection, treatment, or disposal practices.);

3) Both tabular and graphical summaries of the monitoring data for the previous year if parameters are monitored at a frequency of monthly or greater;

4) List of approved analyses, including the following:

   (i) List of analyses for which the Discharger is certified;

   (ii) List of analyses performed for the Discharger by a separate certified laboratory (copies of reports signed by the laboratory director of that laboratory shall not be submitted but be retained onsite); and

   (iii) List of “waived” analyses, as approved;

5) Plan view drawing or map showing the Discharger’s facility, flow routing, and sampling and observation station locations;

6) Results of annual facility inspection to verify that all elements of the SWPP Plan are accurate and up to date (only required if the Discharger does not route all storm water to the headworks of its wastewater treatment plant); and

7) Results of facility report reviews (The Discharger shall regularly review, revise, and update, as necessary, the O&M Manual, the Contingency Plan, the Spill Prevention Plan, and Wastewater Facilities Status Report so that these documents remain useful and relevant to current practices. At a minimum, reviews shall be conducted annually. The Discharger shall include, in each Annual Report, a description or summary of review and evaluation procedures, recommended or planned actions, and an estimated time schedule for implementing these actions. The Discharger shall complete changes to these documents to ensure they are up-to-date.).

g. Report submittal

The Discharger shall submit SMRs to:

California Regional Water Quality Control Board
San Francisco Bay Region  
1515 Clay Street, Suite 1400  
Oakland, CA 94612  
Attn: NPDES Wastewater Division

h. Reporting data in electronic format

The Discharger has the option to submit all monitoring results in an electronic reporting format approved by the Executive Officer. If the Discharger chooses to submit SMRs electronically, the following shall apply:

1) **Reporting Method:** The Discharger shall submit SMRs electronically via a process approved by the Executive Officer (see, for example, the letter dated December 17, 1999, “Official Implementation of Electronic Reporting System [ERS]” and the progress report letter dated December 17, 2000).

2) **Monthly or Quarterly Reporting Requirements:** For each reporting period (monthly or quarterly as specified in the MRP), the Discharger shall submit an electronic SMR to the Regional Water Board in accordance with the provisions of Section V.C.1.a-c, except for requirements under Section V.C.1.c(1) where ERS does not have fields for dischargers to input certain information (e.g., sample time). However, until U.S. EPA approves the electronic signature or other signature technologies, Dischargers that use ERS shall submit a hard copy of the original transmittal letter, an ERS printout of the data sheet, and a violation report (a receipt of the electronic transmittal shall be retained by the Discharger). This electronic SMR submittal suffices for the signed tabulations specified under Section V.C.1.c(1).

3) **Annual Reporting Requirements:** Dischargers who have submitted data using the ERS for at least one calendar year are exempt from submitting the portion of the annual report required under Section V.C.1.f(1) and (3).

D. Compliance Schedules – Not supplemented

E. Twenty-Four Hour Reporting – This section supplements V.E of Standard Provision (Attachment D)

1. Spill of Oil or Other Hazardous Material Reports

   a. Within 24 hours of becoming aware of a spill of oil or other hazardous material that is not contained onsite and completely cleaned up, the Discharger shall report by telephone to the Regional Water Board at (510) 622-2369.

   b. The Discharger shall also report such spills to the State Office of Emergency Services [telephone (800) 852-7550] only when the spills are in accordance with applicable reporting quantities for hazardous materials.

   c. The Discharger shall submit a written report to the Regional Water Board within five working days following telephone notification unless directed otherwise by Regional Water Board staff. A report submitted electronically is acceptable. The written report shall include the following:

      1) Date and time of spill, and duration if known;
2) Location of spill (street address or description of location);

3) Nature of material spilled;

4) Quantity of material involved;

5) Receiving water body affected, if any;

6) Cause of spill;

7) Estimated size of affected area;

8) Observed impacts to receiving waters (e.g., oil sheen, fish kill, water discoloration);

9) Corrective actions taken to contain, minimize, or clean up the spill;

10) Future corrective actions planned to be taken to prevent recurrence, and schedule of implementation; and

11) Persons or agencies notified.

2. Unauthorized Discharges from Municipal Wastewater Treatment Plants

The following requirements apply to municipal wastewater treatment plants that experience an unauthorized discharge at their treatment facilities and are consistent with and supersede requirements imposed on the Discharger by the Executive Officer by letter of May 1, 2008, issued pursuant to California Water Code Section 13383.

a. Two (2)-Hour Notification

For any unauthorized discharges that result in a discharge to a drainage channel or a surface water, the Discharger shall, as soon as possible, but not later than two (2) hours after becoming aware of the discharge, notify the State Office of Emergency Services (telephone 800-852-7550), the local health officers or directors of environmental health with jurisdiction over the affected water bodies, and the Regional Water Board. The notification to the Regional Water Board shall be via the Regional Water Board’s online reporting system at www.wbers.net, and shall include the following:

1) Incident description and cause;

2) Location of threatened or involved waterway(s) or storm drains;

3) Date and time the unauthorized discharge started;

4) Estimated quantity and duration of the unauthorized discharge (to the extent known), and the estimated amount recovered;

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California Code of Regulations, Title 23, Section 2250(b), defines an unauthorized discharge to be a discharge, not regulated by waste discharge requirements, of treated, partially treated, or untreated wastewater resulting from the intentional or unintentional diversion of wastewater from a collection, treatment or disposal system.
5) Level of treatment prior to discharge (e.g., raw wastewater, primary treated, undisinfected secondary treated, and so on); and

6) Identity of the person reporting the unauthorized discharge.

b. 24-hour Certification

Within 24 hours, the Discharger shall certify to the Regional Water Board, at www.wbers.net, that the State Office of Emergency Services and the local health officers or directors of environmental health with jurisdiction over the affected water bodies have been notified of the unauthorized discharge.

c. 5-Day Written Report

Within five business days, the Discharger shall submit a written report, via the Regional Water Board’s online reporting system at www.wbers.net, that includes, in addition to the information required above, the following:

1) Methods used to delineate the geographical extent of the unauthorized discharge within receiving waters;

2) Efforts implemented to minimize public exposure to the unauthorized discharge;

3) Visual observations of the impacts (if any) noted in the receiving waters (e.g., fish kill, discoloration of water) and the extent of sampling if conducted;

4) Corrective measures taken to minimize the impact of the unauthorized discharge;

5) Measures to be taken to minimize the chances of a similar unauthorized discharge occurring in the future;

6) Summary of Spill Prevention Plan or O&M Manual modifications to be made, if necessary, to minimize the chances of future unauthorized discharges; and

7) Quantity and duration of the unauthorized discharge, and the amount recovered.

d. Communication Protocol

To clarify the multiple levels of notification, certification, and reporting, the current communication requirements for unauthorized discharges from municipal wastewater treatment plants are summarized in Table B that follows.
# Table B
Summary of Communication Requirements for Unauthorized Discharges\(^1\) from Municipal Wastewater Treatment Plants

<table>
<thead>
<tr>
<th>Discharger is required to:</th>
<th>Agency Receiving Information</th>
<th>Time frame</th>
<th>Method for Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Notify</td>
<td>California Emergency Management Agency (Cal EMA)</td>
<td>As soon as possible, but not later than 2 hours after becoming aware of the unauthorized discharge.</td>
<td>Telephone – (800) 852-7550 (obtain a control number from Cal EMA)</td>
</tr>
<tr>
<td></td>
<td>Local health department</td>
<td>As soon as possible, but not later than 2 hours after becoming aware of the unauthorized discharge.</td>
<td>Depends on local health department</td>
</tr>
<tr>
<td></td>
<td>Regional Water Board</td>
<td>As soon as possible, but not later than 2 hours after becoming aware of the unauthorized discharge.</td>
<td>Electronic(^2) <a href="http://www.wbers.net">www.wbers.net</a></td>
</tr>
<tr>
<td>2. Certify</td>
<td>Regional Water Board</td>
<td>As soon as possible, but not later than 24 hours after becoming aware of the unauthorized discharge.</td>
<td>Electronic(^3) <a href="http://www.wbers.net">www.wbers.net</a></td>
</tr>
<tr>
<td>3. Report</td>
<td>Regional Water Board</td>
<td>Within 5 business days of becoming aware of the unauthorized discharge.</td>
<td>Electronic(^4) <a href="http://www.wbers.net">www.wbers.net</a></td>
</tr>
</tbody>
</table>

---

\(^1\) California Code of Regulations, Title 23, Section 2250(b), defines an unauthorized discharge to be a discharge, not regulated by waste discharge requirements, of treated, partially treated, or untreated wastewater resulting from the intentional or unintentional diversion of wastewater from a collection, treatment or disposal system.

\(^2\) In the event that the Discharger is unable to provide online notification within 2 hours of becoming aware of an unauthorized discharge, it shall phone the Regional Water Board’s spill hotline at (510) 622-2369 and convey the same information contained in the notification form. In addition, within 3 business days of becoming aware of the unauthorized discharge, the Discharger shall enter the notification information into the Regional Water Board’s online system in electronic format.

\(^3\) In most instances, the 2-hour notification will also satisfy 24-hour certification requirements. This is because the notification form includes fields for documenting that OES and the local health department have been contacted. In other words, if the Discharger is able to complete all the fields in the notification form within 2 hours, certification requirements are also satisfied. In the event that the Discharger is unable to provide online certification within 24 hours of becoming aware of an unauthorized discharge, it shall phone the Regional Water Board’s spill hotline at (510) 622-2369 and convey the same information contained in the certification form. In addition, within 3 business days of becoming aware of the unauthorized discharge, the Discharger shall enter the certification information into the Regional Water Board’s online system in electronic format.

\(^4\) If the Discharger cannot satisfy the 5-day reporting requirements via the Regional Water Board’s online reporting system, it shall submit a written report (preferably electronically in pdf) to the appropriate Regional Water Board case manager. In cases where the Discharger cannot satisfy the 5-day reporting requirements via the online reporting system, it must still complete the Regional Water Board’s online reporting requirements within 15 calendar days of becoming aware of the unauthorized discharge.
F. Planned Changes – Not supplemented

G. Anticipated Noncompliance – Not supplemented

H. Other Noncompliance – Not supplemented

I. Other Information – Not supplemented

VI. STANDARD PROVISION – ENFORCEMENT – Not Supplemented

VII. ADDITIONAL PROVISIONS – NOTIFICATION LEVELS – Not Supplemented

VIII. DEFINITIONS – This section is an addition to Standard Provisions (Attachment D)

More definitions can be found in Attachment A of this NPDES Permit.

1. Arithmetic Calculations

   a. Geometric mean is the antilog of the log mean or the back-transformed mean of the logarithmically transformed variables, which is equivalent to the multiplication of the antilogarithms. The geometric mean can be calculated with either of the following equations:

   \[
   \text{Geometric Mean} = \text{Anti} \log \left( \frac{1}{N} \sum_{i=1}^{N} \log(C_i) \right)
   \]

   or

   \[\text{Geometric Mean} = (C_1 \times C_2 \times \ldots \times C_N)^{1/N}\]

   Where "N" is the number of data points for the period analyzed and "C" is the concentration for each of the "N" data points.

   b. Mass emission rate is obtained from the following calculation for any calendar day:

   \[
   \text{Mass emission rate (lb/day)} = \frac{8.345}{N} \sum_{i=1}^{N} Q_i C_i
   \]

   \[
   \text{Mass emission rate (kg/day)} = \frac{3.785}{N} \sum_{i=1}^{N} Q_i C_i
   \]

   In which "N" is the number of samples analyzed in any calendar day and "Q_i" and "C_i" are the flow rate (MGD) and the constituent concentration (mg/L) associated with each of the "N" grab samples that may be taken in any calendar day. If a composite sample is taken, "C_i" is the concentration measured in the composite sample and "Q_i" is the average flow rate occurring during the period over which the samples are composited. The daily concentration of a constituent measured over any calendar day shall be determined from the flow-weighted average of the same constituent in the combined waste streams as follows:
Cd = Average daily concentration = \frac{1}{Q_t} \sum_{i=1}^{N} Q_i C_i

In which “N” is the number of component waste streams and “Q” and “C” are the flow rate (MGD) and the constituent concentration (mg/L) associated with each of the “N” waste streams. “Q_t” is the total flow rate of the combined waste streams.

c. **Maximum allowable mass emission rate**, whether for a 24-hour, weekly 7-day, monthly 30-day, or 6-month period, is a limitation expressed as a daily rate determined with the formulas in the paragraph above, using the effluent concentration limit specified in the permit for the period and the specified allowable flow.

d. **POTW removal efficiency** is the ratio of pollutants removed by the treatment facilities to pollutants entering the treatment facilities (expressed as a percentage). The Discharger shall determine removal efficiencies using monthly averages (by calendar month unless otherwise specified) of pollutant concentration of influent and effluent samples collected at about the same time and using the following equation (or its equivalent):

\[
\text{Removal Efficiency (\%) = 100 \times [1-(\text{Effluent Concentration/Influent Concentration})]}
\]

2. **Biosolids** means the solids, semi-liquid suspensions of solids, residues, screenings, grit, scum, and precipitates separated from or created in wastewater by the unit processes of a treatment system. It also includes, but is not limited to, all supernatant, filtrate, centrate, decantate, and thickener overflow and underflow in the solids handling parts of the wastewater treatment system.

3. **Blending** is the practice of recombining wastewater that has been biologically treated with wastewater that has bypassed around biological treatment units.

4. **Bottom sediment sample** is (1) a separate grab sample taken at each sampling station for the determination of selected physical-chemical parameters, or (2) four grab samples collected from different locations in the immediate vicinity of a sampling station while the boat is anchored and analyzed separately for macroinvertebrates.

5. **Composite sample** is a sample composed of individual grab samples collected manually or by an automatic sampling device on the basis of time or flow as specified in the MRP. For flow-based composites, the proportion of each grab sample included in the composite sample shall be within plus or minus five percent (+/-5%) of the representative flow rate of the waste stream being measured at the time of grab sample collection. Alternatively, equal volume grab samples may be individually analyzed with the flow-weighted average calculated by averaging flow-weighted ratios of each grab sample analytical result. Grab samples comprising time-based composite samples shall be collected at intervals not greater than those specified in the MRP. The quantity of each grab sample comprising a time-based composite sample shall be a set of flow proportional volumes as specified in the MRP. If a particular time-based or flow-based composite sampling protocol is not specified in the MRP, the Discharger shall determine and implement the most representative sampling protocol for the given parameter subject to Executive Officer approval.

6. **Depth-integrated sample** is defined as a water or waste sample collected by allowing a sampling device to fill during a vertical traverse in the waste or receiving water body being sampled. The Discharger shall collect depth-integrated samples in such a manner that the collected sample will be representative of the waste or water body at that sampling point.
7. **Flow sample** is an accurate measurement of the average daily flow volume using a properly calibrated and maintained flow measuring device.

8. **Grab sample** is an individual sample collected in a short period of time not exceeding 15 minutes. Grab samples represent only the condition that exists at the time the wastewater is collected.

9. **Initial dilution** is the process that results in the rapid and irreversible turbulent mixing of wastewater with receiving water around the point of discharge.

10. **Overflow** is the intentional or unintentional spilling or forcing out of untreated or partially treated wastes from a transport system (e.g., through manholes, at pump stations, and at collection points) upstream from the treatment plant headworks or from any part of a treatment plant facility.

11. **Priority pollutants** are those constituents referred to in 40 CFR Part 122 as promulgated in the Federal Register, Vol. 65, No. 97, Thursday, May 18, 2000, also known as the California Toxics Rule, the presence or discharge of which could reasonably be expected to interfere with maintaining designated uses.

12. **Storm water** means storm water runoff, snow melt runoff, and surface runoff and drainage. It excludes infiltration and runoff from agricultural land.

13. **Toxic pollutant** means any pollutant listed as toxic under federal Clean Water Act section 307(a)(1) or under 40 CFR 401.15.

14. **Untreated waste** is raw wastewater.

15. **Waste, waste discharge, discharge of waste, and discharge** are used interchangeably in the permit. The requirements of the permit apply to the entire volume of water, and the material therein, that is disposed of to surface and ground waters of the State of California.
### Table C
List of Monitoring Parameters and Analytical Methods

<table>
<thead>
<tr>
<th>CTR No.</th>
<th>Pollutant/Parameter</th>
<th>Analytical Method $^1$</th>
<th>Minimum Levels $^2$ (µg/l)</th>
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<td>GCMS</td>
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<tr>
<td>5b.</td>
<td>Chromium (VI)</td>
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<td>Mercury</td>
<td>1631 (note) $^4$</td>
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<td>Selenium</td>
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<tr>
<td></td>
<td></td>
<td>or C</td>
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</tr>
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<td>16.</td>
<td>2,3,7,8-TCDD and 17 congeners (Dioxin)</td>
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1. The suggested method is the U.S. EPA Method unless otherwise specified (SM = Standard Methods). The Discharger may use another U.S. EPA-approved or recognized method if that method has a level of quantification below the applicable water quality objective. Where no method is suggested, the Discharger has the discretion to use any standard method.

2. Minimum levels are from the State Implementation Policy. They are the concentration of the lowest calibration standard for that technique based on a survey of contract laboratories. Laboratory techniques are defined as follows: GC = Gas Chromatography; GCMS = Gas Chromatography/Mass Spectrometry; LC = High Pressure Liquid Chromatography; Color = Colorimetric; FAA = Flame Atomic Absorption; GFAA = Graphite Furnace Atomic Absorption; ICP = Inductively Coupled Plasma; ICPMS = Inductively Coupled Plasma/Mass Spectrometry; SPGFAA = Stabilized Platform Graphite Furnace Atomic Absorption (i.e., U.S. EPA 200.9); Hydride = Gaseous Hydride Atomic Absorption; CVAA = Cold Vapor Atomic Absorption; DCP = Direct Current Plasma.

3. Analysis for total chromium may be substituted for analysis of chromium (III) and chromium (VI) if the concentration measured is below the lowest hexavalent chromium criterion (11 µg/l).

4. The Discharger shall use ultra-clean sampling (U.S. EPA Method 1669) and ultra-clean analytical methods (U.S. EPA Method 1631) for mercury monitoring. The minimum level for mercury is 2 ng/l (or 0.002 µg/l).

5. MUN = Municipal and Domestic Supply. This designation, if applicable, is in the Findings of the permit.


Attachment G
Regional Standard Provisions, and Monitoring and Reporting Requirements (March 2010)
<table>
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<tr>
<th>CTR No.</th>
<th>Pollutant/Parameter</th>
<th>Analytical Method</th>
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<th>GCMS</th>
<th>LC</th>
<th>Color</th>
<th>FAA</th>
<th>GFAA</th>
<th>ICP</th>
<th>ICP MS</th>
<th>SPGFAA</th>
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7 Measurement for 1,2-Diphenyldiazine may use azobenzene as a screen: if azobenzene is measured at >1 ug/l, then the Discharger shall analyze for 1,2-Diphenyldiazine.
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PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Engineer's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Engineer. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

D. All work specified herein shall conform to or exceed the requirements of the referenced specifications, codes and standards to the extent that the provisions of such documents are not in conflict with the requirements of these Specifications.

E. References herein to "Building Code" shall mean the California Building Code (CBC) of the International Code Council (ICC). The 2016 edition of the code, as approved and adopted by the agency having jurisdiction, including all addenda, modifications, amendments or other lawful changes thereto, shall apply to the Work.

F. In case of conflict between codes, reference standards, drawings and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or labor. The Contractor shall bid the most stringent requirements.

G. Applicable Standard Specifications: The Contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards and specifications listed herein.

H. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

AA \hspace{1cm} Aluminum Association
AAMA \hspace{1cm} American Architectural Manufacturers Association
AASHTO \hspace{1cm} American Association of State Highway and Transportation Officials
ACI \hspace{1cm} American Concrete Institute (Formerly: ACI International)
ACPA \hspace{1cm} American Concrete Pipe Association
AGA \hspace{1cm} American Gas Association
AGC \hspace{1cm} Associated General Contractors
AHRI \hspace{1cm} Air-Conditioning, Heating, and Refrigeration Institute (The)
AI \hspace{1cm} Asphalt Institute
AIA \hspace{1cm} American Institute of Architects (The)
AISC \hspace{1cm} American Institute of Steel Construction
AISI \hspace{1cm} American Iron and Steel Institute
AITC \hspace{1cm} American Institute of Timber Construction
AMCA \hspace{1cm} Air Movement and Control Association International, Inc.
ANSI \hspace{1cm} American National Standards Institute
APA \hspace{1cm} APA - The Engineered Wood Association
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>APA</td>
<td>Architectural Precast Association</td>
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<tr>
<td>API</td>
<td>American Petroleum Institute</td>
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<td>APWA</td>
<td>American Public Works Association</td>
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<td>ASA</td>
<td>Acoustical Society of America</td>
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<td>ASAE</td>
<td>American Society of Agriculture Engineer</td>
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<td>ASCE</td>
<td>American Society of Civil Engineers</td>
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<tr>
<td>ASCE/SEI</td>
<td>American Society of Civil Engineers/Structural Engineering Institute (See ASCE)</td>
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<tr>
<td>ASHRAE</td>
<td>American Society of Heating, Refrigerating and Air-Conditioning Engineers</td>
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<td>ASLE</td>
<td>American Society of Lubricating Engineers</td>
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<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
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<td>ASQC</td>
<td>American Society for Quality Control</td>
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<td>ASSE</td>
<td>American Society of Safety Engineers (The)</td>
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<td>ASSE</td>
<td>American Society of Sanitary Engineering</td>
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<td>ASTM</td>
<td>American Society for Testing and Materials International</td>
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<td>ATIS</td>
<td>Alliance for Telecommunications Industry Solutions</td>
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<td>AWWA</td>
<td>American Water Works Association</td>
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<td>BHMA</td>
<td>Builders Hardware Manufacturers Association</td>
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<td>BIA</td>
<td>Brick Industry Association (The)</td>
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<td>BOCA</td>
<td>BOCA (Building Officials and Code Administrators International Inc.)</td>
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<tr>
<td>CDA</td>
<td>Copper Development Association</td>
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<td>CGA</td>
<td>Compressed Gas Association</td>
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<td>CLFMI</td>
<td>Chain Link Fence Manufacturers Institute</td>
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<td>CMA</td>
<td>Concrete Masonry Association</td>
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<td>CPA</td>
<td>Composite Panel Association</td>
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<td>CRSI</td>
<td>Concrete Reinforcing Steel Institute</td>
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<tr>
<td>DASMA</td>
<td>Door and Access Systems Manufacturers Association</td>
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<td>DHI</td>
<td>Door and Hardware Institute</td>
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<td>ETL</td>
<td>Electrical Test Laboratories</td>
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<td>GA</td>
<td>Gypsum Association</td>
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<td>GANA</td>
<td>Glass Association of North America</td>
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<td>HI</td>
<td>Hydraulic Institute</td>
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<td>HMMA</td>
<td>Hollow Metal Manufacturers Association (See NAAMM)</td>
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<td>HPVA</td>
<td>Hardwood Plywood &amp; Veneer Association</td>
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<td>ICBO</td>
<td>International Conference of Building Officials (See ICC)</td>
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<td>ICC</td>
<td>International Code Council</td>
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<td>ICEA</td>
<td>Insulated Cable Engineers Association, Inc.</td>
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<td>ICPEA</td>
<td>International Cast Polymer Alliance</td>
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<td>ICRI</td>
<td>International Concrete Repair Institute, Inc.</td>
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<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers, Inc. (The)</td>
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<td>IES</td>
<td>Illuminating Engineering Society</td>
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<td>IPC</td>
<td>Institute of Printed Circuits</td>
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<td>IPCEA</td>
<td>Insulated Power Cable Engineers Association</td>
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<td>ISA</td>
<td>International Society of Automation</td>
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<td>ISO</td>
<td>International Organization for Standardization</td>
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<td>LPI</td>
<td>Lightning Protection Institute</td>
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<tr>
<td>MBMA</td>
<td>Metal Building Manufacturers Association</td>
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<td>MCA</td>
<td>Metal Construction Association</td>
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<tr>
<td>MHIA</td>
<td>Material Handling Industry of America</td>
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MPI  Master Painters Institute
MSS  Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM  National Association of Architectural Metal Manufacturers
NACE  NACE International (National Association of Corrosion Engineers International)
NAIMA  North American Insulation Manufacturers Association
NBS  National Bureau of Standards
NCMA  National Concrete Masonry Association
NEC  National Electrical Code
NECA  National Electrical Contractors Association
NEMA  National Electrical Manufacturers Association
NFPA  NFPA (National Fire Protection Association)
NFPA  National Forest Products Association
NFRC  National Fenestration Rating Council
NHLA  National Hardwood Lumber Association
NLGI  National Lubricating Grease Institute
NRCA  National Roofing Contractors Association
NRMCA  National Ready Mixed Concrete Association
NSF  NSF International (National Sanitation Foundation International)
NSPE  National Society of Professional Engineers
NSSGA  National Stone, Sand & Gravel Association
OSHA  Occupational Safety and Health Administration
PCA  Portland Cement Association
PCI  Precast/Prestressed Concrete Institute
PDI  Plumbing & Drainage Institute
SDI  Steel Door Institute
SEI/ASCE  Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
SJI  Steel Joist Institute
SMA  Screen Manufacturers Association
SMACNA  Sheet Metal and Air Conditioning Contractors' National Association
SPFA  Spray Polyurethane Foam Alliance
SPRI  Single Ply Roofing Industry
SSPC  Society for Protective Coatings
SSPC  Steel Structures Painting Council
SSPWC  Standard Specifications for Public Works Construction
SWPA  Submersible Wastewater Pump Association
UBC  Uniform Building Code (See ICC)
UL  Underwriters Laboratories Inc.
WASTEC  Waste Equipment Technology Association
WCRI  Western Concrete Reinforcing Steel Institute
WDMA  Window & Door Manufacturers Association
WRI  Wire Reinforcement Institute, Inc.
WWPA  Western Wood Products Association

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.
1. DIN- Deutsches Institut fur Normung e. V.; www.din.de.
2. IAPMO – International Association of Plumbing and Mechanical Officials; www.iapmo.org.
D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. COE - Army Corps of Engineers; www.usace.army.mil.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.

END OF SECTION 014200
SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

   1. Section 011000 "Summary of Work" for work restrictions and limitations on utility interruptions.

   2. Requirements given in the General Conditions.

1.2 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Engineer, occupants of Project, testing agencies, and authorities having jurisdiction.

1.3 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel. Coordinate location with the Owner.

B. Erosion- and Sedimentation-Control Plan for projects disturbing more than 1 acre: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts.

B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts, with 1-5/8-inch OD top and bottom rails. Provide galvanized-steel bases for supporting posts.

C. Wood Enclosure Fence: Plywood, 6 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Contractor's Field Office: Of sufficient size to accommodate needs of Owner, Engineer, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly.

C. Inspector’s Field Office: Provided by the contractor in accordance with Article 44 of General Conditions.

D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

E. Final location of Contractor’s temporary facilities shall be coordinated with the Owner to ensure that access critical to plant operations is maintained at all times.
2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures. The Contractor shall provide fire extinguishers and other fire protection equipment to adequately protect new and existing facilities and temporary facilities against damage by fire. Hose connections and hose, water casks, chemical equipment or other sufficient means shall be provided for fighting fires in the new, existing and temporary structures and other portions of the Work and responsible persons shall be designated and instructed in the operation of such fire apparatus so as to prevent or minimize the hazard of fire. The Contractor's fire protection program shall conform to the requirements of the OSHA Standards for Construction. The Contractor shall employ every reasonable means to prevent the hazard of fire.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostat control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary of Work."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

1. The Contractor shall provide an adequate supply of water of a quality suitable for all domestic and construction purposes.

2. Non-Potable water (plant effluent water) may be used for grading and hydraulic structures and pipeline testing as approved by the Engineer. Quantity of utility water available for construction will vary seasonally and daily. The Contractor shall be responsible to obtain information from the Owner and understand the availability of utility water relative to planned construction activities.

3. The Contractor shall properly identify all construction water trucks and vessels and inform all workmen and the general public when reclaimed waste water is used as construction water.

4. All drinking water on the site during construction shall be furnished by the Contractor and shall be bottled water or water furnished in approved metal dispensers. Notices shall be posted conspicuously throughout the site warning the Contractor's personnel that piped water may be contaminated.

5. The Contractor shall not make connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the water system. For each such connection made the Contractor shall first attach to the fire hydrant or pipeline a valve, backflow preventer and a meter, if required by the said authority, of a size and type acceptable to said authority and agency.

6. Before final acceptance of the Work all temporary water connections and piping installed by the Contractor shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the Engineer and to the agency owning the affected utility.

C. Waste Collection: Provide trash cans and instruct personnel to maintain a clean site.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Toilets: Portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction. The Owner's toilet facilities shall not be used by the Contractor's work force.

2. The Contractor shall establish adequate and regular collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of in a manner satisfactory to the Engineer and in accordance with all laws and regulations pertaining thereto.
E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Electric Power Service from Existing System: Electric power from Owner's existing system will be made available for all Field office power requirements and construction activities limited by the plants’ electrical system capacity as a whole or at a specific location. All use of power from Owner’s existing system shall be coordinated with the Owner and shall be associated with the activities related to construction.

The Contractor shall be responsible to provide necessary electrical power. The contractor will be responsible for all temporary power and generators required during the construction and planned power shut-downs. The Contractor shall provide all necessary temporary power connection, disconnects and distribution lines required for its operations under the Contract and shall provide and maintain all temporary power systems required to perform the Work in a safe and satisfactory manner. All temporary connections for electricity shall be subject to approval of the Engineer and shall be completely removed at the Contractor's expense prior to final acceptance of the Work. All wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. All electrical facilities shall conform to the requirements of the OSHA Safety and Health Standards for Construction.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Telephone Service: The Owner’s telephone system shall not be used by the Contractor’s work force.

1. Post a list of important telephone numbers in the project field office.
   a. Police and fire departments.
   b. Ambulance service.
   c. Contractor's home office.
   d. Contractor's emergency after-hours telephone number.
   e. Engineers' offices.
   f. Owner's office.
   g. Principal subcontractors' field and home offices.

2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
3. The Contractor shall provide a telephone in their facility with an adequate speaker phone for use on conference calls. This system may be used for weekly conference calls/project progress meetings.

J. Electronic Communication Service: Provide a computer in the primary field office adequate for use by Engineer and Owner to access project electronic documents and maintain electronic communications.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Engineer schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, with prior consent from the Owner and under conditions acceptable to Owner.

B. Temporary Roads: Access to the site shall be permitted by the Owner. The Contractor shall not construct any staging areas, haul roads, and access roads without the approval of the Owner.

1. Contractor to maintain clear access roadways and walkways necessary for the daily operation and maintenance of the plant. All road closures, trenching/excavation, or other construction activities that may interfere or impede access must be coordinated with and approved by Owner.

2. A public road passes through the construction area and access to and along this route must be maintained during construction. Contractor shall maintain a graded, non-paved road, to accommodate traffic on the road and allow for construction activities until the permanent road is installed. The general proposed routes for this road are as shown in the general site staging plans provided in the General drawings of Volume 4A. Contractor is responsible to provide suitable road-grade backfill, graded, for the road. Contractor shall maintain and regrade the road as required to maintain the road in acceptable condition. In addition, contractor shall maintain proper barricades and fencing along this road to secure the construction/staging areas from the public access road. Finally, contractor shall furnish traffic controls along public road per Paragraph 3.3.C.

3. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction and coordinate with the Western Riverside County Regional Wastewater Authority Facility personnel.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.
3. Contractor shall provide all lights, signs, barricades, flaggers, and other appurtenances necessary for safety.
D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with all Federal, State, and Local Government requirements. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Provide Project sign. Unauthorized signs are not permitted.
   1. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
      a. Provide temporary, directional signs for construction personnel and visitors.
   2. Maintain and touchup signs so they are legible at all times.


H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

I. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

J. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
   1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

K. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

G. Site Access: Prior to commencing work the Owner will supply the contractor with access key(s) for the facility front gate. The contractor is responsible to:
   1. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner for any gates, enclosures or fenced areas constructed by the contractor.
   2. The contractor shall be responsible for security of the site during non-working hours of the facility personnel.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather tight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

L. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.
   1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

   a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.

4. Insulate partitions to control noise transmission to occupied areas.

5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.

6. Protect air-handling equipment.

7. Provide walk-off mats at each entrance through temporary partition.

M. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.

   1. Prohibit smoking in construction areas.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
   4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL


B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Discard or replace water-damaged and wet material.
   4. Discard, replace, or clean stored or installed material that begins to grow mold.
5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000
SECTION 015300 – PROTECTION OF EXISTING FACILITIES

PART 1 - GENERAL

1.1 GENERAL

A. The Contractor shall protect all existing utilities, piping and improvements not designated for removal and shall restore damaged or temporarily relocated utilities, piping and improvements to a condition equal to or better than they were prior to such damage or temporary relocation.

B. The Contractor shall verify the exact locations and depths of all underground piping and utilities shown and not shown and shall make exploratory excavations of all piping and utilities that may interfere with the Work. It shall be the Contractor's responsibility to ascertain the actual location of all existing utilities, piping and other improvements that will be encountered in its construction operations and to see that such utilities or other improvements are adequately protected from damage due to such operations.

C. The Contractor shall notify the Owner’s representative of any change of condition or extra work as soon as it is discovered, including any damage to existing facilities, pipelines and improvements not designated for removal. The Contractor shall also notify the Owner’s representative of any plans to relocate existing piping or facilities to accommodate new construction.

D. Maintaining in Service: All pipelines, electrical, power, telephone, communication cables, gas and water mains shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the Engineer are made with the Owner. Where the proper completion of the Work requires the temporary or permanent removal and/or relocation of an existing utility or other improvement the Contractor, after necessary scheduling and approval, shall remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the Engineer and the owner of the facility. In all cases of such temporary removal or relocation, the Work shall be accomplished by the Contractor in a manner that will restore or replace the utility or improvement to a new condition meeting the specification requirements.

E. All repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the improvement owner before being concealed by backfill or other work.

1.2 RIGHTS-OF-WAY

A. The Contractor shall not do any work or enter upon the rights-of-way of any oil, gas, sewer or water pipeline; any telephone or electric transmission line; any fence; or any other structure, until notified by the Engineer that the Owner has secured authority to do so. After authority has been obtained, the Contractor shall give the governing utility proper advanced notice of its intention to begin work.

1.3 RESTORATION OF PAVEMENT AND SIDEWALKS

A. All paved areas and sidewalks not designated for replacement, cut or damaged during construction
shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas unless otherwise noted. All sidewalks and pavements which are subject to partial removal shall be neatly saw-cut in straight lines. All restoration shall be at the Contractor’s expense.

1.4 UNDERGROUND UTILITIES NOT SHOWN OR INDICATED

A. If the Contractor damages existing utilities, piping or improvements that are not shown or the location of which was not made known to the Contractor prior to excavation and the damage was not due to failure of the Contractor to exercise reasonable care the Contractor shall immediately notify the Engineer. If directed by the Engineer, repairs shall be made by the Contractor under the provisions for changes and extra work contained in the Contract (Article 6 – Changes and Extra Work).

1.5 NOTIFICATION BY THE CONTRACTOR:

A. Prior to any excavation in the vicinity of any existing underground facilities, including water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications or telecommunication cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way, the Contractor shall notify the respective authorities representing the owners or agencies responsible for such facilities not less than three (3) working days prior to excavation so that a representative can be present during such work if they are required to do so.

END OF SECTION 015300
PART 1 - GENERAL

1.1 SUMMARY

A. The following sections include mitigation measures to be integrated into the LGVSD Secondary treatment and RWTF upgrade project to reduce the potentially environmental impacts resulting from the construction activities. The Contractor shall implement mitigation measures identified below during the construction process, as well as any other measures required in these documents, on the design drawings, and as required by other local, state, and federal agencies.

1.2 WATER QUALITY

A. NPDES Construction Activity Stormwater Permit. Contractor shall comply with the provisions of the NPDES Construction Activity Stormwater permit, including preparation of Notice of Intent to comply with the provisions of this General Permit and preparation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP will identify implementation measures necessary to mitigate potential water quality degradation as a result of construction-related runoff. These measures will include BMPs and other standard pollution prevention actions, such as erosion and sediment control measures, proper control of non-stormwater discharges, and hazardous spill prevention and response. The SWPPP will also include requirements for BMP inspections, monitoring, and maintenance.

B. The following items are examples of BMPs that would be implemented during construction to avoid causing water quality degradation:

1. Erosion control BMPs, such as use of mulches or hydroteering to prevent detachment of soil, following guidance presented in the California BMP Handbooks – Construction (CASQA 2003). A detailed site map will be included in the SWPPP outlining specific areas where soil disturbance may occur, and drainage patterns associated with excavation and grading activities. In addition, the SWPPP will provide plans and details for the BMPs to be implemented prior, during, and after construction to prevent erosion of exposed soils and to treat sediments before they are transported offsite.

2. Sediment control BMPs such as silt fencing or detention basins that trap soil particles.

3. Construction staging areas designed so that stormwater runoff during construction will be collected and treated in a detention basin or other appropriate structure.

4. Management of hazardous materials and wastes to prevent spills.

5. Groundwater treatment BMPs such that localized trench dewatering does not impact surface water quality.

6. Vehicle and equipment fueling BMPs such that these activities occur only in designated staging areas with appropriate spill controls.

7. Maintenance checks of equipment and vehicles to prevent spills or leaks of liquids of any kind.
1.3 AIR QUALITY

A. Construction Fugitive Dust Control Plan: Contractor shall prepare, submit for review and approval, and implement a dust control plan that conforms to the local requirements. The dust control plan shall include the following dust control procedures, or others as required by the local authority:

1. Water all active construction areas at least twice daily, taking into consideration temperature and wind conditions.
2. Cover all trucks hauling soil, sand, and other loose materials or require trucks to maintain at least two feet of freeboard.
3. Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on unpaved access roads, parking areas and staging areas at construction sites.
4. Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites.
5. Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
6. Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for ten days or more).
7. Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.)
8. Limit traffic speeds on unpaved roads to 5 mph.
9. Install sandbags or other erosion control measures to prevent silt runoff to public roadways, consistent with Mitigation Measures for Erosion Control.
10. Replant vegetation in disturbed areas as quickly as possible.

B. Construction Exhaust Emissions Control Plan: Contractor shall implement an exhaust emissions control plan that shall include the following controls and practices:

1. On road vehicles with a gross vehicular weight rating of 10,000 pounds or greater shall not idle for longer than five minutes at any location as required by Section 2485 of Title 13, Division 3, Chapter 10, Article 1 of the California Code of Regulations. This restriction does not apply when vehicles remain motionless during traffic or when vehicles are queuing.
2. Off road equipment engines shall not idle for longer than five minutes per Section 2449(d)(3) of Title 13, Division 3, Chapter 9, Article 4.8 of the California Code of Regulations. All vehicle operators shall receive a written idling policy to inform them of idling restrictions. The policy shall list exceptions to this rule that include the following: idling when queuing; idling to verify that the vehicle is in safe operating condition; idling for testing, servicing, repairing or diagnostic purposes; idling necessary to accomplish work for which the vehicle was designed (such as operating a crane); idling required to bring the machine to operating temperature as specified by the manufacturer; and idling necessary to ensure safe operation of the vehicle.
3. Off road engines greater than 50 horsepower shall, at a minimum, meet Tier 2 emissions standards. When available, higher Tier engines shall be utilized.
1.4 NOISE

A. Contractor shall develop, submit for review and approval, and implement a Construction Noise Reduction Plan that requires, at a minimum, the following:

1. The contractor shall locate all stationary noise-generating equipment, including hammer bore and drill rigs, as far as possible from nearby noise-sensitive receptors. Stationary noise sources located within 500 feet of noise-sensitive receptors shall be equipped with noise reducing engine housings, and the line of sight between such sources and nearby sensitive receptors shall be blocked by portable acoustic barriers.

2. The contractor shall assure that construction equipment with internal combustion engines have sound control devices at least as effective as those provided by the original equipment manufacturer. No equipment shall be permitted to have an un-muffled exhaust.

3. All construction activities within unincorporated areas shall be limited to between the hours depending upon the jurisdiction.

4. Residences and other sensitive receptors within 200 feet of a construction area shall be notified of the construction schedule in writing, at least two weeks prior to the commencement of construction activities. This notice shall indicate the allowable hours of construction activities as specified by the applicable local jurisdiction or as defined by this mitigation measure. The Owner shall designate a noise disturbance coordinator who would be responsible for responding to complaints regarding construction noise. The coordinator shall determine the cause of the complaint and ensure that reasonable measures are implemented to correct the problem. A contact number for the noise disturbance coordinator shall be conspicuously placed on construction site fences and entrances by the contractor and included in the construction schedule notification sent to nearby residences and sensitive receptors.

1.5 HAZARDS AND HAZARDOUS MATERIALS

A. In the event that evidence of potential soil contamination such as soil discoloration, noxious odors, debris, or buried storage containers, is encountered during construction, the contractor will have a contingency plan for sampling and analysis of potentially hazardous substances, including use of a photoionization detector. The required handling, storage, and disposal methods shall depend on the types and concentrations of chemicals identified in the soil. Any site investigations or remediation shall comply with applicable laws and will coordinate with the appropriate regulatory agencies.

B. If unknown USTs are discovered during construction, the UST, associated piping, and impacted soil shall be removed by a licensed and experienced UST removal contractor. The UST and contaminated soil shall be removed in compliance with applicable county and state requirements governing UST removal.

C. Contractor shall prepare, submit for review and approval, and implement a project-specific Health and Safety Plan that would apply to excavation activities. The plan shall establish policies and procedures to protect workers and the public from potential hazards posed by hazardous materials. The plan shall be prepared according to federal and California OSHA regulations and submitted to the appropriate agency with jurisdiction prior to beginning site activities. The health and safety plan shall also be submitted to the District for review and approval.
D. Consistent with the SWPPP requirements, the construction contractor shall be required to implement BMPs for handling hazardous materials onsite. The use of construction BMPs will minimize any adverse effects on groundwater and soils, and will include, but not limited to, the following:

1. Follow manufacturers’ recommendations and regulatory requirements for use, storage, and disposal of chemical products and hazardous materials used in construction;
2. Spill control and countermeasures, including employee spill prevention/response training;
3. Avoid overtopping construction equipment fuel gas tanks;
4. During routine maintenance of construction equipment, properly contain and remove grease and oils; and
5. Properly dispose of discarded containers of fuels and other chemicals.

E. The contractor shall follow the provisions of California Code of Regulations, Title 8, Sections 5163 through 5167 for General Industry Safety Orders to protect the project area from being contaminated by the accidental release of any hazardous materials and/or wastes. The local Certified Unified Program Agency (CUPA) will be contacted for any site-specific requirements regarding hazardous materials or hazardous waste containment or handling.

F. Oil and other solvents used during maintenance of construction equipment shall be recycled or disposed of in accordance with applicable regulatory requirements. All hazardous materials shall be transported handled, and disposed of in accordance with applicable regulatory requirements.

G. In the event of an accidental release of hazardous materials during construction, containment and clean up shall occur in accordance with applicable regulatory requirements.

H. Contractor shall prepare, submit for review and approval, and implement a Fire Safety Plan for each of the service areas associated with the project. The Fire Safety Plan(s) will describe various potential scenarios and action plans in the event of a fire.

I. During project construction, all staging areas, welding areas, or areas slated for development using spark-producing equipment will be cleared of dried vegetation or other material that could ignite. Any construction equipment that includes a spark arrestor shall be equipped with a spark arrestor in good working order. All vehicles and crews working at the project site(s) will have access to functional fire extinguishers at all times. In addition, construction crews will be required to have a spotter during welding activities to look out for potentially dangerous situations, including accidental sparks.

1.6 CULTURAL RESOURCES

A. Inadvertent Discoveries: If discovery is made of items of historical or archaeological interest, the contractor shall immediately cease all work activities in the area (within approximately 100 feet) of discovery. Prehistoric archaeological materials might include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or toolmaking debris; culturally darkened soil (“midden”) containing heat-affected rocks, artifacts, or shellfish remains; and stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered stone tools, such as hammerstones and pitted stones. Historic-period materials might include stone, concrete, or adobe footings and walls; filled wells or privies; and deposits of metal, glass, and/or ceramic refuse. After cessation of excavation the contractor shall immediately contact the NBWRA and
the Authority. The contractor shall not resume work until authorization is received from the Authority.

1. In the event of unanticipated discovery of archaeological indicators during construction, the Authority shall retain the services of a qualified professional archaeologist to evaluate the significance of the items prior to resuming any activities that could impact the site.

2. In the case of an unanticipated archaeological discovery, if it is determined that the find is unique under the National Historic Preservation Act (NHPA) and/or potentially eligible for listing in the National Register, and the site cannot be avoided, the Authority shall provide a research design and excavation plan, prepared by an archaeologist, outlining recovery of the resource, analysis, and reporting of the find. The research design and excavation plan shall be submitted to NBWRA and the Authority and approved by the Authority prior to construction being resumed.

B. Discovery of Human Remains: If potential human remains are encountered, the Authority shall halt work in the vicinity of the find and contact the county coroner in accordance with Public Resources Code Section 5097.98 and Health and Safety Code Section 7050.5. If the coroner determines the remains are Native American, the coroner shall contact the Native American Heritage Commission (NAHC). As provided in Public Resources Code Section 5097.98, the NAHC shall identify the person or persons believed to be most likely descended from the deceased Native American. The most likely descendent makes recommendations for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98.

1.7 EXPLOSIVES AND BLASTING:

A. The use or storage of explosives on the Work or site will not be permitted.

1.8 SANITATION

A. The Contractor shall provide approved fixed or portable chemical toilets wherever needed for its employees. The Contractor shall establish regular intervals of collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of in a manner satisfactory to the Engineer and in accordance with all laws and regulations pertaining thereto. The Owner's toilet facilities shall not be used by the Contractor.

END OF SECTION 015600
SECTION 016100 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

   1. General Conditions

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.

   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number, manufacturer name, or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

   1. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor of approval or rejection of proposed comparable...
product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Section 013300 "Contractor Submittals."
b. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Contractor Submittals." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

B. To the greatest extent possible for each unit of work, the Contractor shall provide products, materials or equipment from a single source.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
D. Fabricated structural components shall be stored on supports above ground and in a manner to prevent accumulation of water and warping. Products subject to deterioration from atmospheric conditions shall be covered in a manner that will provide adequate ventilation to avoid condensation.

E. Products, materials and equipment not stored in a manner that will insure the maintaining of a new condition will be rejected by the Engineer. Such rejected products, materials and equipment shall be immediately removed from the Work site.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.

3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

B. Product Selection Procedures:

1. Where Specifications name a product or manufacturer as the “Basis-of-Design”, provide product(s) as listed or by the manufacturer listed. Where Specifications include a list of available products or manufacturers, followed by the phrase “or equal,” provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer subject to requirements included in General Conditions.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016100
SECTION 016600 – EQUIPMENT TESTING AND PLANT STARTUP

PART 1 - GENERAL

1.1 GENERAL

A. Equipment testing and plant startup are required for satisfactory completion of the contract and shall be scheduled and completed within the contract time.

1.2 EQUIPMENT TESTING

A. Contractor Furnished Equipment

1. The Contractor shall provide the services of an experienced and authorized representative of the manufacturer of each item of equipment indicated in the equipment schedules who shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The Contractor shall have the manufacturer's representative revisit the Work site as often as necessary until any and all problems are corrected. The Contractor shall require that each manufacturer's representative furnish to the Engineer a written report addressed to the Owner certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchor bolts and has been operated satisfactorily under full-load conditions.

2. The Contractor shall be responsible for scheduling all operations testing. The Contractor shall furnish all personnel, power, water, chemicals, fuel, oil, grease and all other necessary equipment, facilities and services required for conducting the tests. The Contractor is advised that the Engineer and the Owner's operating personnel will witness operations testing and that the manufacturer's representative shall be required to instruct the Owner's operating personnel in correct operation and maintenance procedures. This instruction shall be scheduled with the Engineer and the Owner at least ten (10) days in advance and shall be provided while the equipment is fully operational. The Contractor shall have previously furnished the technical manuals required under Section 013300 entitled, "Contractor Submittals".

B. Owner Selected Equipment

1. The Contractor shall notify the Engineer when Owner selected equipment is completely installed in accordance with the Owner selected manufacturer's instructions and requirements of the Contract Documents and ready for operational testing. The Contractor will schedule the manufacturer's representative to visit the site of the Work and inspect, check, adjust if necessary and approve the equipment installation. If the manufacturer's representative cannot complete the testing and startup services due to the Contractor's negligence in installing the equipment, the Contractor shall be responsible for the costs of the service representatives' revisit to the site of the Work.
1.3 PLANT STARTUP

A. The startup of the treatment plant facilities and equipment is a coordinating operation requiring the combined technical expertise of the Contractor, suppliers, Engineer and the Owner. The Contractor shall provide the effective coordination of all parties necessary for successful plant, facilities and equipment startup.

B. The Contractor shall be required to startup and operate the various pieces of equipment in accordance with requirements of section 17500 “Commissioning”.

C. All defects in materials or workmanship which appear during this test period shall be immediately corrected by the Contractor. The Contractor shall provide the services of authorized representatives of the manufacturer, in addition to those services required under equipment testing, as may be necessary, to correct faulty equipment operation. Time lost for equipment repairs, wiring corrections, control point settings or other reasons which actually interrupt the startup may, at the discretion of the Engineer, be justifiable cause for extending the startup test duration.

END OF SECTION 016600
SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:

1. Section 024116 "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements.
2. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.
3. General Conditions

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging. The Contractor shall be responsible for the disposal of his own waste. Waste shall daily be cleaned up and piled into proper containers by the Contractor.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

1.3 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 7 days of date established for commencement of the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
B. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

C. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

A. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.6 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

PART 2 - EXECUTION

2.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Section 015000 "Temporary Facilities and Controls" and 015600 “Project Environmental Controls” for controlling dust and dirt, environmental protection, and noise control.

2.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Burning of waste materials is not permitted.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

2.3 DISPOSAL OF HAZARDOUS WASTE

A. It is not expected that hazardous materials will be encountered in the Work. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify the Owner’s representative.

END OF SECTION 017419
SECTION 017500 – COMMISSIONING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This specification discusses pre-commissioning and commissioning activities. Pre-commissioning activities include all the activities associated with the first time startup of all equipment, instruments, electrical gear and/or process. This includes all checks and tests prior to running equipment including any manufactures inspections. Commissioning activities include, but is not limited to the Functional Acceptance Test (FAT) of equipment and facilities with clean water, operator training and manufacturers start up services. The final step in commissioning includes a Reliability Acceptance Test (RAT). This test will require the system to function for an extended period without interruption as listed in Table 2. After the test period is complete, the system will be substantially complete and can be turned over to the Owner for beneficial use.

B. For the purpose of this Project, commissioning will start after LGVSD’s acceptance of Operational Readiness Test (ORT) and the listed requirements in Table 1. Full operational tests that demonstrate functionality and reliability will be done during commissioning. It may be necessary to include the installation of temporary facilities to support testing and the removal of temporary facilities when testing is complete. It is the Contractor’s responsibility to execute proper planning, notification and scheduling. The commissioning activities will involve the Owner, Engineer, Construction Manager, Contractor and LGVSD staff responsible for plant operation. The Contractor will provide a Commissioning Coordinator to lead all commissioning activities.

C. This section identifies the tests and documentation that the Contractor shall be responsible for in order to complete pre-commissioning and commissioning. All pre-commissioning and commissioning work, as described in this section, shall be performed by the Contractor and witnessed by the Owner.

D. Related Requirements:

1. Section 016600 – Equipment Testing and Plant Startup
2. Section 017823 – Operation and Maintenance Data
3. Section 017839 – Project Record Documents
4. Division 26 – Electrical

1.2 DEFINITIONS

A. Operational Readiness Test (ORT): This test includes all parts of a system to verify they are in working order and functioning properly in the system including, but not limited to pressure tests, rotational checks, control devices, loop checks and other items listed in Table 1. The requirements of the ORT are described in detail in Section 1.3 Pre-commissioning Work.

B. Functional Acceptance Test (FAT): The FAT is used to test the system prior to placing it into service. The test is to prove the system is operational using clean water insuring normal operating requirements. The requirements for the FAT are listed in Section 1.4 Commissioning Work.
C. Reliability Acceptance Test (RAT): The RAT is used to prove the reliability of the system for a duration listed in Table 2. The test is performed under normal plant flows using typical process influent with the assistance of LGVSD plant operators. The requirements for the RAT are listed in Section 1.4 Commissioning Work. Following successful completion of the RAT, and acceptance of the system by the Owner, the Contractor may apply for substantial completion of the system.

D. Substantial Completion: The Contractor may apply for Substantial Completion after the Engineer has accepted all Reliability Acceptance Tests (RATs) and the Contractor have submitted all Manufacturers’ Certificates of Proper Installation. Also, see Division 1 - General Requirements.

E. Final Completion: Includes all Work under the Contract as outlined in the contract documents, including any approved change orders.

F. System: A system means the overall process, or a portion thereof, that performs a specific function.

G. Commissioning Coordinator: The Commissioning Coordinator is employed by the Contractor and responsible for all commissioning activities, scheduling start-up and training sessions, developing and submitting all reports and certificates. The Commissioning Coordinator shall have no other responsibilities during commissioning and will be on site during all commissioning phases. The Commissioning Coordinator shall be a registered engineer in the State of California or a currently licensed grade 5 wastewater treatment operator in the state of California.

H. Owner: Owner is defined as the Las Gallinas Valley Sanitary District (LGVSD). The term Owner also includes the Owners representatives, which includes the Construction Manager, Engineer and Plant Operations Staff.

I. Plant Water: Plant Water is fully treated plant effluent and is considered non-potable water.

1.3 PRE-COMMISSIONING WORK

A. Pre-commissioning is made up of all the activities that shall be completed before the Contractor is permitted to begin Commissioning. Table 1 illustrates some of the tasks.

B. The primary activities for this are construction, factory testing, documentation, component testing, stand-alone equipment testing, and energization of electrical power distribution equipment. This also includes pipe pressure testing. The intent is to test isolated equipment and components. Pre-commissioning testing shall conclude with the Owner’s acceptance of the Operational Readiness Tests.

C. Once all components have been tested individually, electrical power distribution equipment has been functionally tested and energized, and Owner has accepted all required deliverables, the Contractor may request to proceed to Commissioning. If the Owner agrees that the Contractor has successfully performed all tests and provided all required documentation, the Owner will notify the Contractor in writing that he may begin Commissioning.
1.4 COMMISSIONING WORK

A. Commissioning is composed of two parts, Phase 1 and Phase 2. Table 1 illustrates some of the tasks.

1. Phase 1 Commissioning will include operator training as well as comprehensive testing with clean water. The steps will include approval of Operational Readiness Tests and the Functional Acceptance Test (FAT). The purpose of the FAT is to test all equipment, instruments and software as an integrated system using plant water wherever applicable. The successful completion of the Functional Acceptance Test will allow the Contractor to request Operational Acceptance. When all deliverables have been accepted and operator and maintenance training is complete, Owner will notify the Contractor in writing that the facility has achieved Operational Acceptance and he may proceed to the next phase of Commissioning.

2. Phase 2 Commissioning is designed to functionally test the facility as an integrated system under normal operating conditions using wastewater. The testing includes the Reliability Acceptance Test (RAT) that will be conducted over a period of time that demonstrates the operational reliability of the system. (See Table 2 for test durations.) After successful completion of the RAT and all Manufacturers’ Certificates of Proper Operation have been submitted to Engineer, and after the Contractor has submitted all Operation and Maintenance Manuals, the Contractor may request the Owners’ acceptance that the system is Substantially Complete (see General Conditions for definition).

1.5 MANUFACTURER’S FIELD SERVICES

A. It is the Contractor’s responsibility to provide the services of the manufacturer’s representatives that apply during equipment installation, facilities testing, pre-commissioning, commissioning and training of LGVSD personnel. Where manufacturer’s services are specified, the Contractor shall furnish a qualified representative of the manufacturer to provide these services.

B. Definitions: For purposes of furnishing manufacturers’ services, the following definitions shall apply:

1. Manufacturer’s Representatives: Employee of manufacturer who is factory trained and knowledgeable in technical and operational aspects of their products and systems.
2. Person-Day or Instructor-Day: One person for eight (8) hours straight time, exclusive of Saturdays, Sundays or holidays; does not include travel time.

C. Submittals

1. Submittals shall be in accordance to General Requirements Section 013300 entitled “Contractor Submittals” and the requirements of this section.
2. Qualifications and experience records of proposed manufacturers’ representatives who will assist installation and testing of equipment and conduct training sessions.
3. After installation, each manufacturer’s representative shall submit to the Owner, via the Construction Manager, a written report (Certificate of Proper Installation) certifying that the all equipment is installed properly, in accordance with the manufacturer’s installation instructions.
4. During Phase 2 of Commissioning and after the RAT, each manufacturer’s representative shall submit to the Owner a written report (Certificate of Proper Operation) certifying that
the all equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated per specifications.

D. Scheduling of Manufacturer’s Field Services

1. The manufacturer’s representative shall be an experienced, competent, and an authorized representative of the manufacturer of each item of equipment for which field services are indicated in the individual sections of the Contract Specifications. He shall visit the site of the Work to inspect, check, adjust if necessary, and accept the equipment installation. In each case, the manufacturer’s representative shall be present when the equipment is being tested and placed in operation. The manufacturer’s representative shall revisit the jobsite as often as necessary until all trouble is corrected.

2. The scheduling of all visits to the site by the manufacturer’s field services representative shall be determined by the Contractor and accepted by Owner. It is intended that the manufacturers’ representatives’ visits be for making equipment inspections and normal adjustments, and not for remedying defective work.

3. Manufacturers’ representatives shall resolve assembly or installation problems attributable to or associated with, their products and equipment.

4. During the testing, the manufacturer’s representative shall assist, as applicable, to perform initial equipment and system adjustments and calibrations.

5. After all acceptance tests have been completed, but prior to Substantial Completion, the Contractor shall recheck all equipment for proper alignment and adjustment, check oil levels, re-lubricate all bearing and wearing points, and, in general, assures that all equipment is in proper condition for regular continuous operation.

PART 2 - PRODUCTS

2.1 COMMISSIONING PLAN

A. The Commissioning Coordinator shall be responsible for preparing the Commissioning Plan.

B. As a condition precedent to receiving any progress payment for work 30 days prior to the pre-commissioning activities, the Commissioning Coordinator shall submit and receive the Owner’s acceptance for all commissioning plan documents. The Owner shall require five (5) copies to review the submitted commissioning plan. The commissioning plan shall be submitted 60 days preceding commissioning of a system.

C. Once the Owner has accepted the Commissioning Plan, the Commissioning Coordinator shall reproduce the plans in sufficient number for the Commissioning Coordinator’s purposes and an additional five (5) copies for delivery to the Owner. No test work shall begin until the Commissioning Coordinator has delivered the specified number of final commissioning plans to the Owner.

D. Testing

1. The Contractor shall develop and produce the ORTs, FATs and RATs to conduct the testing. Sample templates for ORT, FAT and RAT have been provided in Exhibit 1 – Commissioning Document Samples of this specification to help facilitate this production.
2. The Contractor shall submit an EPSET procedure, as defined in Section 2.2.B.1 entitled EPSET - Electrical Power System Energization Test.

3. The Commissioning Coordinator shall develop test plans detailing the coordinated, sequential testing of each item of equipment and system installed under this Contract. Each test plan shall be specific to the item of equipment or system to be tested. Test plans shall identify by specific equipment or tag number each device or control station to be manipulated or observed during the test procedure. The specific results to be observed or obtained shall be identified in the plan. Test plans shall also be specific as to support systems required to complete the test work, temporary systems required during the test work, Subcontractors' and manufacturers' representatives to be present and expected test duration.

4. The Commissioning Coordinator shall prepare written test procedures for submittal to the owner and Engineer, for acceptance. The test procedures shall be submitted in hard copy and electronically as needed. For each test, the procedure form should clearly define the following:
   a. Test Number
   b. Purpose of the test: Describe what is being verified by this particular test.
   c. Test Method: Describe the setup for the test and the steps required to complete the test.
   d. Criteria: Describe the criteria for passing or failing the test.
   e. Provide space on the form for the Owner’s comments and for individual sign-off.
   f. Test on a loop-by-loop basis. Every loop shall be signed off individually.
   g. Provide a test schedule.
   h. Provide a list of all test equipment to be available for the tests.
   i. Provide a block diagram showing the test setup arrangement. The diagram shall illustrate the equipment under test, any special test equipment and indicate equipment interconnections.

5. Staffing for each test identifying roles and responsibilities.

6. For all ORT testing, the Contractor shall use the final project PLC hardware.

7. Instrumentation list with calibration methods and calibration dates.

8. Acceptance criteria required to release equipment and systems for commissioning.


10. Forms for each test.

E. Training

1. Identify each operator and maintenance training class.
2. Lesson plan for each class.

F. Schedule: The Commissioning Coordinator shall produce a test and training schedule setting forth the sequence contemplated for performing the test and training work.

1. The schedule shall detail the equipment and systems to be tested, and shall be part of the Contractor’s Baseline Construction Schedule.
2. The schedule shall show the contemplated start date, duration of the test and completion of each pre-commissioning and commissioning activity.
3. The test schedule shall be submitted, reviewed, and accepted by the Owner with the Baseline Construction Schedule.
4. The test schedule shall be updated weekly, showing actual dates of test work, indicating systems and equipment testing completed satisfactorily and meeting the requirements of the Contract Documents.
5. Daily Schedule for Testing
   a. The Commissioning Coordinator shall begin each day of witnessed testing by meeting with the Owner.
   b. The meeting purpose is to review the test schedule, the test results from the previous day, and where applicable, to coordinate the testing schedule with Plant Operations.
   c. Note that the Commissioning Coordinator will need to schedule some testing outside normal working hours because of plant operational requirements. The Commissioning Coordinator may be required to rearrange portions of the testing schedule at short notice to accommodate unanticipated plant conditions such as equipment failure or unusually high sewage flows caused by wet weather.

6. Show all tests with beginning and ending dates. At a minimum, the Commissioning Coordinator will show all ORT, FAT and RAT schedules.

7. Show all operations and maintenance training classes.

2.2 PRE-COMMISSIONING AND COMMISSIONING TESTS

A. The following tests are conducted by the Commissioning Coordinator during Pre-commissioning and Commissioning.

B. Pre-commissioning: The Contractor shall successfully complete each test and receive written confirmation prior to starting any Commissioning Tests.

1. EPSET - Electrical Power System Energization Test – This test is performed after installation of all electrical switchgear systems and MCCs, after completion of NETA testing of the electrical power distribution system and after receipt of vendor certificate of proper installation. An accepted EPSET procedure shall be used to perform this test. The purpose of EPSET is to ensure 480V and greater power distribution is functional and ready for energization during commissioning. Prior to energization, PLC I/O check will not be possible; it will be part of ORTs and FAT testing. The Contractor cannot power any equipment i.e. lighting panel, PLC panels, etc. until EPSET is complete. Arc Flash labels shall be placed on electrical equipment prior to start of EPSET.
   a. This test will check and document that all local manual, remote and automatic interlocks, switching scenarios, I/O and controls are functional; any temporary power for testing of breakers, switchgear and battery charger system (125 V dc), if required, shall be provided. The Owner’s personnel will witness this test. Qualified Contractor and vendor personnel capable of operating and troubleshooting electrical equipment shall be available during the course of this test. The Contractors’ Commissioning Coordinator shall direct test.
   b. The Contractor shall submit an EPSET procedure. The EPSET procedure shall include the following:
      1) Steps to test and check all modes of operation (local, remote, manual, automatic and PLC), verify all required switching scenarios and functions, and verify that precluded switching scenarios do not occur,
      2) Methodology for supplying temporary power (if required)
      3) Steps to coordinate administrative control of project electrical equipment that interfaces with existing LGVSD electrical equipment to insure that testing does not negatively affect Plant operations.
   c. Prior to commencement of the EPSET, the following documentation shall be submitted and made available to the Owner:
      1) An accepted EPSET procedure
2) All associated redlined as-built single line and loop drawings
3) Electrical equipment O&M manuals and schematics
4) Certificate of Proper Installation
5) NETA testing reports and required testing outlined in Division 26 – Electrical
d. Prior to commencement of the EPSET, vendor training of LGVSD personnel for electrical equipment shall be completed.

2. ORT - Operational Readiness Test - This test is performed after installation and calibration of instruments is complete. The test purpose is for the Contractor to check and document the complete control system, including I/O to/from PLC register but excluding the application software is ready for operation. In addition, the equipment shall be tested in local/manual mode for operation and functionality. This test will be required for all electrical, piping and mechanical equipment, including but not limited to, actuated valves and gates, meters, conveyors, blowers, compressors, mixers, screens, motors, boilers, biogas handling equipment, pumps and filters. Upon completion of the test, the Contractor shall leave the equipment de-energized.

a. After the equipment supplier has certified proper installation, Contractor shall submit printouts for VFD, RVSS, relays and similar parameter settings for review by the Owner prior to starting the ORT. If further tuning is required when equipment is under load, as during FAT or RAT, the Contractor shall arrange to have on site the Supplier to finalize settings. When complete, the Contractor shall provide printouts of parameter settings and submit to the Owner. The final parameter settings shall be included in the Final Vendor Equipment Manual submittal. The Owner shall witness all ORT's. After the ORT's for a system is complete and approved by the Owner the commissioning can begin.

C. Commissioning

1. Phase 1. FAT – Functional Acceptance Test – The FAT is a combined effort between the Contractor and Owner. The combined software/hardware system is tested from this point forward. This test shall be conducted for LOCAL control; REMOTE MANUAL control; REMOTE AUTO control; REMOTE CASCADE (if applicable) control. The purpose for the test is to insure that the PLC and Operator Graphics software configuration is working in conjunction with the hardware and plant as intended. This test is accomplished with the system online under normal operating conditions. Equipment will operate with plant water. After acceptance of the FAT by the Owner, the Contractor may request to start with Phase 2.

2. Phase 2. RAT – Reliability Acceptance Test – The Purpose for this test is for the Contractor to demonstrate that all systems are capable of operating continuously in the intended manner for an extended period without failing. During the RAT, the Contractor will be responsible for recording all readings, collecting all samples and conducting laboratory analysis. During the RAT, the system under test will be operated within design parameters reflecting the day-to-day operation of the facilities for an uninterrupted period. The duration for each system is listed in Table 2. Several systems may have to test simultaneously in order to treat the wastewater adequately. The first group of systems to come on line together is the Primary Pump Station, modified Primary Biofilter, and Electrical Building. Other test systems groups are listed in Table 2. Each system will require its own RAT, but all of the above systems must start up together. The existing systems must remain operational during the test in case of a problem during the test period.

3. The RAT will run for 7 continuous days without interruption. During the test, operation of the system will be under the direction of the Contractors Commissioning Coordinator with assistance from Equipment Manufacturers, Sub-Contractors, Owner and Plant Operators.
The test, to the greatest extent possible, will take place at 80% of design flow for each process or piece of equipment. The test may need to be terminated due to above average rainfall, unforeseen conditions at the plant or any malfunction with the equipment causing the plant not to meet its discharge requirements. The Plant must be able to return to normal operation prior to the test if suspension of the test is necessary.

4. If the system test is suspended for a period over 4 hours due to equipment malfunction or break down, the entire test will be void and will need to start at the beginning of the test period.

2.3 PRE-COMMISSIONING AND COMMISSIONING DOCUMENTATION

A. Pre-commissioning: The following documentation shall be up to date and accepted by the Owner prior to starting any Commissioning activities. The Owner will give written notice to the Contractor when all the documents are accepted.

1. Equipment Submittal Process Complete.
2. RFI's and Responses up to Date.
3. All Electrical Equipment Tests.
4. All Process and Instrumentation Equipment Tests.
5. All Mechanical Equipment Tests.
6. Loop Drawings.
7. P&ID Drawings.
9. All Vendor and Manufacturer Certificates of Correct Installation.
10. All Pressure Test Reports.
11. All Loop Test Reports.
12. All Conductivity Test Reports.
13. All Instrument Calibration Reports, including parameter settings for magnetic flow meters, ultrasonic level elements, transmitters and similar instruments requiring calibration.
14. All Electrical Breaker Setting Reports.
15. All Mechanical Alignment Reports.
17. Any and All Operating Permits.

B. Commissioning: The following documents shall be submitted by the Commissioning Coordinator to Owner during commissioning:

1. Redline As-Built Drawings.
2. Final Maintenance Manuals.
3. Final Punch List.

2.4 DOCUMENTATION

A. The Commissioning Coordinator shall develop a records keeping system to document compliance with the requirements of this Section. Calibration documentation shall include identification (by
make, manufacturer, model, and serial number) of all test equipment, date of original calibration, subsequent calibrations, calibration method, and test laboratory.

B. Equipment and system documentation shall include date of test, equipment number or system name, nature of test, test objectives, test results, test instruments employed for the test, and signature spaces for Owner’s witness and the Contractor. A separate file shall be established for each system and item of equipment. For process systems that require commissioning prior to taking another process system out of service, the documentation shall be provided for each process system to be completed independently. These files shall include the following information as a minimum:

1. Metallurgical tests (If applicable).
2. Factory performance tests.
3. Accelerometer recordings made during shipment.
4. Field calibration tests.
5. Field pressure tests.
6. Field performance tests.
7. Field operational tests.

C. The Commissioning Coordinator shall develop test documentation forms specific to each item of equipment and system installed under this Contract.

D. Once the Owner has reviewed and taken no exception to the forms proposed by the Commissioning Coordinator, the Commissioning Coordinator shall produce sufficient forms, at his expense, to provide documentation of all testing work to be conducted as a part of this Contract.

E. Reference Documentation

1. The Commissioning Coordinator shall make two sets and a digital file of the following documentation available to the Owner or its representatives, at the test site:
   a. All drawings, specifications, addenda and change-orders;
   b. Copy of the accepted test procedure for the specific equipment being tested and record keeping forms filled out during testing.

2.5 REPORTS

A. The Contractor shall submit several reports to the Owner for acceptance in order to continue with the Commissioning process. For process systems that require commissioning prior to taking another process system out of service the reports shall be submitted for each process system as completed. These shall be submitted in hard copy and electronic format. The reports are described below. One each of these tests is required even though not specifically listed in the detailed specification section.

B. Pre-commissioning Report: The Pre-commissioning Report is a collection of all test reports, test data, certificates and commissioning forms that are produced during the Pre-commissioning Stage. The first section of this document will be a summary of the contents certifying that all prescribed tests and procedures have been successfully completed. The Commissioning Coordinator is responsible for producing this document.
C. Commissioning – Phase 1 Report

1. The Phase 1 Report is a collection of all test reports, test data, certificates and commissioning forms that are produced during the Phase 1 Stage. The first section of this document will be a summary of the contents certifying that all prescribed tests and procedures have been successfully completed. The Commissioning Coordinator is responsible for producing this document.

D. Commissioning – Phase 2 Report

1. The Phase 2 Report is a collection of all test reports, test data, certificates and commissioning forms that are produced during the Phase 2 Stage. The first section of this document will be a summary of the contents certifying that all prescribed tests and procedures have been successfully completed. The Commissioning Coordinator is responsible for producing this document.
   a. Manufacturer's equipment data.
   b. Field recorded dimensional measurements and clearances.
   c. Pressure, pressure differential, level, flow and other field settings.
   d. All electrical devices field settings.
   e. Operational pressure tests, control system timing tests and settings and other test data specified.
   f. Field wiring changes made, including marked up drawings.

2.6 SUBMITTALS

A. Contractor shall submit the following information in addition to specific equipment where specified in individual sections and paragraphs:

   1. Manufacturer’s Certification of Proper Installation of all equipment.
   2. Completed ORT, FAT and RAT forms.

B. Submit design and details of temporary test equipment and facilities.

C. Formal Reports

   1. Submit two (2) bound copies and one (1) digital file of all start-up and test reports within thirty days after completion of last test.

PART 3 - EXECUTION

3.1 PRE-COMMISSIONING AND COMMISSIONING ACTIVITIES

A. The following is a partial list of activities that shall be complete during each stage of Commissioning.

B. Pre-commissioning

   1. Electrical Service Tie-ins.
2. Electrical Testing.
3. Electrical Equipment is Clean and Energized.
4. Mechanical Equipment is Clean and Energized.
5. Verify Rotation of Motors.
7. Piping Equipment is Complete and Pressure Tested.
8. Pipe Supports Complete.
9. Pipe is Clean of Debris (inside and out).
11. SCADA System is Complete and Energized.
13. PLC Programming Complete.
15. Perform Operational Readiness Test.
16. Pre-commissioning Requirements.

C. Commissioning

1. Operator Training.
2. Prepare As-Built Drawings.
3. Functional Acceptance Test (FAT).
4. Reliability Acceptance Test (RAT).
5. Prepare Final Maintenance Manuals.
6. Complete Final Punch List.
<table>
<thead>
<tr>
<th>PRE-COMMISSIONING</th>
<th>COMMISSIONING</th>
<th>PHASE 1</th>
<th>PHASE 2</th>
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<td>Equipment Submittal Process Complete</td>
<td>Redline As-Built Drawings Received Prior to Operator Training</td>
<td>Reliability Acceptance Test (RAT)</td>
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<td>RFI's and Responses up to Date</td>
<td>Operational Readiness Tests Reports Approved</td>
<td>All Manufactures Certificates of Proper Installation and Training</td>
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<td>All Electrical Equipment Tests Complete</td>
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</tr>
<tr>
<td>All Process and Instrumentation Tests Complete</td>
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<td>All Mechanical Equipment Tests Complete</td>
<td>Operator Training Completed Prior to Phase 2</td>
<td>Commissioning - Phase 2 Report</td>
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<tr>
<td>Loop Drawings</td>
<td>Functional Acceptance Test (FAT)</td>
<td>Substantial Completion of System</td>
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<tr>
<td>P&amp;ID Drawings</td>
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<td>Contractor Safety Procedures in place</td>
<td>Commissioning - Phase 1 Report</td>
<td>Final O&amp;M Manuals</td>
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<td>Equipment, Valve and Pipe Labeling Complete</td>
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<tr>
<td>All Manufactures Certificates of Proper Installation</td>
<td>Obtain Operational Acceptance from the Owner a to Proceed to Phase 2</td>
<td>Final Punch List Complete</td>
<td>Final As-Built Drawings</td>
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<td>All Pressure Test Reports</td>
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<td>All Loop Test Reports</td>
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<td>All Conductivity and Megger Test Reports</td>
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<td>All Instrument Calibration Reports</td>
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<td>All Breaker Setting Reports</td>
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<td>All Mechanical Alignment Reports</td>
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<td>Operator and Maintenance Training Plan</td>
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<td>Commissioning Plan Accepted</td>
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<td>Draft O&amp;M Manuals Submitted and Approved</td>
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<td>Electrical Power System Energization Test</td>
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<td>Operational Readiness Tests (ORT's) Complete</td>
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<td>Pre-commissioning Report Submitted</td>
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<td>Obtain Owner Approval to Proceed to Commissioning Phase 1</td>
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<td>SYSTEM</td>
<td>TEST DURATION</td>
<td>NOTES</td>
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<td>--------------------------------------------</td>
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<tr>
<td><strong>Group #1</strong></td>
<td></td>
<td>All of the systems in Group #1 must start simultaneously. Each system must have its own start up plan and separate RAT documentation.</td>
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<tr>
<td>Primary Pump Station</td>
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<td>Modified Primary Biofilter</td>
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<td>Electrical Building</td>
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<td>All of the systems in Group #2 must start simultaneously. Each system must have its own start up plan and separate RAT documentation.</td>
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<tr>
<td>Facility, including feed pumps, CCB feed pumps, and CCB modifications.</td>
<td>7 continuous days without a problem</td>
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<td>Secondary Clarifier #2</td>
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<td>RAS Splitting Structure</td>
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<td>Secondary Scum Pump Station</td>
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<td>UV Disinfection Facility</td>
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<td><strong>Independent Systems</strong></td>
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<tr>
<td>Secondary Clarifier #1</td>
<td>7 continuous days without a problem</td>
<td>These systems can start independently. Each system must have its own start up plan and separate RAT documentation.</td>
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<td>Secondary Clarifier #3</td>
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<td>EQ Basin</td>
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<td>Anoxic Basins</td>
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<td>Solar Awnings</td>
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<td>Biogas Flares</td>
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<td>Recycled Water Distribution Pump Station</td>
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<td>Restroom</td>
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<td>Storage Building</td>
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<td>Sludge Storage Decant Pump Station</td>
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<tr>
<td>Fuel Tank Modifications</td>
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</table>
EXHIBIT 1

COMMISSIONING DOCUMENT SAMPLES

OPERATIONAL READINESS TEST (ORT)

FUNCTIONAL ACCEPTANCE TEST PROCEDURE (FAT)

SAMPLE RELIABILITY ACCEPTANCE TEST PROCEDURE (RAT)
# OPERATIONAL READINESS TEST

LAS GALLINAS VALLEY SANITARY DISTRICT
SECONDARY TREATMENT & RWTF UPGRADE

<table>
<thead>
<tr>
<th>Step</th>
<th>Contractor</th>
<th>Sub</th>
<th>Comment / Sign Off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify ready for startup by manufacture if applicable</td>
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<tr>
<td>Verify correct installation</td>
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<tr>
<td>Verify correct electrical and control wiring (voltage, breaker settings, etc.)</td>
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<tr>
<td>Verify all lubrication is complete and correct</td>
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<tr>
<td>Check rotation (uncouple motor from equipment if required)</td>
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<tr>
<td>Verify all alarms and signals are functioning (simulate signal if needed)</td>
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<tr>
<td>Verify all H/O/A switches function</td>
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<tr>
<td>Verify all emergency stops function</td>
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<td></td>
<td></td>
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<tr>
<td>Check clearances and verify all guards are in place</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verify loop checks are complete and test operation through the PLC</td>
<td></td>
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</tbody>
</table>

Equipment is ready for system Functional Acceptance Test (FAT)
FUNCTIONAL ACCEPTANCE TEST PROCEDURE (FAT)

1.1 OVERVIEW

A. The purpose of the Functional Acceptance Test (FAT) is to demonstrate to the Owner that both the software and hardware installed under this Contract is performing as specified. The test is performed with the equipment in service using plant water. The FAT is a combined effort between Contractor and Owner. The tests will require coordination with Operations to ensure normal processing is not disrupted. A LGVSD Operator must be present when any system operated may disrupt normal plant operation. Each individual piece of equipment shall have a completed ORT prior to the system FAT. This schedule will be based on work sequencing as discussed in the Contract Documents.

1.2 TEST PROTOCOL

A. The combined software/hardware system is tested from this point forward. The test is performed with equipment in service under normal operating conditions, and extreme design conditions (max and min), to the extent that test conditions allow. The purpose of the test is to ensure that the PLC and Operator Graphics software configuration is working in conjunction with the hardware and plant as intended.

B. Equipment will operate with plant water. Application software problems encountered during the test will be investigated and corrected by the Contractor. Problems with PLC and/or SCADA software programming done by the LGVSD will be corrected by the LGVSD. The Contractor shall provide a qualified person familiar with the installation and trouble-shooting of PLC panels, working full time, under the direction of the Commissioning Coordinator, for the duration of the test. Prior to the test, the Contractor shall submit a written FAT procedure, prepared by the Commissioning Coordinator, to the Owner for approval. The Owner’s approval of the procedure prior to the start of the FAT is required.

C. Alarms and interlocks are simulated in the field by activating the final element (sensor) or where this is not possible, by simulating the test condition at field terminals as close as possible to the final element. Calibration checks completed for the Operational Readiness Test will not be repeated.

D. The Owner must be notified 48 hours prior to the start of the FAT and must be present during the test.

E. Any sections of the test are found to be unsatisfactory; the Contractor will be required to repeat the test at his expense.
1.3 COMPONENTS

A. Each component of a system shall be brought on line as required to simulate a fully functioning system.

B. Each component shall be tested at normal plant flows. If it is not possible to produce the flow, it can be simulated for this testing purpose.

C. Each component shall be fully functional and compatible with the system at the conclusion of the FAT.

D. Any repair or replacement of system components shall be completed and tested prior to final approval and beginning the RAT (Reliability acceptance Test).

1.4 TEST PROCEDURE

A. The Commissioning Coordinator shall prepare a written procedure and sign off sheet for each system. The sheet shall include all necessary components and requirements for the system. The procedure must be submitted to the Owner 21 working days prior to the test for approval and comments. The Owner must approve the procedure prior to proceeding with the test.

B. Following is a general procedure for conducting the FAT:

1. Schedule test time with the Owner.
2. Set all valves and gates to the required position.
3. Fill channels and basins with Plant Water to prepare for the startup.
4. Energize electrical equipment.
5. Check and calibrate all transmitters, sensors, alarms and meters.
6. Simulate high, normal and low flow conditions.
7. Verify operation and reporting of the system through the SCADA System as well by manual operation.
8. Obtain approval from the Owner prior to terminating the test.
# SAMPLE FUNCTIONAL ACCEPTANCE TEST PROCEDURE
## PRIMARY PUMP STATION

<table>
<thead>
<tr>
<th>#</th>
<th>Test and Setup</th>
<th>Required Results</th>
<th>Sign-off / Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Verify all ORT’s are complete and accepted by Owner</td>
<td>All ORT’s complete (Provide copies of all ORT’s)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Notify Owner</td>
<td>All required people notified to observe test</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Verify all local and remote switches are in the off position</td>
<td>No unwanted starting of equipment</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Energize equipment at the MCC and power panel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pump 1 23-P-1100
(Typical for pumps)

<table>
<thead>
<tr>
<th>#</th>
<th>Test and Setup</th>
<th>Required Results</th>
<th>Sign-off / Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Open plug valve 23-V-1120</td>
<td>Pumps should not operate unless the discharge valves are open.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Verify proper operation of wet well influent gates 23-G-3100, 23-G-3120, 23-G-3110, 23-G-3130, and associated HS instrumentation</td>
<td>Gates must be operational and set in the correct position to allow for proper flow.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Verify proper operation of level instruments LSH-23-1004, LT-23-1003, and LSL-23-1004</td>
<td>Verify the gates and level instruments operate as intended.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Verify downstream gates are open and downstream process is ready to receive flow, either EQ, Anoxic, or Aeration Basins.</td>
<td>Pumps should not be operated unless downstream processes and gates are available to receive flow.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Provide utility water to wet well and fill wet well as needed.</td>
<td>Pumps should not operate without water in the wet well.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Turn HOA switch to Hand</td>
<td>Verify the pump operates and run at appropriate flow/head conditions.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Turn HOA switch to Auto</td>
<td>Pump should not operate until water level is up</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Verify pump alarms along with pump on and pump off sequence with HOA in Auto.</td>
<td>Pump should operate as intended in Auto.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>De-energize equipment until Reliability Acceptance Test (RAT)</td>
<td>Contractor lock out tag out procedure</td>
<td></td>
</tr>
</tbody>
</table>

## Test Completion Endorsements

<table>
<thead>
<tr>
<th>Rep</th>
<th>Signature/Date (Contractor)</th>
<th>Signature/Date(Owners)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All components are complete and functioning.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Acceptance to move on to Reliability Acceptance Test (RAT)</td>
<td></td>
</tr>
</tbody>
</table>
SAMPLE RELIABILITY ACCEPTANCE TEST PROCEDURE (RAT)

PRIMARY PUMP STATION

1.1 OVERVIEW

A. The RAT for the Primary Pump Station will involve other areas or systems that must start simultaneously; they are listed in Table 2 Reliability Acceptance Test Parameters. Each related area will have its own RAT. The Commissioning Coordinator will be responsible to prepare each RAT and schedule the startup of the systems with the Owner. The RAT cannot begin until the Functional Acceptance Tests (FAT) is complete and passed off by the Owner for all of the related areas.

1.2 CONSTRAINTS

A. The RAT will run for 7 continuous days without interruption or problem. During the test, the responsibility for operation of the system and direction for testing falls on the Contractors Commissioning Coordinator with assistance from Equipment Manufacturers, Sub-Contractors, Engineer, Owner and Plant Operators. The test, to the greatest extent possible, will take place at 80% of design flow for each process or piece of equipment. The test may need to be terminated due to above average rainfall, unforeseen conditions at the plant or any malfunction with the equipment causing the plant not to meet its discharge requirements. A contingency plan in case the RAT is suspended must be submitted.

B. If the system test is suspended for a period over 4 hours, due to equipment malfunction or breakdown, the entire test will be void and will need to start at the beginning of the test period.

1.3 PROCEDURE

A. Prior to beginning the Primary Pump Station RAT, all of the related systems must be ready for their own RAT. They include the following systems: Modified Primary Biofilter and Electrical Building. The areas are also listed in Table 2 Group #1. The contractor with the approval of the Owner may modify this list of related areas.

B. All ORT’s and the FAT must be complete and approved prior to beginning the RAT. Documentation requirements will be discussed with the Commissioning Coordinator and Owner. The Commissioning Coordinator will create the logs, and record the information. The logs will be submitted to the Owner for acceptance at the conclusion of the test and have the logs available for review during the test.

C. A written procedure will be submitted to the Owner 60 days prior to the test for approval and comment. A sample startup activity list for the Primary Pump Station is provided below.
<table>
<thead>
<tr>
<th>PRIMARY PUMP STATION STARTUP ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Verify completion of ORT’s and FAT.</td>
</tr>
<tr>
<td>2. Verify the Owner has approved the RAT procedure.</td>
</tr>
<tr>
<td>3. Verify all downstream systems are ready to accept flow. (See Table 2 Group #1 for a list of related systems.)</td>
</tr>
<tr>
<td>4. Startup meeting with Owner, Plant Operators, Commissioning Coordinator and Engineer reviewing the startup plan.</td>
</tr>
</tbody>
</table>

**Primary Pump Station**

- The Modified Primary Biofilter and Electrical Building should be operating. After Primary Pumps 23-P-1100, -1200, -1300, -1400, -1500 are operating and proven reliable, and Gates 23-G-3100, -3110, -3120, 3130 are operating and proven reliable the RAT can commence.

| 1. Open the appropriate pump isolation valves. |
| 2. Open the appropriate discharge gates, to EQ, Anoxic, or Aeration Basins. |
| 4. Set the HOA switch for Pumps 23-P-1100, -1200, -1300, -1400, -1500 to Auto. |
| 5. Open the appropriate gates to introduce flow to the wet well. |
| 6. Verify the operation of the pump station. |
| 7. Verify the flow meter is reading. |
| 8. Start the clock for the RAT. |
A test and issue log will be the only required documentation for the Primary Pump Station RAT. A sample log sheet is provided below.

<table>
<thead>
<tr>
<th>PRIMARY PUMP STATION TEST AND ISSUE LOG</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Activity/Equipment</td>
<td>Start Time/Date</td>
<td>Verify Proper Operation Initial Y=Yes N=No Stop Time/Date Comments/Issues (Use additional sheet if needed.)</td>
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<td></td>
</tr>
<tr>
<td>Pump 1, 23-P-1100</td>
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<td></td>
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<td></td>
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<tr>
<td>Pump 2, 23-P-1200</td>
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<td>Pump 3, 23-P-1300</td>
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<tr>
<td>Pump 4, 23-P-1400</td>
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<tr>
<td>Pump 5, 23-P-1500</td>
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<tr>
<td>Level Sensor LT-23-1003</td>
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<tr>
<td>Level Alarm Low/High LT-23-1004</td>
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<td></td>
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<tr>
<td>Magnetic Flow Meter 23-M-1010</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Gate 23-G-3100</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Gate 23-G-3110</td>
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<tr>
<td>Gate 23-G-3120</td>
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<td></td>
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<tr>
<td>Gate 23-G-3130</td>
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<tr>
<td>Level Sensor LE-23-1001</td>
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<tr>
<td>Level Sensor LE-23-1000</td>
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</tr>
</tbody>
</table>

Note:

Contractor Approval:

Engineer Approval:

Owner Approval:
SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 017500 “Commissioning” for commissioning requirements.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning agents (submitted by the Contractor)

B. Contractor's List of Incomplete Items: Initial submittal by the Contractor at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal by the Contractor at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include comments from the Construction Manager, Owner and Engineer.
4. Submit list of incomplete items in the following format:
   a. MS Excel electronic file. Engineer will return annotated copy.
   b. PDF electronic file. Engineer will return annotated copy.
   c. Three paper copies unless otherwise indicated. Engineer will return two copies.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 14 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number where applicable.
   a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Engineer's signature for receipt of submittals.
5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 14 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video as required.
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion at least 14 days prior to the work being completed and ready for final inspection and tests. On receipt of request, Engineer and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items identified by Engineer, that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.5 FINAL COMPLETION PROCEDURES

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
1. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
2. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.6 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

D. Operating manuals, technical manuals and instructions. The Contractor's attention is directed to the condition that one percent (1%) of the contract price will be deducted from any monies due the Contractor as progress payments if at the seventy-five percent (75%) construction completion point the approved technical manuals have not been submitted in accordance with Section 013300 entitled, "Contractor Submittals". The aforementioned amount will be retained by the Owner as the agreed estimated value of the approved technical manuals. Any such retention of money for failure to submit the approved technical manuals on or before the seventy-five percent (75%) construction completion point shall be in addition to the retention of any payments due to the Contractor as specified in Article 4 of the Contract.

E. Releases from all parties who are entitled to claims against the subject project, property or improvement pursuant to the provisions of law.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.
PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Remove snow and ice to provide safe access to building.
   f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   h. Sweep concrete floors broom clean in unoccupied spaces.
   i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
   j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
   k. Remove labels that are not permanent.
   l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
   m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
   n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
   o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
   p. Leave Project clean and ready for occupancy.
C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
   a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Engineer will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Engineer.
   a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
   b. Enable inserted reviewer comments on draft submittals.

2. Four (4) paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. One set will be provided to the Engineer and three sets to the Owner.

C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Engineer will return copy with comments.

1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within 15 days of receipt of Engineer's comments and prior to commencing demonstration and training.
PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.

B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.

C. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Engineer.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily

G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.

4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
   1. Startup procedures.
   2. Equipment or system break-in procedures.
   3. Routine and normal operating instructions.
   4. Regulation and control procedures.
   5. Instructions on stopping.
   7. Seasonal and weekend operating instructions.
   8. Required sequences for electric or electronic systems.
   9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Color, pattern, and texture.
   5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.

F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823
SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: The Contractor shall submit one (1) set of marked-up record prints to the Engineer.

B. Record Specifications: The Contractor shall submit one paper copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy of each submittal to the Engineer.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Record data as soon as possible after obtaining it.

c. Record and check the markup before enclosing concealed installations.
2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.

3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Engineer and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.

2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.

3. Refer instances of uncertainty to Engineer through Construction Manager for resolution.

4. Engineer will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Identification: As follows:

   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Engineer and Construction Manager.
   e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy.
2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as paper copy.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Engineer's and Construction Manager's reference during normal working hours.

END OF SECTION 017839
SECTION 018110 - SEISMIC DESIGN CRITERIA

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes seismic design criteria for the following:
   1. Anchorage of mechanical and electrical equipment and piping.
   2. Seismic design of tanks and anchorage of tanks.
   3. Other structures or items as specified or indicated on the Drawings.

1.2 REFERENCES

A. International Code Council (ICC) documents as follows:
   CBC California Building Code, 2016 Edition

B. American Society of Civil Engineers (ASCE) documents as follows:

1.3 SUBMITTALS

A. Shop Drawings and Calculations: Submit shop drawings and structural calculations in accordance with Section 013300 – Contractor Submittals. All drawings and calculations shall be signed and sealed by a licensed Civil or Structural engineer as required below under “Qualifications.”

B. ICC-ES reports for concrete anchors.

1.4 QUALITY ASSURANCE

A. Qualifications
   1. Licensed Professionals: Design of items required by this Section and other items not specifically shown in the Contract Documents shall be performed by a Structural Engineer licensed to practice in the state of California.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Design Criteria: Design in accordance with the requirements of the California Building Code and ASCE 7.
   1. Seismic acceleration variables to be used in design are as shown in the Drawings.
   2. Seismic Importance Factor for Anchorage of Mechanical and Electrical Equipment: 1.50.
   4. Do not use friction to resist sliding due to seismic forces.
5. Use only headed anchor bolts, adhesive anchors, or welded studs for anchors resisting seismic forces. Embedded anchor bolts used to resist seismic forces shall have a standard hex bolt head.
   a. Adhesive anchors must have current ICC-ES reports showing that the anchors meet CBC requirements when installed in cracked substrates.
   b. Do not use other types of anchors unless indicated on the Drawings or approved in writing by Engineer.
   c. Seismic forces must be resisted by direct bearing on the fasteners used to resist seismic forces. Do not use connections which use friction to resist seismic forces.

PART 3 - EXECUTION

Not Used

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This section includes design criteria for the following when exposed to wind forces:
   1. Anchorage of mechanical and electrical equipment and piping.
   2. Design of tanks and anchorage of tanks.
   3. Other structures or items as specified or indicated on the Drawings.

1.2 REFERENCES

A. International Code Council (ICC) documents as follows:


B. American Society of Civil Engineers (ASCE) documents as follows:


1.3 SUBMITTALS

A. Shop Drawings and Calculations: Submit shop drawings and structural calculations in accordance with Section 01330 – Contractor Submittals Procedures. All drawings and calculations shall be signed and sealed by a licensed Structural engineer as required below under “Qualifications.”

B. ICC-ES reports for concrete anchors.

1.4 QUALITY ASSURANCE

A. Qualifications

   1. Licensed Professionals: Design of items not specifically shown in the Contract Documents shall be performed by a professional Structural Engineer licensed to practice in the state of California.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Design Criteria: Design in accordance with the requirements of the California Building Code, ASCE 7 and in accordance with design criteria indicated in the drawings.

   1. Use only headed anchor bolts, adhesive anchors, or welded studs for anchors resisting wind forces. Embedded anchor bolts used to resist wind forces shall have a standard hex bolt head.

      a. Adhesive anchors must have current ICC-ES reports showing that the anchors meet CBC requirements.

      b. Do not use other types of anchors unless indicated on the Drawings or approved in writing by the Engineer.
c. Wind forces must be resisted by direct bearing on the fasteners used to resist wind forces.

PART 3 - EXECUTION

Not Used

END OF SECTION
SECTION 020960 – TEMPORARY BYPASS PUMPING SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section includes requirements for implementing a temporary pumping system for the purpose of diverting sewage and process flows around work areas as needed to accomplish the work.

B. The Contractor shall maintain the sewage and process flows through the existing system at all times during construction. Sewage and process flows shall not be allowed to back up and surcharge within the system. To accomplish this, bypass pumping of sewage and process flows may be required by the Contractor. Section 2.3 identifies potential areas of work where temporary bypass pumping may be required. Contractor shall determine if this and any additional bypass pumping associated with the project work will be required.

C. The Contractor shall coordinate all bypass pumping work with the Owner or Owner’s Representative.

D. If bypass pumping is required or desired, the requirements of this section shall apply.

1.2 QUALITY ASSURANCE

A. Follow national standards and as specified herein.

B. Perform leakage and pressure tests on discharge piping using clean water, before operation. Notify Engineer 24 hours prior to testing.

C. Maintain and inspect temporary pumping system every two hours. The Contractor shall have a responsible operator on site when pumps are operating.

D. Keep and maintain spare parts for pumps and piping on site, as required.

E. Maintain adequate hoisting equipment and accessories on site for each pump.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 013300.

1. Detailed plan and description of proposed pumping system. Indicate number, size, material, location and method of installation of suction and discharge piping, size of pipeline or conveyance system to be bypassed, staging area for pumps, site access point, and expected flow.
   a. Size and location of manhole or access points for suction and discharge hose or piping.
   b. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill, if buried.
   c. Temporary pipe supports and anchoring required.
d. Thrust and restraint block sizes and locations.
e. Sewer plugging method and type of plugs.
f. Bypass pump sizes, capacity, number of each size to be on site and power requirements.
g. Backup pump, power and piping equipment.
h. Calculations of static lift, friction losses, and flow velocity. Pump curves showing pump operating range.
i. Design plans and computation for access to bypass pumping locations indicated on drawings.
j. Calculations for selection of bypass pumping pipe size.
k. Method of noise control for each pump and/or generator.
l. Method of protecting discharge manholes or structures from erosion and damage.
m. Schedule for installation and maintenance of bypass pumping lines.
n. Procedures to monitor upstream mains for backup impacts.
o. Procedures for setup and breakdown of pumping operations.
p. Emergency plan detailing procedures to be followed in event of pump failures, sewer overflows, service backups, and sewage spillage.
q. List of equipment for spill containment and cleanup.

2. Maintain copy of emergency plan on site for duration of project.

B. Certify bypass system will meet requirements of codes, and regulatory agencies having jurisdiction.

1.4 CONTRACTORS RESPONSIBILITY FOR OVERFLOWS AND SPILLS
A. Schedule and perform work in manner that does not cause or contribute to incidence of overflows, releases or spills of sewage from sanitary sewer system or bypass operation.

1.5 DELIVERY AND STORAGE
A. Transport, deliver, handle, and store pipe, fittings, pumps, ancillary equipment and materials to prevent damage and following manufacturer’s recommendations.

1. Inspect all material and equipment for proper operation before initiating work.

B. For material found to be defective or damaged due to manufacturer or shipment;

1. When repairable: Repair as recommended by manufacturer.
2. When not repairable: Replace before initiating work.
3. Repair or replacement of defective or damaged material and equipment will be at no cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Discharge and Suction Pipes: Approved by Engineer.

1. Discharge piping: Determined according to flow calculations and system operating calculations.
2. Suction piping: Determined according to pump size, flow calculations, and manhole/structure depth following manufacturer’s specifications and recommendations.

B. Polyethylene Plastic Pipe:

1. High density solid wall and following ASTM F714 Polyethylene (PE) Plastic Pipe (SDR-DR) based on Outside Diameter, ASTM D1248 and ASTM D3550.
2. Homogenous throughout, free of visible cracks, discoloration, pitting, varying wall thickness, holes, foreign material, blisters, or other deleterious faults.

C. High-Density Polyethylene (HDPE).

1. Homogenous throughout, free of visible cracks, discoloration, pitting, varying wall thickness, holes, foreign material, blisters, or other deleterious faults.
   a. Defective areas of pipe: Cut out and joint fused as stated herein.
2. Assembled and joined at site using couplings, flanges or butt-fusion method to provide leak proof joint. Follow manufacturer’s instructions and ASTM D 2657.
   a. Threaded or solvent joints and connections are not permitted.
3. Fusing: By personnel certified as fusion technicians by manufacturer of HDPE pipe and/or fusing equipment.
4. Butt-fused joint: True alignment and uniform roll-back beads resulting from use of proper temperature and pressure.
   a. Allow adequate cooling time before removal of pressure.
   b. Watertight and have tensile strength equal to that of pipe.
   c. Acceptance by Engineer before insertion.

D. Flexible Hoses and Associated Couplings and Connectors.

1. Abrasion resistant.
2. Suitable for intended service.
3. Rated for external and internal loads anticipated, including test pressure.
   a. External loading design: Incorporate anticipated traffic loadings, including traffic impact loading.
4. When subject to traffic loading, compose system, such as traffic ramps or covers.
   a. Install system and maintain H-20 loading requirements while in use or as directed by the Engineer.

E. Valves and Fittings: Determined according to flow calculations, pump sizes previously determined, and system operating pressures.

F. Plugs: Selected and installed according to size of line to be plugged, pipe and manhole configurations, and based on specific site.

1. Additional plugs: Available in the event a plug fails. Plugs will be inspected before use for defects which may lead to failure.

G. Aluminum “irrigation type” piping or glued PVC piping will not be permitted.

H. Discharge hose will only be allowed in short sections when approved by Engineer.
2.2 EQUIPMENT

A. Pumps.

1. Fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in priming system.
2. Electric or diesel powered.
   a. Diesel powered equipment shall be supplied with hospital grade mufflers for noise suppression. Equipment shall meet air quality exhaust criteria of the local Air Pollution Control District as applicable.
3. Constructed to allow dry running for long periods of time to accommodate cyclical nature of influent flows.

B. Provide.

1. Necessary stop/start controls for each pump.
2. One standby pump of each size maintained on site.
   a. On-line, isolated from primary system by a valve.
3. Quiet flow pumps.

2.3 DESIGN REQUIREMENTS

A. The anticipated flow in areas that may require bypass pumping is given based on historical plant influent and/or process flows. Please note that the plant flows are not constant and vary during any given day and/or season. Bypass pumping will be required to accommodate hourly flow variations based on influent flow received at the treatment facility. Flow areas are given for the following areas where bypass pumping may occur:

1. Bypass Line from Secondary Biofilter Effluent Box to Fixed Film Reactor Pump Pit (line 124 in the yard piping schedule – Reference Sheet C-13 in the design drawings):
   a. Peak Flow = 6.0 MGD (Verify with Engineer prior to completing the bypass pumping system design).
   b. This may be required to install the 24” temporary bypass line from the primary biofilter to the existing secondary clarifier.

2. Bypass Line for existing 6” gravity sewer line (line 105 in the yard pipe schedule). This line is to be rerouted (with new piping and manholes) in two different locations. Bypass pumping may be required for each location or may be coordinated for both tie-in locations to be completed at one time. Bypass would extend from unimpacted manholes south of the site (off property) to unimpacted manholes to the north that could be separated by as much as 400 feet (line 105 in the yard piping schedule – Reference Sheets C-12, C-13, and C-14 in the design drawings.
   a. Peak Flow = 1.0 MGD (Verify with Engineer and Owner prior to completing the bypass pumping system design).

3. Bypass Line for existing 12/18” pressure sewer main (line 114 in the yard piping schedule – Reference Sheets C-12 and C-13 in the design drawings). If possible, this tie-in may be completed by coordinating some acceptable downtime of the source lift stations (usually at night during low-flow events). Depending on the allowable downtime, bypass pumping may not be required for this application.
a. Peak Flow = 2.0 MGD (Verify with Engineer and Owner prior to completing the bypass pumping system design).

4. Bypass line for the Supernatant Line and Work associated with the modification of the existing Sludge Pond Supernatant Pump Station – Reference Sheets C-38 and C-39 in the design drawings. The maximum allowed “down” time for this pump station is limited to a single, continuous 24-hour period and must be coordinated with the Owner. Additional 24-hour periods of “down” time may be allowed following coordination and approval by the Owner. Bypass pumping may be utilized to allow the completion of this work outside of the allowed “down” time. The suction line for pump station may be isolated at the existing pond outlet boxes.
   a. Peak Flow = 300 GPM (Verify with Engineer and Owner prior to completing the bypass pumping system design).

B. Provide pipeline plugs and pumps of adequate size to handle peak flow, and temporary discharge piping to ensure total flow associated with structures can be safely diverted around structures to be constructed or modified.

PART 3 - EXECUTION

1.1 PREPARATION
   A. Determining location of bypass pipelines.
      1. Minimal disturbance to existing utilities and facilities.
         a. Field locate existing utilities in proposed bypass area including convenient points.
      2. Obtain Engineer’s approval of location.

1.2 INSTALLATION AND REMOVAL
   A. Provisions and requirements must be reviewed by Engineer before starting construction.

   B. Construct temporary bypass pumping structures and make connections to existing and/or newly constructed structures requiring bypass pumping and as required to provide adequate suction conduit.

   C. Plugging or blocking of sewage flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance of work, remove in a manner that permits the sewage flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.

   D. When working inside structure and manholes, exercise caution. Follow OSHA, Local, State and Federal requirements. Take required measures to protect workforce against sewer gases and/or combustible or oxygen-deficient atmosphere.

   E. Installation of Bypass Pipelines:
      1. Pipeline may be placed along shoulder of roads and access ways.
      2. If a pipeline must be placed across a roadway and/or access way provide adequate roadway maps suitable for expected traffic loads associated with normal plant operations and construction traffic.
3. Following Engineer’s approval, the contractor may place bypass piping in trenches and cover with temporary pavement.

F. During bypass pumping operation, protect existing utilities and infrastructure from damage inflicted by equipment.

G. Upon completion of bypass pumping operations, and after the receipt of written permission from Engineer, remove piping, restore property to pre-construction condition and restore pavement.

1.3 MEASUREMENT AND PAYMENT

A. Except as otherwise specified herein, providing for and complying with requirements in this Section will not be measured for payment, but cost will be considered incidental to Contract.

END SECTION 020960
SECTION 024100 - DEMOLITION, SALVAGE, AND RECONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. The Contractor shall demolish, salvage and reconstruct existing civil, landscaping, structural, architectural, mechanical, HVAC, electrical, and instrumentation facilities as indicated, in accordance with the Contract Documents.

1.2 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.3 COORDINATION AND PROJECT CONDITIONS

A. The Contractor shall carefully coordinate the Work in areas where existing facilities are interconnected with new facilities and where existing facilities remain operational. The Work as indicated is not all inclusive, and the Contractor shall be responsible to perform the reconstruction indicated plus that which can be reasonably inferred from the Contract Documents as necessary to complete the Project. The Specifications and Drawings identify the major facilities that shall be demolished and reconstructed, but auxiliary utilities such as water, air, chemicals, drainage, lubrication, fluid power, electrical wiring, controls, and instrumentation are not necessarily shown. The Contractor shall comply with sequencing requirements in Section 01100 – Summary of Work

B. The Contractor shall note that the Drawings used to indicate demolition and reconstruction are based on record drawings of the existing facilities. Prior to bidding, the Contractor shall conduct a comprehensive survey at the Site to verify the scope of Work, and the extent of auxiliary utilities. A partial set of record drawings is available for review from the Owner.

C. Buildings and/or structures to be demolished will be vacated and their use discontinued before start of the demolition.

D. Owner assumes no responsibility for buildings and structures to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

E. Hazardous Materials:

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract or negotiated with the Contractor via a change order.
F. On-site storage or sale of removed items or materials is not permitted.

G. Arrange demolition schedule so as not to interfere with Owner's operations at the adjacent WRF.

H. While demolition and reconstruction are being performed, the Contractor shall provide adequate access for the continued operation and maintenance of equipment and treatment processes at the existing WWTP. The Contractor shall erect and maintain fences, warning signs, barricades, and other devices around the reconstruction as required for the protection of the Contractor's employees and the Owner's personnel. The Contractor shall remove such protection when reconstruction activities are complete, or as work progresses, or when directed by the Engineer.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

C. Pre-demolition Conference: Conduct conference at Project site.

1.5 CONTRACTOR SUBMITTALS

A. Demolition and reconstruction activities and procedures, including operational sequence, shall be submitted to the Engineer for approval. The procedures shall provide for safe conduct of the Work, careful removal and disposition of materials and equipment, protection of existing facilities which are to remain undisturbed, coordination with existing facilities to remain in service, and timely disconnection and reconnection of utility services. The procedures shall include a detailed description and time schedule of the methods and equipment to be used for each operation and the sequence of operation. A storage plan for salvaged items shall be included.

1.6 DEMOLITION AND ABANDONMENT

A. Existing pavement, concrete, retaining walls, curb and gutter, sidewalks, buildings, yard structures, equipment, piping, valves, ductwork, duct banks, electrical gear, instrumentation, utilities, and related appurtenances such as anchors, supports, and hardware indicated or required to be demolished as part of the Work shall be removed and disposed of unless otherwise indicated. Removal of buried structures, utilities, and appurtenances includes the related excavation and backfill as required. Removed items shall be disposed of offsite by the Contractor.

1.7 SALVAGE

A. Items of existing equipment, piping, valves, electrical gear, instrumentation, utilities, and appurtenances indicated in the drawings to be salvaged shall be removed without any degradation in condition from that prior to removal. Salvaged items shall be stockpiled and protected on the Site at a location directed by the Engineer. The Contractor shall be responsible to properly safeguard the salvaged items against damage and loss during removal and handling.

1.8 RELOCATION

A. Items of existing equipment, piping, valves, electrical gear, instrumentation, utilities, and appurtenances required to be relocated shall be removed without any degradation in condition from
that prior to removal. The Contractor shall be responsible to properly safeguard the relocated items against damage and loss during removal, handling, storage, and installation in the new location.

B. Items to be relocated/salvaged include but are not limited (see Drawings for any additional items):

<table>
<thead>
<tr>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surge Anticipator Valve (51-V-2520) (Relocate)</td>
</tr>
<tr>
<td>Two (2) NMWD distribution pumps. (Relocate)</td>
</tr>
<tr>
<td>One (1) Bisulfite Chemical Storage Tank (Salvage)</td>
</tr>
<tr>
<td>One (1) 24-inch magmeter (Reference drawing D-5) (Salvage)</td>
</tr>
<tr>
<td>All stainless steel body valves that are removed as part of this project.</td>
</tr>
</tbody>
</table>

1.9 REHABILITATION

A. Existing WWTP site shall be restored and landscaped as noted in the drawings.

1.10 DISPOSAL

A. The Contractor shall be responsible for the legal, offsite disposal of debris resulting from reconstruction in compliance with local, state, and federal codes and requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Inventory and record the condition of items to be removed and salvaged.

3.2 GENERAL

A. The Contractor shall coordinate demolition and reconstruction Work with the Owner and Engineer. Unless otherwise indicated, the Contractor shall be responsible for the sequence of activities. Work shall be performed in accordance with applicable safety rules and regulations.

B. The Contractor shall verify that any utilities connected to structures, equipment, and facilities to be removed, relocated, salvaged, replaced, or abandoned are rendered inoperable, replaced with new utilities, or adequately bypassed with temporary utilities before proceeding with demolition and reconstruction. The Owner shall arrange the shutoff of indicated utilities when requested by the Contractor.

C. The Contractor shall take precautions to avoid damage to adjacent facilities and to limit the Work activities to the extent indicated. If reconstruction beyond the scope indicated is required, the Contractor shall obtain approval from the Engineer prior to commencing.
3.3 PROTECTION OF EXISTING FACILITIES

A. Before beginning any reconstruction, the Contractor shall carefully survey the existing facilities and examine the Specifications and Drawings to determine the extent of reconstruction and coordination with the Work. Existing facilities not subject to demolition shall be protected and maintained in accordance with Section 015300 – Protection of Existing Facilities. Damaged existing facilities shall be repaired to the previous condition or replaced.

B. Persons shall be afforded safe passages around areas of demolition.

C. Erect a plainly visible fence around drip line of individual trees or around the perimeter drip line of groups of trees to remain.

D. Provide temporary barricades and other protection required to prevent injury to people and adjacent buildings and facilities to remain.

E. Provide protection to ensure safe passage of people around demolition areas.

F. Structural elements shall not be overloaded. The Contractor shall be responsible for shoring, bracing, or adding new supports as may be required for adequate structural support as a result of work performed under this Section. The Contractor shall remove temporary protection when the work is complete or when so authorized by the Engineer.

G. The Contractor shall carefully consider bearing loads and capacities before placement of equipment and material on Site. In the event of any questions as to whether an area to be loaded has adequate bearing capacity, the Contractor shall consult with the Engineer prior to the placement of such equipment or material.

H. The Contractor shall not destroy any permanent survey points without the consent and review of the District. Any permanent monuments or points destroyed shall be replaced by a licensed land surveyor who is licensed in the State of California. Replacement shall be at the Contractor’s expense.

I. All valve boxes, catch basins, manholes, and vaults that are to remain in service shall be adjusted to new grade to coordinate with final grade or pavement.

3.4 DEMOLITION, SALVAGE, AND RELOCATION

A. The Contract Documents indicate existing facilities to be demolished, salvaged, and/or relocated. Auxiliary utilities including such services as water, air, chemicals, drainage, lubrication, fluid power, electrical wiring, controls, and instrumentation are not necessarily indicated. The Contractor shall verify the scope of the Work to remove the equipment indicated; coordinate its shutdown, removal, replacement, or relocation; and submit an outage plan in accordance with Section 011000 – Summary of Work. The removal of existing facilities for demolition, salvage, and relocation shall include the following requirements:

1. Demolish indicated buildings/structures and site improvements completely. Use methods required to complete the Work within limitations of governing regulations.

2. Equipment supports, including concrete pads, baseplates, mounting bolts, and support hangers, shall be removed. Damage to the existing structure shall be repaired as indicated.
3. Exposed piping including vents, drains, and valves shall be removed. Where exposed piping penetrates existing floors and walls, the piping, including wall thimbles, shall be removed to a minimum depth of 2-inches. Resultant openings in the structure shall be repaired as indicated.

4. Electrical control panels, junction boxes, motor control centers, and local switches and pushbuttons shall be removed.

5. Exposed electrical conduits and associated wiring shall be removed. Resultant openings in structures shall be repaired as indicated.

6. Connections to embedded electrical conduits shall be removed a minimum of 2-inches inside the finished surface of the existing structure. Wiring shall be removed and the resulting openings shall be repaired as indicated.

7. Associated instrumentation devices shall be removed.

8. Auxiliary utility support systems shall be removed.

9. The area shall be thoroughly cleaned such that little or no evidence of the previous equipment installation will remain.

10. Asphalt and concrete pavement, curbs, and gutters shall be removed as necessary to perform reconstruction. The limits of removal shall be sawcut. When the required improvements have been constructed, new asphalt and concrete pavement, curbs, and gutters shall be placed to match the original unless otherwise indicated.

11. Footings, foundation walls, below-grade construction and concrete slabs on grade shall be demolished and removed completely.

12. Below-grade areas and voids resulting from demolition of structures shall be completely filled. Fill and compaction shall be in accordance with Section 312000 – Earth Moving. After fill and compaction, surfaces shall be graded to meet adjacent contours and to provide flow to surface drainage structures, or as indicated.

13. When existing pipe is removed, the Contractor shall plug the resulting open ends whether or not so indicated. Where removed piping is exposed, the remaining piping shall be blind-flanged or fitted with a removable cap or plug.

14. When existing piping is removed from existing structures, the Contractor shall fill resulting openings in the structures and repair any damage such that the finished rehabilitated structure shall appear as a new homogeneous unit with little or no indication of where the new and old materials join. The openings in water-bearing structures shall be filled with non-shrink grout to be watertight and reinforced as required or indicated. In locations where the surface of the grout will be exposed to view, the grout shall be recessed approximately 1/2-inch and the recessed area filled with cement mortar grout.

15. Electrical reconstruction shall be conducted by the Contractor in a safe and proper manner to avoid injury from electrical shock to the Owner’s and Contractor’s personnel. Electrical equipment to be shut off for a period of time shall be tagged, locked out, and sealed with a crimped wire and lead seal and made inoperable. At no time shall electrical wiring or connections, which are energized or could become energized be accessible to Contractor, Owner, or other personnel without suitable protection or warning signs.

B. The Contractor shall perform, in the presence of Owner, an initial and final inspection of existing equipment that will be relocated to ensure the equipment condition is maintained as documented during the initial inspection. The Contractor shall make repairs and modifications necessary to restore the equipment to its original condition at no additional cost to the Owner.
3.5 ABANDONMENT

A. Existing facilities to be abandoned shall be prepared as indicated. Where existing buried piping is to be abandoned, the Contractor shall completely remove the abandoned pipe to the points indicated on the plans. For abandoned segments that connect into active segments to remain, piping shall be removed to the connection point, and stubbed and capped at the connection point.

B. Where removal is deemed unfeasible, the contractor may abandon in place after receiving permission from Owner. In this case, abandoned pipe shall be removed for a distance of 5-feet from any connecting structures. Openings at the existing structures shall be repaired. The remaining pipe shall be capped at both ends prior to backfill. Buried piping, 12-inches diameter or greater shall be completely sand-filled prior to closure of the piping ends.

C. Where abandoned underground structures are encountered, the contractor shall remove the abandoned structures to sufficient depth to allow for new underground lines to cross or for new structures/foundations. Extent of removal shall be coordinated with Owner.

3.6 REHABILITATION

A. Certain areas of existing structures, piping, conduits, and the like will be affected by Work necessary to complete modifications under this Contract. The Contractor shall be responsible to rehabilitate those areas affected by its construction activities.

B. Where new piping is installed in existing structures, the Contractor shall accurately position core-drilled openings in the concrete as indicated or otherwise required. Openings shall be of sufficient size to permit a final alignment of pipelines and fittings without deflection of any part and to allow adequate space for satisfactory packing where pipe passes through the wall to provide watertightness around openings so formed. The boxes or cores shall be provided with continuous keyways to hold the filling material in place, and they shall have a slight flare to facilitate grouting and the escape of entrained air during grouting. Before placing the non-shrink grout, concrete surfaces shall be sandblasted, thoroughly cleaned of sand and any other foreign matter, and coated with epoxy bonding compound.

C. Pipes, castings, or conduits shall be grouted in place by pouring in grout under a head of at least 4-inches. The grout shall be poured or rammed or vibrated into place to fill completely the space between the pipes, castings, or conduits, and the sides of the openings so as to obtain the same watertightness as through the wall itself. The grouted casings shall then be water cured.

D. When new piping is to be connected to existing piping, the existing piping shall be cut square and ends properly prepared for the connection. Any damage to the lining and coating of the existing piping shall be repaired. Dielectric insulating joints shall be installed at interconnections between new and existing piping.

E. Abandoned connections to piping and conduits shall be terminated with blind flanges, caps, and plugs suited for the material, type, and service of the pipe or conduit.

F. Where existing handrailing is removed, post embedments and anchors shall be removed and post holes shall be filled with non-shrink grout flush to the floor surface. At the point of continuation of existing handrailing, a new post with rail connections matching the existing handrailing system.
shall be installed. New posts in existing concrete floors shall be installed in core-drilled socket holes and the annular space between the post and hole filled with non-shrink grout.

G. Where reconstruction activities damage the painting and coating of adjacent or nearby facilities, the damaged areas shall be surface prepared and coated in accordance with Section 09 90 00 – Painting and Coating to match the original painting and coating with a compatible system.

3.7 DISPOSAL

A. Demolition and removal of debris shall minimize interference with roads, streets, walks, and other adjacent occupied or used facilities, which shall not be closed or obstructed without permission from the Owner. Alternate routes shall be provided around closed or obstructed traffic ways.

B. Site debris, rubbish, and other materials resulting from reconstruction operations shall be legally removed and disposed of. Structures and equipment to be demolished shall be cleaned prior to demolition and the wash water properly disposed of. No trace of these structures shall remain prior to placing of backfill in the areas from which structures were removed.

C. Refuse, debris, and waste materials resulting from demolition and clearing operations shall not be burned.

3.8 OCCUPANCY AND POLLUTION CONTROL

A. Water sprinkling, temporary enclosures, chutes, and other suitable methods shall be used to limit dust and dirt rising and scattering in the area. The Contractor shall comply with government regulations pertaining to environmental protection.

B. Water shall not be used if it creates hazardous or objectionable conditions such as ice, flooding, or pollution.

3.9 CLEANING

A. During and upon completion of Work, the Contractor shall promptly remove tools and equipment, surplus materials, rubbish, debris, and dust and shall leave areas affected by Work in a clean, approved condition.

B. Adjacent structures shall be cleaned of dust, dirt, and debris caused by reconstruction, as directed by the Engineer or governing authorities, and adjacent areas shall be returned to condition existing prior to start of Work.

END OF SECTION
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PART 1 - GENERAL

1.1 THE REQUIREMENT:
   A. The Contractor shall furnish, fabricate and place all concrete and masonry reinforcement steel, including all the tie wires, clips, supports, chairs, spacers and other accessories, all as shown and specified in the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE:
   A. Contractor Submittals. 013000
   B. Cast-In-Place Concrete. 033000
   C. Concrete Formwork. 031000
   D. Concrete Unit Masonry. 042000

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS:
   A. Codes:
      The Building Code, as referenced herein, shall be the latest California Building Code (CBC).
   B. Commercial Standards:
      ACI 315 Details and Detailing of Concrete Reinforcement.
      ACI 318-14 Building Code Requirements for Reinforced Concrete.
      ACI 350-06 Code Requirements for Environmental Engineering Concrete Structures.
      AWS D1.4-11 Structural Welding Code - Reinforcing Steel.
      ASTM A 615 Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
1.4 CONTRACTOR SUBMITTALS:

A. The Contractor shall furnish to the Engineer reinforcing steel placing drawings. These drawings shall show the number, grade, size, length, mark, location and bending diagrams for all reinforcing steel and related products, together with lists of bent and straight bars in accordance with the ACI Detailing Manual (latest edition) of the American Concrete Institute and the requirements specified herein and shown on the Contract Drawings. The Engineer may or may not review the placement drawings. Any review of the placement drawings by the Engineer will be limited to general compliance with the Contract Documents and will not be returned to the Contractor. Reinforcing steel placement will be checked in the field using the design drawings. Any discrepancies, errors or omissions from the requirements of the Contract Documents shall be corrected prior to placement of concrete and at the sole expense of the Contractor.

1.5 QUALITY ASSURANCE:

A. If requested by the Engineer, the Contractor shall provide a certified copy of the mill test report showing physical and chemical analysis for each heat of reinforcement steel delivered.

PART 2 - PRODUCTS

2.1 REINFORCEMENT STEEL:

A. Reinforcement steel for all cast-in-place reinforced concrete construction shall conform to the following requirements:

1. Bar reinforcement shall conform to the requirements of ASTM A 615 for Grade 60 Billet Steel Reinforcement with supplementary requirement S-1, or as otherwise shown.

2. Welded wire fabric reinforcement shall conform to the requirements of ASTM A 185 and the details shown. Welded wire fabric with longitudinal wire equal to or less than 4.0 size wire shall be either furnished in flat sheets or in rolls with a core diameter or not less than 10-inches. Welded wire fabric with longitudinal wires larger than 4.0 size shall be furnished in flat sheets only.

3. Spiral reinforcement shall be cold-drawn steel wire conforming to the requirements of ASTM A 82.

B. Accessories:

1. The Contractor shall furnish and install all accessories including necessary chairs or bolsters, concrete blocks (dobies), tie wires, supports, spacers and other devices to position reinforcement during concrete placement.
2. Wire bar supports shall be made of plain cold-drawn steel wire with pre-molded, gray-colored, plastic tips to the legs of the support. The plastic shall have a thickness of 1/8-inch or greater at points of contact with formwork and extend upward on the wire a minimum of 1/2-inch. Wire sizes and geometric dimensions shall be made in accordance with Table II of the latest edition of CRSI Manual of Standard Practice.

3. Concrete blocks (dobies), used to support and position reinforcement steel, shall have the same or higher compressive strength as specified for the concrete in which it is located. Where the concrete blocks are used on concrete surfaces exposed to view, the color and texture of the concrete blocks shall match that required for the finished surface. Wire ties shall be embedded in concrete block bar supports.

4. The wire tie shall be 16-gauge or heavier, black annealed.

2.2 MECHANICAL COUPLERS:

A. Mechanical couplers shall be provided where shown and where approved by the Engineer. The couplers shall develop a tensile strength which exceeds one hundred fifty percent (150%) of the yield strength of the reinforcement bars being spliced at each splice.

PART 3 - EXECUTION

3.1 GENERAL:

A. All reinforcement steel, welded wire fabric, couplers and other appurtenances shall be fabricated and placed in accordance with the requirements of the Contract Documents, including referenced specifications, codes and standards.

3.2 FABRICATION:

A. Reinforcement steel shall be accurately fabricated to the dimensions and shape shown in the Contract Documents. Fabricating details shall be prepared in accordance with ACI 315, ACI 318, and ACI 350 except as modified by the Drawings. Bends shall conform to bend dimensions defined as standard in accordance with details in the ACI Detailing Manual and/or CRSI Manual of Standard Practice, unless otherwise shown. Bars shall be bent cold and shall not be bent or straightened in a manner that will injure the material. All hooks shall conform to bend dimensions defined as ACI Standard Hooks.

B. The Contractor shall fabricate reinforcement bars within the tolerances shown in the ACI Detailing Manual and/or CRSI Manual of Standard Practice.

C. Reinforcing bars delivered to the field shall be tagged with durable material and marked in a legible manner with waterproof markings. Tags shall show the grade, number of pieces, size and mark or length of bars.

3.3 PLACING:
A. Reinforcing steel shall be accurately positioned as shown on the Contract Documents and shall be adequately supported and wired together to prevent displacement. All reinforcement steel shall be supported or spaced off the forms by concrete or metal supports which are rigid enough to prevent any displacement or the reinforcement steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement. Concrete blocks shall not be used as spacers between mats. All concrete blocks used to space reinforcement steel off vertical formed surfaces shall be tied to the steel with wire ties which are embedded in the blocks. For reinforcement including welded wire fabric over formwork, the Contractor shall furnish concrete or metal supports with plastic covered legs for bar supports.

B. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.

C. Bars additional to those shown which may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position shall be provided by the Contractor at its own expense.

D. Placing Tolerances: Unless otherwise specified, reinforcement placing tolerances shall be within the limits specified in Section 7.5 or ACI 318, except where in conflict with the requirements of The Building Code.

E. Bars may need to be moved to avoid interference with other reinforcement steel, conduits or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be as acceptable to the Engineer. Additional bars may be necessary to prevent cracking or provide additional reinforcement in this case and shall be provided by the Contractor at its own expense.

F. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than three (3) feet on centers in any direction. The construction practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.

3.4 SPACING OF BARS:

A. The clear distance between parallel bars (except in columns and between multiple layers of bars in beams) shall be not less than the nominal diameter of the bars nor less than 1-1/3 times the maximum size of the coarse aggregate, nor less than 1-inch.

B. Where reinforcement in beams or girders is placed in two (2) or more layers, the clear distance between layers shall be not less than 1-inch.

C. In columns, the clear distance between longitudinal bars shall not be less than 1-1/2 times the bar diameter, more less than 1-1/2 times the maximum size of the coarse aggregate, more less than 1-1/2 inches.

3.5 SPLICING:
A. General: Reinforcement bar splices shall only be used at locations shown, unless otherwise acceptable to the Engineer. Reinforcing bar in concrete marked as continuous shall be spliced with a lap of at least 48 bar diameters and no less than 24” for building structures.

B. Splices of Reinforcement: The length of lap for reinforcement bars, shall be in accordance with Contract Drawings for non-building structures (i.e. DAFT, Secondary Clarifiers, Equalization Basin, etc.)

C. Laps of welded wire fabric shall be in accordance with ACI 318 and ACI 350. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each two (2) running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

D. Bending or Straightening: Reinforcement shall not be straightened or re-bent in a manner which will injure the material. Bars with kinks or bends not shown shall not be used. All bars shall be bent cold, unless otherwise permitted by the Engineer. No bars partially embedded in concrete shall be field-bent, except as specifically permitted by the Engineer.

3.6 CLEANING AND PROTECTION:

A. Reinforcing steel delivered to the jobsite shall be suitably stored off the ground and protected from oils, mud, concrete splatter and all conditions conducive to corrosion until embedded in concrete.

B. The surfaces of all reinforcement steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcement shall be re-inspected and, if necessary, re-cleaned.

END OF SECTION 032000
SECTION 032900 – JOINTS IN CONCRETE

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The Contractor shall construct all construction joints, expansion joints and control joints in concrete at the locations shown (where not shown the Contractor shall submit joint layout for Engineer’s approval) and formed in accordance with the details shown in the drawings.

B. Waterstops shall be provided in all construction and expansion joints of hydraulic or below grade structures unless specifically noted otherwise on the drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Cast-In-Place Concrete. 033000
B. Joint Sealants. 079200

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Federal Specifications:

TT-S-00227E Sealing Compound, elastomeric type, multi-component (for Caulking, Sealing, Glazing Buildings and Other Structures)

B. Commercial Standards:

ASTM C 920-86 Specification for Elastomeric Joint Sealants
ASTM D 624-81 Test Method for Rubber Property - Tear Resistance
ASTM D 1752-84 Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1.4 CONTRACTOR SUBMITTALS

A. Waterstop: Prior to production of the waterstop material required under this Contract, the Contractor shall submit for review complete product data, including qualification samples of extruded sections of each size and shape to be used, catalogue cut, technical data, storage requirements, and splicing methods.. The submittal shall also include the manufacturer's certification that the water stop material meets the physical requirements as outlined under paragraph 2.1, herein.

1.5 QUALITY ASSURANCE
A. Waterstop Inspection: Waterstop installation shall be subject to rigid inspection. No waterstop shall be cast in concrete without the Engineer's observation. Not less than twenty-four (24) hours notice shall be provided to the Engineer for scheduling such inspections.

B. Waterstop Field Samples: Prior to use of the waterstop material in the field, a sample of a fabricated mitered cross and a tee constructed of each size or shape of material to be used shall be submitted to the Engineer for review. These samples shall be fabricated so that the material and workmanship represent in all respects the fittings to be furnished under this Contract. Field samples of fabricated fittings (crosses, tees, etc.) may be selected at random by the Engineer for testing by a laboratory at the Owner's expense. When tested, they shall have a tensile strength across the joints equal to at least 600 psi.

C. All field joints in waterstops shall be subject to rigid inspection for misalignment, bubbles, inadequate bond, porosity, cracks, offsets and other defects. All defective joints shall be replaced and all weathered, damaged or otherwise faulty material shall be removed from the site and disposed of by the Contractor at its own expense.

D. Waterstops shall be stored on site where it will not be subjected to freezing temperatures or exposed to the direct rays of the sun.

E. Construction Joint Sealant: The Contractor shall prepare adhesion and cohesion test specimens as specified herein from each shipment of material received at the jobsite. Sealant shall be stored at room temperature and shall not be stored longer than seventy-five percent (75%) of the manufacturer's stated shelf life.

F. The sealant material shall show no signs of adhesive or cohesive failure when tested in accordance with the following procedure:

1. Sealant specimen shall be prepared between two concrete blocks (1-inch by 2-inch by 3-inch). Spacing between the blocks shall be 1/2-inch. Coated spacers (2-inch by 1-1/2 inch by 1/2-inch) shall be used to ensure sealant cross-sections of 1/2-inch by 2-inches with a width of 1/2-inch.

2. Sealant shall be cast and cured according to manufacturer's recommendations except that curing period shall not exceed twenty-four (24) hours.

3. Following curing period, the gap between blocks shall be widened to 1-inch. Spacers shall be used to maintain this gap for twenty-four (24) hours prior to inspection for failure.

1.6 GUARANTEE

A. The Contractor shall provide a three (3) year written guarantee of the entire joint sealant and waterstop installations against faulty and/or incompatible materials and workmanship, together with a statement that it agrees to repair or replace, to the satisfaction of the Owner, at no additional cost to the Owner, any such defective areas which become evident within said three (3) year guarantee period.
PART 2 - PRODUCTS

2.1 PVC WATERSTOPS

A. General: Waterstops shall be extruded from an elastomeric plastic compound consisting of virgin polyvinylchloride and additional plasticizers and stabilizers necessary to meet or exceed the requirements and performance criteria of these Specifications and the Corps of Engineers Specifications CRD-C572. No reclaimed scrap or reprocessed material shall be used.

B. Flatstrip, and Multi-Rib Waterstops: Flatstrip, center-bulb and multi-rip waterstops shall be detailed and as manufactured by: Vinylex Corp or approved equal; provided, that at no place shall the thickness of flat strip waterstops, including the center-bulb type, be less than 3/8-inch. Prefabricated joint fittings shall be used at all intersections of the ribbed-type waterstops.

C. Physical Properties: When tested in accordance with the specified test standards, the waterstop material shall meet or exceed the following requirements:

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<thead>
<tr>
<th>Physical Property, Sheet Material</th>
<th>Value</th>
<th>ASTM Test Method</th>
</tr>
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<tbody>
<tr>
<td>Tensile Strength-Min (psi)</td>
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<td>Ultimate Elongation-Min (percent)</td>
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<td>D 638</td>
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<td>Low Temp. Brittleness-Max (-35 Deg F)</td>
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<td>D 746</td>
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<tr>
<td>Stiffness in Flexure-Min (psi)</td>
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Accelerated Aging (CRD-C572)

<table>
<thead>
<tr>
<th>Physical Property</th>
<th>Value</th>
<th>ASTM Test Method</th>
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<tbody>
<tr>
<td>Tensile Strength-Min (psi)</td>
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<td>D 638</td>
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<tr>
<td>Ultimate Elongation-Min (percent)</td>
<td>300</td>
<td>D 638</td>
</tr>
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</table>

2.2 HYDROPHILIC WATERSTOPS

A. Hydrophilic waterstops where shown on the Drawings, shall be Adeka Ultra Seal MC-2010 MN, Greenstreak “Hydrotite” Hydrophilic rubber waterstops or equal. Hydrophilic waterstops shall be installed according to the manufacturer’s recommendations.

B. Physical Properties: When tested in accordance with the specified test standards, the waterstop material shall meet or exceed the following requirements:

<table>
<thead>
<tr>
<th>Physical Property</th>
<th>Value</th>
<th>ASTM TEST Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness</td>
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</tr>
</tbody>
</table>

C. Hydrophilic Paste: Where required, use a paste to adhere the waterstop to the surface. Paste shall be Adeka P-201 or equal. Paste shall be applied according to the manufacturer’s recommendations.
2.3 JOINT SEALANTS

A. Joint sealant shall be Sikaflex 2c NS or equal. Where sealant is applied in areas to be submerged in liquid, Sikaflex Primer-429 or equal shall be applied first. Contractor shall follow the manufacturer’s recommended application methods.

PART 3 - EXECUTION

3.1 GENERAL

A. Unless otherwise shown, waterstops of the type specified herein, shall be fully continuous for the extent of the joint. The Contractor shall take suitable precautions and means to support and protect the waterstops during the progress of the work and shall repair or replace at its own expense any waterstops damaged during the progress of the work.

B. Suitable precautions shall be taken to shade and protect the exposed waterstop from direct rays of the sun during the entire exposure and until the exposed portion of the waterstop is embedded in concrete.

C. Splices in waterstops shall be performed by heat sealing the adjacent waterstop sections in accordance with the manufacturer's printed recommendations. It is essential that the splices have a tensile strength of not less than sixty percent (60%) of the unspliced materials tensile strength and the continuity of the waterstop ribs and of its tubular center axis be maintained.

3.2 INSTALLATION OF WATERSTOP

A. All joints with waterstops involving more than two (2) ends to be jointed together and all joints which involve an angle cut, alignment change or the joining of two (2) dissimilar waterstop sections shall be prefabricated by the Contractor prior to placement in the forms, allowing not less than 24-inch long strips of waterstop material beyond the joint. Upon being inspected and approved, such prefabricated waterstop joint assemblies shall be installed in the forms and the ends of the 24-inch strips shall be butt welded to the straight run portions of waterstop in place in the forms.

B. Adequate provisions must be made to support the waterstops during the progress of the work and to ensure the proper embedment in the concrete. The symmetrical halves of the waterstops shall be equally divided between the concrete pours at the joints. The center axis of the waterstops shall be coincident with the joint openings. Maximum density and imperviousness of the concrete shall be ensured by thoroughly working it in the vicinity of all joints.

B. Adequate means shall be provided to prevent waterstops from being folded over by the concrete as it is placed. Unless otherwise shown, all waterstops shall be held in place with light wire ties on 12-inch centers which shall be passed through the edge of the waterstop and tied to the curtain of reinforcing steel. In placing concrete around horizontal waterstops, with their flat face in a horizontal plane, concrete shall be carefully worked under the waterstops so as to avoid the formation of air and rock pockets.

3.3 JOINT CONSTRUCTION
A. Joint Location: Construction joints and control joints shall be provided where shown on Drawings or as approved by the Engineer. Do not eliminate or relocate control joints. Any additional or relocation of construction joints proposed by the Contractor must be submitted to the Engineer for written approval. The location of all joints shall be submitted for acceptance by the Engineer.

B. Construction Joints

1. Locate additional or relocated joints where they least impair strength of the member. In general, locate joints within the middle third of spans of slabs, beams and girders. However, if a beam intersects a girder at the joint, offset the joint a distance equal to twice the width of the member being connected. Locate joints in walls and columns at the underside of floors, slabs, beams or girders and at tops of footings or floor slabs. Do not locate joints between beams, girders, column capitals, or drop panels and the slabs above them. Do not locate joints between brackets or haunches and walls or columns supporting them.

2. At all construction joints and at concrete joints indicated on the Drawings to be "roughened", uniformly roughen the surface of the concrete to a full amplitude (distance between high and low points and side to side) of 1/4-in with chipping tools to expose a fresh face. Thoroughly clean joint surfaces of loose or weakened materials by waterblasting or sandblasting and prepare for bonding. At least two hours before and again shortly before the new concrete is deposited, saturate the joints with water. After glistening water disappears, coat joints with neat cement slurry mixed to the consistency of very heavy paste. The surfaces shall receive a coating at least 1/8-in thick, scrubbed-in by means of stiff bristle brushes. Deposit new concrete before the neat cement dries.

3. Unless indicated otherwise, provide joints perpendicular to main reinforcement. Continue reinforcing steel through the joint as indicated on the Drawings.

4. Provide waterstops in wall and slab construction joints in liquid retaining structures and at other locations shown on the Drawings.

5. Do not use keyways in construction joints unless specifically shown on the Drawings or approved by the Engineer.

C. Control Joints

1. Make control joints at locations shown on the Drawings. Do not eliminate or relocate control joints.

2. Extend every other bar of reinforcing steel through control joints or as indicated on the Drawings. Coat the concrete surface with a bond breaker prior to placing new concrete against it as shown on the Drawings. Do not cast reinforcement with bond breaker.

D. Sealant

1. Install sealants in clean dry recesses free of frost, oil, grease, form release agent, loose material, laitance, dirt, dust and other materials which will impair bond at the locations shown on the Drawings. Apply sealant conforming to the manufacturer's recommendations including concrete cure, temperature, moisture, mixing, primer, primer cure time, joint and recess preparation, tooling, and curing. Apply masking tape to each side of the joint prior to
the installation of the sealant and remove afterwards along with any spillage to leave a sealant installation with neat straight edges.

2. Sealant grooves shall be formed as shown on the drawings and shall be protected from damage until final application of the sealant. Care shall be taken to prevent chipping of the sealant groove during removal of forms.

E. Special care shall be used in preparing concrete surfaces at joints where bonding between two (2) sections of concrete is required. Unless otherwise shown, such bonding will be required at all horizontal joints in walls and wall to slab joints. Surfaces shall be prepared by sandblasting and washing for removal of laitance or any objectional material. Joints shall be kept clean until the concrete is placed. Vertical joints shall be clean and free of concrete fins, rock pockets or any objectional material.

END OF SECTION 032900
SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Sections:

   1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: Before placing any concrete, the Contractor shall submit to the Engineer, for review, the complete details of all concrete mix designs which he proposes to use including proportions and gradations of all materials for each class and type of concrete specified herein. The mix designs shall be designed by a certified testing laboratory acceptable to the Engineer. The mix design submittal shall also include test results from at least one (1) trial batch of each class and type concrete. From each trial batch six (6) 6-inch X 12-inch test cylinders shall be cast in accordance with ASTM C 31. Three (3) of these cylinders shall be compression tested in accordance with ASTM C 39 at 7-days and the other three (3) at 28-days. Test results shall include full information on each cylinder as to mix and slump in accordance with ASTM C 143. Three (3) drying shrinkage specimens shall also be cast and tested in accordance with ASTM C 157 on each type of structural concrete mix design. All costs for such mix design including mix design tests shall be borne by the Contractor.

C. If fly ash concrete is proposed by the concrete supplier, the Contractor shall submit to the Engineer for review the design mix for fly ash concrete together with the design mix for Portland Cement (non-fly ash) concrete as specified in this Section. The Contractor shall furnish a Certificate of Compliance signed by the supplier identifying the type of fly ash and stating that the fly ash complies with ASTM C 618 and these specifications, together with all supporting test data including a certified chemical and physical analysis report prior to the use of the fly ash the sample represents. The supporting data shall also contain test results confirming that the fly ash in combination with the cement and water to be used meets all strength requirements and is compatible with air-entraining agents and other admixtures.

D. When a water-reducing admixture is to be used, the Contractor shall furnish mix designs for concrete both with and without the admixture.

E. Delivery Tickets: Furnish a delivery ticket for ready mixed concrete to the Engineer as each truck arrives. Provide a printed record of the weight of cement and each aggregate as batched individually on each ticket. Use the type of indicator that returns for zero punch or returns to zero after a batch is discharged. Indicate for each batch the weight of fine and coarse aggregate,
cement, fly ash, and water, moisture content of fine and coarse aggregate at time of batching, and types, brand and quantity of each admixture, the quantity of concrete delivered, the time any water is added and the amount, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of transit mix truck.

F. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

G. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

H. Welding certificates.

I. Material certificates.
   1. Certify that admixtures used in the same concrete mix are compatible with each other and the aggregates.
   2. Certify that the Contractor is not associated with the independent testing laboratory proposed for use by the Contractor nor does the Contractor or officers of the Contractor's organization have a beneficial interest in the laboratory.
   3. Certify that cement is produced by a manufacturer that does not use hazardous waste derived fuel as an energy source for its kilns.
   4. Certificate of conformance for concrete production facilities from the NRMCA.

J. Material test reports.
   1. Aggregates: Conformance to ASTM standards, including sieve analysis, mechanical properties, deleterious substance content, and mortar bar expansion test results.
   2. Cement and fly ash: Conformance to ASTM standards, including chemical analysis and physical tests.
   3. Concrete mixes: For each formulation of concrete proposed for use, submit constituent quantities per cubic yard, water cementitious ratio, air content, concrete slump, type and manufacturer of cement and type and manufacturer of fly ash. Provide for each mix proposed.
      a. Standard deviation data for each proposed concrete mix based on statistical records.

      Provide the following for each strength data point used in the calculation of the standard deviation for determination of the minimum required average strength:
      1) Date of sampling and name of testing laboratory.
      2) Name of concrete batch plant.
      3) Water cementitious ratio.
      4) Slump of batch.
      5) Air content of batch.
6) 28 day compression test results.
7) If available, temperature and unit weight of batch.

Provide data from projects not more strictly controlled than outlined in these specifications. Provide summary sheet showing all pertinent data and the computation of the standard deviation.

4. Concrete Mixes: shrinkage.

K. Floor surface flatness and levelness measurements.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
7. ASTM C138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
8. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete
10. ASTM C156 - Standard Test Method for Water Retention by Liquid Membrane-Forming Curing Compound for Concrete
15. ASTM C192 – Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.

16. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.


22. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.


B. American Concrete Institute (ACI).

1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.

2. ACI 232.2R - Use of Fly Ash in Concrete.

3. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.

4. ACI 304.2R - Placing Concrete by Pumping Methods.

5. ACI 305R - Hot Weather Concreting.

6. ACI 306R - Cold Weather Concreting.
7. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

8. ACI 350 - Code Requirements for Environmental Engineering Concrete Structures and Commentary.

C. National Ready Mixed Concrete Association (NRMCA)

1. Quality Control Manual, Section 3 - Certification of Ready Mixed Concrete Production Facilities.

D. Truck Mixer Manufacturers Bureau (TMMB)

1. TMMB 100 - Truck Mixer, Agitator and Front Discharge Concrete Carrier Standards.

E. Corps of Engineers Specification

1. CRD-C 621-85 Corps of Engineers Specification for Non-Shrink Grout

F. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA’s "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Name and address.

2. Names and positions of principal officers and the name, position, and qualifications of the responsible registered professional engineer in charge.

3. Listing of technical services to be provided. Indicate external technical services to be provided by other organizations.

4. Names and qualifications of the supervising laboratory technicians.

5. Statement of conformance provided by evaluation authority defined in ASTM C1077. Provide report prepared by evaluation authority when requested by the Engineer.

6. Submit as required above for other organizations that will provide external technical services.
C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

F. Preinstallation Conference: Conduct conference at Project site.

G. Mix design tests on component materials and for compressive strength and shrinkage of concrete shall be performed as specified herein. The mix shall not at any time be changed without approval of the Engineer, except that at all times the batching of fine aggregate shall be adjusted to compensate for the moisture content. Satisfactory means shall be provided at the batching plant for checking the moisture content of the fine aggregate. The details of concrete mixes submitted for approval shall include information on the correction of the batching for varying moisture contents of the fine aggregate.

To avoid unnecessary or haphazard changes in consistency, the aggregate shall be obtained from a source which will ensure a uniform quality.

H. During the progress of construction, the Owner will have tests made to determine whether the concrete, as being produced, complies with the standards of quality specified herein. These tests will be made in accordance with ASTM C 31, ASTM C 39, ASTM 179 and ASTM C 157. The testing expense during construction, except for the trial batch or mix design testing, will be borne by the Owner. The Contractor shall take sets of field control cylinder specimens during the progress of the work in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each class of concrete place each day shall comply with the requirements of the California Building Code (CBC), Section 1905, but shall not be less than one set per day, nor less than one set for each 50 cu yds of concrete nor less than one set for each 5,000 sq ft of surface area for slabs or walls.

I. Specimens shall be formed in 6-in by 12-in long non-absorbent cylindrical molds.

1. A “set” of test cylinders shall consist of five cylinders; one to be tested at seven days, one to the tested at 14 days, and two to be tested and their strengths averaged at 28 days. The fifth may be used for a special test at 3 days or to verify strength after 28 days if 28 day test results are low.

J. Testing agency shall provide four firmly braced, insulated, heated, closed wooden curing boxes, each sized to hold ten specimens, complete with cold weather temperature and hot weather temperature control thermostat for initial curing and storage from time of fabrication until shipment to the testing lab. Protect the specimens against injury or loss through construction operations.

K. Concrete for testing shall be supplied by the Contractor at no cost to the Owner, and the Contractor shall provide assistance to the Engineer in obtaining samples and disposal and cleanup of excess material.
L. Evaluation and Acceptance of Concrete:

1. Concrete is expected to reach a higher compressive strength than that which is indicated in Paragraph 2.9, as compressive strength. The strength level of the concrete will be considered satisfactory if the average strength of the two (2) 28-day specimens equals or exceeds the required strength and no individual specimen strength falls below the required strength by more than 500 psi. Where an individual strength test falls below the required strength by more than 500 psi, the Engineer shall have the right to ask for cores taken in accordance with ASTM C 42 and ACI 318, all at the Contractors expense.

2. If any concrete fails to meet these requirements, immediate corrective action shall be taken to increase the compressive strength for all subsequent batches of the type of concrete affected. Any and all corrective actions shall be at no additional cost to the Owner.

3. All concrete which fails to meet the ACI requirements and these specifications, is subject to removal and replacement at the cost of the Contractor.

M. Test slump immediately prior to placing the concrete. Test shall be made in accordance with ASTM C143. When concrete is pumped, slump will be determined at point of truck discharge. If the slump is outside the specified range, the concrete will be rejected.

N. Test for air content shall be conducted on a fresh concrete sample. Air content for concrete made of ordinary aggregates having low absorption shall be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173. If aggregates with high absorptions are used, the latter test method shall be used. When concrete is pumped, air content will be determined at point of placement.

O. Shrinkage Tests: Shrinkage tests will be made during construction to ensure continued compliance with these specifications.

P. Ready-mix concrete shall conform to the requirements of ASTM C 94.

Q. The Engineer shall have access to and have the right to inspect all batch plants, cement mills and supply facilities providing products under these specifications. Batch plants shall have current certificates that all scales have been tested and are certified within the tolerances as set forth in the National Bureau of Standards Handbook No. 44.

R. Construction Tolerances: The Contractor shall set and maintain concrete forms and perform finishing operations so as to ensure that the completed work is within the tolerances specified herein. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the specified permissible variation from lines, grades or dimensions shown. Where tolerances are not stated in these specifications, permissible deviations will be in accordance with ACI 347. Where tolerances are not met, the concrete shall be repaired or replaced at the Contractor’s expense until the tolerances are met.

The following construction tolerances are hereby established and apply to finished walls and slab unless otherwise shown:

<table>
<thead>
<tr>
<th>Structural Component</th>
<th>Tolerance</th>
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LGVSD
SECONDARY TREATMENT & RWTF UPGRADE
CAST-IN-PLACE CONCRETE
033000 - 7
| Variation of the constructed linear outline from the established position in plan. | In 10-feet: 1/4-inch; In 20-feet or more: 1/2-inch. |
| Variation from the level or from the grades shown. | In 10-feet: 1/4-inch; In 20-feet or more: 1/2-inch. |
| Variation from the plumb. | In 10-feet: 1/4-inch; In 20-feet or more: 1/2-inch. |
| Variation in the thickness of slabs and walls. | Plus 1/4-inch; Plus 1/2-inch. |
| Variation in the locations and sizes of slab and wall openings. | Plus or minus 1/4-inch. |

**PART 2 - PRODUCTS**

**2.1 FORM-FACING MATERIALS**

**A.** Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

**B.** Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

**2.2 STEEL REINFORCEMENT**

**A.** Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

**B.** Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.


**D.** Galvanized-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from galvanized-steel wire into flat sheets.

**E.** Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1 steel.

**F.** Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI’s "Manual of Standard Practice.”
2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type V, Low Alkali. Supplement with the following:
   a. Fly Ash: ASTM C 618, Class F, including the requirements of Section 2.8 but with the Loss of Ignition (LOI) limited to 3 percent maximum and the optional physical requirements of Table 3. Test in compliance with ASTM C311 with a minimum of one sample weighing four pounds taken from each 200 tons of fly ash supplied for the project.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
   c. Portland Cement shall contain not more than 0.60 percent total alkalies. The term "alkalies" is defined as the sum sodium oxide (Na₂O), potassium oxide (K₂O), calculated as sodium oxide (.658 K₂O). Only one (1) brand of cement shall be used for exposed concrete in any individual structure. The cement shall be suitably protected from exposure to moisture until used. Certified mill test reports for each shipment of cement to be used shall be submitted to the Engineer. Mill test reports shall include the alkali content. Do not use cement produced by a manufacturer that uses hazardous waste derived fuel as an energy source for its kilns.
   d. Do not use air entraining cements.

B. Normal-Weight Aggregates: ASTM C 33, graded.
   1. Maximum size aggregate in foundations and mass concrete shall be 1 inch. The maximum size aggregate in slabs on grade, walls, and all concrete shall be ¾ inch.

C. Water: ASTM C 94/C 94M and potable. Water shall be clean and free from objectionable quantities of silty organic matter, oils, chlorides, alkali, salts and other impurities. The water shall be considered potable, for the purpose of this Section only, if it meets the requirements of the local governmental agencies. Agricultural water with high total dissolved solids (over 1000 mg/l TDS) shall not be used.

2.4 AGGREGATES

A. All concrete aggregates shall be obtained from pits acceptable to the Engineer, shall be non-reactive, sound, uniformly graded and free of deleterious material in excess of allowable limits specified.

B. Combined aggregates shall be well graded from coarse to fine sizes, and be uniformly graded between screen sizes to produce a concrete that has optimum workability and consolidation characteristics. Lightweight sand for fine aggregate will not be permitted. Aggregates shall conform to ASTM C 33.

1. Coarse Aggregate: Coarse aggregate shall consist of gravel, crushed gravel or crushed stone made up of clean, hard, durable particles free from calcareous coatings, organic matter or other foreign substances. Thin or elongated pieces having a length greater than four (4) times the average thickness shall not exceed fifteen percent (15%) by weight. Deleterious substances shall not be present in excess of the following percentages by
weight, and in no case shall the total of all deleterious substances exceed one and one-half percent (1.5%):

2. Fine Aggregate: Fine aggregate for concrete or mortar shall consist of clean, natural sand or a combination of natural and manufactured sands that are hard and durable. Deleterious substances shall not be present in excess of the following percentages by weight of contaminating substances. In no case shall the total exceed three percent (3%):

Fine aggregate shall not contain strong alkali nor organic matter which gives a color darker than a standard color when tested in accordance with ASTM C 40. Fine aggregate shall have a fineness modulus not less than 2.50 nor greater than 3.00. Except as otherwise specified, fine aggregate shall be graded from coarse to fine in accordance with the requirements of ASTM C 33.

3. The fine and coarse aggregates used shall not cause expansion of mortar bars greater than 0.1 percent in 16 days when tested in accordance with ASTM C1260 and using the cement proposed for the project. If aggregates proposed for use do not meet this requirement, then satisfy either a. or b. below.

a. Total equivalent alkali content of the cement used shall not exceed 0.6 percent as provided in the Optional Chemical Requirements of ASTM C150.

b. The fine and coarse aggregates used shall not cause expansion of mortar bars greater than 0.1 percent in 16 days when tested in accordance with ASTM C1260 and using the cement and fly ash proposed for the project. The proportions of the cement-fly ash mix shall be the same as those proposed for the project.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260. Proportion and mix in accordance with manufacturer’s recommendations.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. All concrete shall contain five percent (5%), plus or minus one percent (1%) entrained air of evenly dispersed air bubbles at the time of placement. Air entrainment requirement may be modified or waived following an approval from the Engineer for concrete construction not exposed to freeze/thaw cycles. The air-entraining agent shall contain no chloride and conform to ASTM C 260, or U.S. Army Corps of Engineers Specifications CRD-C13. The air-entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement. The Engineer, or Owner and his duly authorized representatives reserve the right, at any time, to sample and test the air-entraining agent or the air content of concrete received on the job by the Contractor. Air entrainment in the concrete shall be tested by ASTM C 138, ASTM C 231 or ASTM C 173. If any sample tested does not have the specified air content, a second test shall be performed. If the second test does
not meet the specified air content, the concrete represented by the test shall be removed from the job.

2. Retain one or more chemical admixtures from three subparagraphs below.

   a. Water-Reducing Admixture: ASTM C 494/C 494M, Type A. Proportion and mix in accordance with manufacturer’s recommendations.

   b. High-Range, Water-Reducing Admixture (Plasticizer): ASTM C 494/C 494M, Type F resulting in non-segregating plasticized concrete with little bleeding and with the physical properties of low water/cementitious ratio concrete. The treated concrete shall be capable of maintaining its plastic state in excess of 2 hours. Proportion and mix in accordance with manufacturer’s recommendations.

   c. Do not use admixtures causing retarded or accelerated setting of concrete without written approval from the Engineer. Use retarding or accelerating water reducing admixture when so approved.

2.6 SHEET VAPOR RETARDER

   A. Provide under building slabs and/or mat foundations. ASTM E 1745, Class A. Include manufacturer’s recommended adhesive or pressure-sensitive tape.

      1. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.
      2. Vaporblock VB10, by Raven Industries,
      3. Or Equal.

2.7 CURING MATERIALS

   A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

   B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

   C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet. The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 grams per square centimeter of surface.

   D. Polyethylene sheet for use as concrete curing blanket shall be white and shall have a normal thickness of 6 mils.

   E. Water: Potable.

   F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating. The curing compound shall contain a fugitive dye so that areas of application will be readily distinguishable. Compound shall contain no wax, paraffin, or oil. Curing compound shall be non-yellowing and have a unit moisture loss no greater than 0.039 gm/cm² at 72 hours as measured by ASTM C156. Curing compound shall comply with Federal, State, and local VOC limits.
2.8 RELATED MATERIALS


2.9 CONCRETE MIXTURES

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, according to ACI 301.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement. The maximum amount of fly wash used shall be in accordance with ACI 318.

1. Class F Fly Ash
   a. Loss on ignition, maximum 1%
   b. SO3 content, maximum 3%
   c. Moisture content, maximum 1%
   d. R = (CaO - 5%)/(Fe2O3), maximum 1.5

C. Admixtures: Use admixtures according to 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 admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

D. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 5000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50
3. Minimum Cement W/C per cubic yard (94 lb sacks): 6.0
4. Slump Limit: 3 inches, plus or minus 1 inch or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
5. Air Content: 6 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size greater than 3/8 inch.
6. Air Content: 7 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size 3/8 inch or less.
7. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
8. Type of Work: Structural Concrete

E. Proportion Lean concrete mixture as follows:

1. Minimum Compressive Strength: 2500 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.60
3. Minimum Cement W/C per cubic yard (94 lb sacks): 4.5
4. Slump Limit: 3 inches, plus ½ inch or minus 1 inch or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
5. Air Content: 5.0 percent, plus or minus 1 percent at point of delivery.
6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
7. Type of Work: Lean Concrete.

2.10 FABRICATING REINFORCEMENT
A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING
A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

2.12 TRIAL BATCH AND LABORATORY TESTS
A. Before placing any concrete, the Contractor shall submit the certified trial batch results of each class of concrete having a 28-day strength of 4,000 psi or higher, based on the preliminary concrete mixes submitted by the Contractor. All concrete shall conform to the requirements of this Section, whether the aggregate proportions are from the Contractor's preliminary mix design, or whether the proportions have been adjusted during the trial batch process. The trial batch shall be prepared using the aggregates, cement and admixture proposed for the project. . The costs for the trial batch tests shall be borne by the Contractor.
B. The determination of compressive strength will be made by testing 6-inch diameter by 12-inch high cylinders; made, cured and tested in accordance with ASTM C 192 and ASTM C 39. Three (3) compression test cylinders will be tested at 7-days and three (3) at 28-days. The average compressive strength for the three (3) cylinders tested at 28-days for any given trial batch shall not be less than one hundred twenty-five percent (125%) of the specified compressive strength.
C. A standard sieve analysis of the combined aggregate for each trial batch shall be performed according to the requirements for ASTM C 136. Values shall be given for percent passing each sieve.

2.13 SHRINKAGE LIMITATION
A. Drying shrinkage specimens shall be 4-inch by 4-inch by 11-inch prisms with an effective gage length of 10-inches, fabricated, cured, dried and measured in accordance with ASTM C 157 modified as follows: Specimens shall be removed from molds at an age of 23+ hours after trial batching, shall be placed immediately in water at 70 degrees F. ±3 degrees F. for at least thirty
(30) minutes, and shall be measured within thirty (30) minutes thereafter to determine original length and then submerged in saturated lime water at 73 degrees F. ±3 degrees F. Measurement to determine expansion expressed as a percentage of original length shall be made at age 7-days. This length at age 7-days shall be the base length for drying shrinkage calculations ("0" days drying age). Specimens then shall be stored immediately in a humidity control room maintained at 73 degrees F. ±3 degrees F. and fifty percent (50%) ±4 percent relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as percentage of base length shall be made and reported separately for 7, 14, 21 and 28-days-of drying after 7-days of moist curing.

The drying shrinkage deformation of each specimen shall be computed as the difference between the base length (at "0" days drying age) and the length after drying at each test age. the average drying shrinkage deformation of the specimens shall be computed to the nearest 0.0001-inch at each test age. If the drying shrinkage of any specimen departs from the average of that test age by more than 0.0004-inch, the results obtained from that specimen shall be disregarded. Results of the shrinkage test shall be reported to the nearest 0.001 percent of shrinkage. Compression test specimens shall be taken in each case from the same concrete used for preparing during shrinkage specimens. These tests shall be considered a part of the normal compression tests for the project. Allowable shrinkage limitations shall be specified herein.

B. The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21-day drying age or at 28-day drying age (specified in Paragraph 2.07), shall be 0.036 percent or 0.042 percent, respectively. The Contractor shall only use a mix design for construction that has first met the trial batch shrinkage requirements.

C. The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage requirement by more than twenty-five percent (25%).

D. If the required shrinkage limitation is not met during construction, the Contractor shall take all necessary action, at not additional cost to the Owner, for securing the specified shrinkage requirements. These actions may include changing the source of aggregates, cement and/or admixtures; reducing water content ratio; washing or aggregate to reduce fines; increasing the number of construction joints; modifying the curing requirements; or other actions designed to minimize shrinkage or the effects of shrinkage.

2.14 GROUT

A. Grout shall be a mixture of one part Portland cement to 4-1/2 parts sand. Water content shall be such that the grout can be readily spread, yet not wet enough to cause trouble with surface water or laitance, or failure to stay in place after screeding. All grout mixes and mixing procedures shall be submitted in accordance with section 013300-Contractor Submittals, and shall be subject to review and approval by the Engineer prior to commencing the grouting operations.

B. Procedures for Grout placement shall be approved by the equipment supplier, to insure that no equipment is overstressed, as well as proper placement tolerances. Equipment Supplier shall have final say on grouting procedures and final tolerances.
PART 3 - EXECUTION

3.1 MIXING CONCRETE

A. Mixing equipment shall be subject to the Engineers approval. Mixers shall be of the stationary plant or truck mixer type. Adequate equipment and facilities shall be provided for accurate measurement and control of all materials and for readily changing the proportions of the material. The mixing equipment shall be maintained in good working order and shall be capable of combining the aggregates, cement and water within the specified time into a thoroughly mixed and uniform mass and of discharging the mixture without segregation. Cement and aggregate shall be proportioned by weight.

B. The batch plant shall be capable of controlling and delivering of all material to within one percent (1%) by weight of the individual material. If bulk cement is used, it shall be weighed on a separate visible scale which will accurately register the scale load at any stage of the weighing operation from zero to full capacity.

C. Cement shall not come in contact with aggregate or with water until the materials are in the mixer ready for complete mixing with all mixing water. The procedure of mixing cement with sand or with sand and coarse aggregate for delivery to the jobsite for final mixing and an addition of mixing water will not be permitted. Re-tempering of concrete will not be permitted. The entire batch shall be discharged before recharging. The volume of the mixed material per batch shall not exceed the manufacturers rated capacity of the mixer.

D. Each mixer shall be equipped with a device for accurately measuring and indicating the quantity of water entering the concrete, and the operating mechanism shall be such that leakage will not occur when the valves are closed. Each mixer shall be equipped with a device for automatically measuring, indicating and controlling the time required for mixing. This device shall be interlocked to prevent the discharge of concrete from the mixer before the expiration of the mixing period.

E. Transit-mixed concrete shall be mixed and delivered in accordance with ASTM C 94. After the drum is once started, it shall be revolved continuously until it has completely discharged its batch. Water shall not be admitted to the mix until the drum has started revolving. The right is reserved to increase the required minimum number of revolutions allowed, if necessary, to obtain satisfactory mixing, and the Contractor will not be entitled to additional compensation because of such an increase or decrease.

F. Mixed concrete shall be delivered to the site of the work and discharge shall be completed within one (1) hour after the addition of the cement to the aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85 degrees F. or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed forty-five (45) minutes. The use of non-agitating equipment for transporting concrete will not be permitted.

G. Truck mixers shall be equipped with counters so that the number of revolutions of the drum may be readily verified. The counter shall be of the resettable type and shall be actuated at the time of starting mixers at mixing speeds. Concrete shall be mixed in a truck mixer for not less than seventy (70) revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the
manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolution of mixing.

H. Truck mixers and their operation shall be such that the concrete throughout the mixed batch as discharged is within acceptable limits of uniformity with respect to consistency, mix, and grading. If slump tests taken at approximately the ¼ and ¾ points of the load during discharge give slumps differing by more than one inch when the specified slump is more than 3 inches, the mixer shall not be used on the work unless the causing condition is corrected and satisfactory performance is verified by additional slump test. All mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed of rotation, general mechanical condition of the unit, and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.

I. Comply with ACI 318 and ASTM C94 for all central plant and rolling stock equipment and methods.

J. Select equipment of size and design to provide continuous flow of concrete at the delivery end. Use metal or metal-lined non-aluminum discharge chutes with slopes not exceeding one vertical to two horizontal and not less than one vertical to three horizontal. Chutes more than 20-foot long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.

3.2 PREPARATION OR SURFACES FOR CONCRETING

A. Earth surfaces shall be thoroughly and uniformly wetted by sprinkling prior to the placing of any concrete. These surfaces shall be kept moist by frequent sprinkling up to the time concrete is placed thereon. The surface shall be free from standing water, mud and debris at the time of placing concrete.

B. The surfaces of all horizontal construction joints shall be cleaned of all latence, loose or defective concrete and foreign material. Such cleaning shall be accomplished by sandblasting followed by thorough washing. All pools of water shall be removed from the surface of construction joints before the new concrete is placed.

C. No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcement steel and preparation off surfaces involved in the placing have been completed and accepted by the Engineer at least four (4) hours before placement of concrete. All reinforcement, anchor bolts, sleeves, inserts and similar items shall be set and secured in the forms where shown or by shop drawings and shall be acceptable to the Engineer before any concrete is placed. Accuracy of placement is the responsibility of the Contractor. All surfaces of embedded items that have become encrusted with dried grout from concrete previously placed shall be cleaned of all such grout before the surrounding or adjacent concrete is placed.

D. All form surfaces in contact with the concrete shall be thoroughly cleaned of all previous concrete, dirt and other surface contaminants prior to use. Damaged form surfaces shall not be used.

Wood form surfaces in contact with the concrete shall be coated with an approved release agent prior to form installation. The release agent shall be non-staining and non-toxic after thirty (30)
days. Mill scale and other ferrous deposits shall be sandblasted or otherwise removed from the contact surface of steel forms. All steel forms shall have the contact surfaces coated with an approved release agent. The release agent shall be effective in preventing discoloration of the concrete from rust and shall be non-toxic after thirty (30) days.

E. Where concrete is to be cast against old existing concrete, the old concrete shall be thoroughly roughened to exposed, hard aggregate by sandblasting or chipping. Any additional surface preparation shall be as called for in the drawings.

F. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or diverted out of the forms and clear of the work. No concrete shall be deposited under water or allowed to rise on any concrete until the concrete has attained its initial set. Pumping or other necessary dewatering operations for removing ground water, if required, shall be the responsibility of the Contractor and will be subject to review by the Engineer.

G. Pipe, conduit, dowels, sleeves and other ferrous items required to be embedded in concrete construction shall be adequately positioned and supported prior to placement of concrete. There shall be a minimum of 2-inches clearance between embedded items and any of the concrete reinforcement. Securing embeddments in position by wiring or welding them to the reinforcement will not be permitted.

3.3 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete except where grating will be installed.

3.4 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. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

B. Do not embed piping or electrical conduits in concrete unless shown on the Drawings.

C. Pipes and conduits embedded within a slab or wall (other than those merely passing through) shall satisfy the following, unless otherwise shown on the Drawings or approved:

1. Maximum outside dimension of pipe or conduit shall not be greater than one third the overall thickness of the slab or wall.
2. Spacing of pipes or conduits shall be greater than or equal to three diameters or widths on center.

D. Close open ends of piping, conduits, and sleeves embedded in concrete with caps or plugs prior to placing concrete.

E. Fabricate piping and conduit such that the cutting, bending, or relocation

F. Pipe, conduit, dowels, sleeves and other ferrous items required to be embedded in concrete construction shall be adequately positioned and supported prior to placement of concrete. There shall be a minimum of 2-inches clearance between embedded items and any of the concrete reinforcement. Securing embeddments in position by wiring or welding them to the reinforcement will not be permitted. Embedded items shall be clean and free of rust, mud, dirt, grease, oil, ice, or other contaminants which would reduce or prevent bonding with concrete.

G. Coat or isolate all aluminum embedments to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.

H. Ensure all specified tests and inspections on embedded piping are completed and satisfactory before starting concrete placement. Ensure all mechanical or electrical tests and inspections are completed and satisfactory prior to starting concrete placement. Do not place concrete until unsatisfactory items and conditions have been corrected.

3.5 VAPORE TARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRST's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: 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.

E. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.8 CONCRETE PLACEMENT

A. Placement of concrete shall conform to the requirements and recommendations of ACI 301, 304 and 318, except as modified herein.

B. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

D. Cold-Weather Placement:

1. For this Specification, "cold weather" is defined as a period when for more than three successive days, the average daily outdoor temperature drops below 40 degrees F. Calculate average daily temperature as the average of the highest and the lowest temperature during the period from midnight to midnight.

2. Batch, deliver, place, cure and protect concrete during cold weather in compliance with the recommendations of ACI 306R and the additional requirements of this Section.

3. Review the cold weather concreting plan at the preconstruction meeting. Include the methods and procedures for use during cold weather including the production, transportation, placement, protection, curing and temperature monitoring of the concrete and the procedures to be implemented upon abrupt changes in weather conditions or equipment failures.

4. The minimum temperature of concrete immediately after placement and during the protection period shall be as indicated in Table 3. The temperature of the concrete in place and during the protection period shall not exceed these values by more than 20 degrees F. Prevent overheating and non-uniform heating of the concrete.
TABLE 3
Concrete Temperatures
Minimum Dimension of Section

<table>
<thead>
<tr>
<th></th>
<th>≤ 12-in</th>
<th>12 to 36-in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. conc. temp:</td>
<td>55 Degree F</td>
<td>50 Degree F</td>
</tr>
</tbody>
</table>

5. Protect concrete during periods of cold weather to provide continuous warm, moist curing (with supplementary heat when required by weather conditions) for a total of at least 350 degree-days of curing.

   a. Degree-days are defined as the total number of 24 hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (e.g., 7 days at an average 50 degrees F = 350 degree-days).

   b. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50 degrees F as 0 degrees F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.

6. Do not use salt, manure or other chemicals for protection.

7. At the end of the protection period, allow the concrete to cool gradually to the ambient temperature. If water curing has been used, do not expose concrete to temperatures below those shown in Table 3 until at least 24 hours after water curing has been terminated and air dry concrete for at least 3 days prior to first exposure to freezing temperatures.

8. During periods not defined as cold weather, but when freezing temperatures are expected or occur, protect concrete surfaces from freezing for the first 72 hours after placing.

E. Hot-Weather Placement:

1. For this Specification, "hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation as estimated in ACI 305R, approaching or exceeding 0.2 pounds per square foot per hour (lb/sq ft/hr).

2. Batch, deliver, place, cure and protect concrete during hot weather in compliance with the recommendations of ACI 305R and the additional requirements of this Section.

   a. Temperature of concrete being placed shall not exceed 90 degrees F. Maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall not cause loss of slump, flash set or cold joints.

   b. Promptly deliver concrete to the site and promptly place the concrete upon its arrival at the site, not exceeding the maximum time interval specified in Paragraph 3.1F Provide vibration immediately after placement.

   c. The Engineer may direct the Contractor to immediately cover concrete with sheet curing material.
3. Review the hot weather concreting plan at the preconstruction meeting. Include the methods and procedures for use during hot weather including production, placement, and curing.

F. No concrete shall be placed without prior inspection of the forms, reinforcing and embedded items and approval from an authorized representative of the Engineer. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. The Contractor shall notify the Engineer at least twenty-four (24) hours in advance of any scheduled concrete placement and shall call for final inspections no later than four (4) hours in advance of the scheduled placement. The Contractor shall notify the Engineer at least two (2) hours in advance of setting the opposite side of wall forms so that the construction joint preparation, water stop installation and reinforcing steel inspections can be conducted. It is the Contractor's responsibility to see that the forms are properly cleaned and oiled before being set, the construction joints properly prepared, reinforcing steel is securely and properly supported in the correct position and that all embedment items including electrical conduit is correctly installed before calling for inspections. The Engineer may at his option require the use of placement cords if deemed necessary.

G. Concrete which upon or before placing is found not to conform to the requirements specified herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these specifications, or which is of inferior quality, shall be removed and replaced at the expense of the Contractor.

H. No concrete shall be placed during rain or snow storms, unless completely covered to prevent storm water from coming in contact with it. Sufficient protective covering material shall be kept on hand at all times should rain or snow storms arise during concrete placement operations.

I. Concrete shall be deposited at or near its final position to avoid segregation caused by rehandling or flowing. Concrete shall not be deposited in large quantities in one place and worked along the forms with vibrator or other means. Concrete shall be uniformly distributed during the placing process and in no case after depositing shall any portion be displaced in the forms more than 2-feet in horizontal direction. Concrete shall be deposited in forms in horizontal layers not to exceed 24-inches in depth and shall be brought up evenly in all parts of the form. The rate of placement of concrete in forms shall not exceed 5-feet of vertical rise per hour. As the concrete is placed it shall be consolidated thoroughly and uniformly by mechanical vibration to secure a dense mass, close bond with reinforcement and other embedded items and smooth surface. The mechanical vibrator shall penetrate not only the freshly placed concrete, but also the previously placed lift to ensure the lifts become monolith. New concrete shall be placed against previously placed concrete, not away from it. When concrete is placed on a slope, placement shall begin at the lower end of the slope and progress to the upper end for the full width of the placement. Consolidation by mechanical vibration shall follow directly behind placement and the rate of placement shall never get ahead of the consolidation crew. Concrete placement shall continue without avoidable interruption, in a continuous operation until the end of the placement is reached.

J. The drop of concrete into slab or wall forms shall be vertical. Concrete shall not be dropped through reinforced steel, but deposited in forms using a hopper with a drop chute to avoid segregation and to keep mortar from coating the reinforcement steel and forms above the in-place concrete. In no case shall the free fall of concrete exceed 4-feet below the end of the hopper or chute.
K. If it takes more than 20-minutes to get back to place concrete over concrete previously placed, the depth of the layers being placed at one time shall be reduced, and/or placing equipment increased, until it is possible to return with the placing operation to previously placed concrete within 20-minutes. If concrete is to be placed over previously poured concrete and more than 20-minutes have elapsed, then a layer of grout not less than 1/2-inch thick shall be spread over the surface before placing the additional concrete.

L. The placement of concrete for slabs, beams or walkways cast monolithically with walls or columns shall not commence until the concrete in the walls or columns has been allowed to set and shrink. The time allowed for shrinkage shall be not less than one (1) hour.

M. Concrete shall be placed with the aid of approved mechanical vibrators. Vibration shall be supplemented by manual forking or spading adjacent to the forms on exposed faced in order to secure smooth dense surfaces. The concrete shall be thoroughly consolidated around reinforcement, pipes or other shapes built into the work. The vibration shall be sufficiently intense to cause the concrete to flow and settle readily into place and to visibly affect the concrete over a radius of at least 18-inches.

Sufficient vibrators shall be on hand at all times to vibrate the concrete as placed. In addition to the vibrators in actual use while concrete is being placed, the Contractor shall have on hand one (1) spare vibrator in serviceable condition. No concrete shall be placed until it has been ascertained that all vibrating equipment, including spares, is in serviceable condition.

Special care shall be taken to place the concrete solidly against the forms so as to leave no voids. Every precaution shall be taken to make all concrete solid, compact and smooth, and if for any reason the surfaces or interiors have voids or are in any way defective, such concrete shall be repaired as directed by the Engineer. No defective work shall be patched or repaired without the prior inspection and approval of the Engineer.

N. The temperature of concrete when it is being placed shall be not more than 90 degrees F. nor less than 40 degrees F. in moderate weather, and not less than 50 degrees F. in weather during which the mean daily temperature drops below 40 degrees F. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the specified minimum temperature. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F., the Contractor shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The Contractor shall be entitled to no additional compensation on account of the foregoing requirements.

O. Concrete shall not be placed on a frozen subgrade or subgrade that contains frozen materials. All ice and snow shall be removed from inside forms and from reinforcing steel and embedded items. The temperature of all surfaces that the concrete will contact shall be raised above the freezing point for at least 12-hours prior to placing new concrete.

The minimum temperature of fresh concrete as mixed shall be 60 degrees F. for ambient temperature above 30 degrees F.; 65 degrees F. for ambient temperature 0 degrees F. to 30 degrees F.; and 70 degrees F. for ambient temperature below 0 degrees F. The minimum temperature of fresh concrete after placing shall be 55 degrees F. for the first 72-hours.

The use of calcium chloride shall not be permitted.
In general, the Contractor shall adhere to the recommendations as outlined in ACI Standard 306 for cold weather concreting, except as required herein.

3.9 REMOVAL OF FORMS

A. Do not remove forms before the concrete has attained a strength of at least 70% of its specified design strength for beams and slabs and at least 30 percent of its specified design strength for walls and vertical surfaces, nor before reaching the following number of day-degrees of curing (whichever is the longer):

<table>
<thead>
<tr>
<th>Forms for</th>
<th>Degree Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevated beams and elevated slabs</td>
<td>500</td>
</tr>
<tr>
<td>Walls and vertical surfaces</td>
<td>100</td>
</tr>
<tr>
<td>Foundation footings and slabs-on-grade</td>
<td>100</td>
</tr>
</tbody>
</table>

(See definition of degree-days in Paragraph 3.8D)

B. Do not remove shores until the concrete has attained at least 70 percent of its specified design strength and also sufficient strength to support safely its own weight and the construction live loads upon it.

C. In cold weather, when temperature of concrete exceeds ambient air temperature by 20 Degrees F at the end of the protection period, loosen forms and leave in place for at least 24 hours to allow concrete to cool gradually to ambient air temperature.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities. Fill tie holes and depressions and bug-holes ¼ inch or larger in width or depth with mortar.

1. Apply to concrete surfaces to be covered by backfill or coated with below grade waterproofing systems.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces in water channels, below water surface of basins, inside meter and valve vaults, inside cells of hydraulic splitter boxes and weirs.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Formed concrete surfaces inside buildings and machine rooms and all exposed exterior surfaces of foundations, basins, vaults, hydraulic structures and curbs.

2. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

3. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part Portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

4. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part Portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture. Surface irregularities shall not exceed ¼ inch.

1. Apply float finish to surfaces indicated and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or floor slabs to be covered with grouted tile or topping grout and slabs to be covered with built-up roofing.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces all building and machine room floors, basin floors not receiving a grout topping, channel floors, top of interior walls, top of interior curbs, steps and walkways.

2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to exterior walkways, curb, gutter, sidewalk and steps, top of valve or meter vaults, electrical pull boxes and catch basins. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. The schedule for finished unformed surfaces shall be as follows:

**Unformed Concrete Surface Schedule**

<table>
<thead>
<tr>
<th>Area</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade slabs and foundations to be covered with concrete or fill material.</td>
<td>Scratch Finish</td>
</tr>
<tr>
<td>Floor slabs to be covered with grouted tile or topping grout and slabs to be covered with built-up roofing.</td>
<td>Float Finish</td>
</tr>
<tr>
<td>All building and machine room floors, basin floors not receiving a grout topping, channel floors, top of interior walls, top of interior curbs, steps and walkways.</td>
<td>Trowel Finish</td>
</tr>
<tr>
<td>Exterior walkways, curb, gutter, sidewalk and steps, top of valve or meter vaults, electrical pull boxes and catch basins.</td>
<td>Fine-Broom Finish</td>
</tr>
</tbody>
</table>

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than 14 days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped.
at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

D. Immediately following the first frost in the fall, the Contractor shall be prepared to protect all concrete against freezing.

3.13 CONCRETE SURFACE REPAIRS

A. It is the intent of these Specifications to require quality work including forming, mixture and placement of concrete and curing so completed concrete surfaces will require no patching or repairs.

B. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

C. As soon as the forms have been stripped and the concrete surfaces exposed: Remove fins and other projections; fill recesses left by the removal of form ties; and repair surface defects which do not impair structural strength. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete.

D. Immediately after removal of forms remove tie cones and metal portions of ties. Fill holes promptly upon stripping as follows: Moisten the hole with water, roughen first if necessary for adhesion, followed by a 1/16-in brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form of a spider web. Trowel smooth with heavy pressure. Avoid burnishing.

E. When filling tie cone holes and patching or repairing exposed surfaces use the same source of cement and sand as used in the parent concrete. Adjust color to match by addition of white cement. Rub lightly with a fine carborundum stone at an age of one to five days if necessary to bring the surface down with the parent concrete. Do not damage or stain the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.
F. Defective concrete and honeycombed areas: Chip down square and at least 1-in deep to sound concrete with hand chisels or pneumatic chipping hammers. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded in the parent concrete. If honeycomb exists around reinforcement, chip to provide a clear space at least 3/8-in wide all around the steel. For areas less than 1-1/2-in deep, the patch may be made in the same manner as described above for filling form tie holes, care being exercised to use adequately dry (non-trowelable) mixtures and to avoid sagging. Thicker repairs will require build-up in successive 1-1/2-in layers on successive days, each layer being applied (with slurry, etc.) as described above.

G. For very heavy (generally formed) patches, the Engineer may order the addition of pea gravel to the mixture and the proportions modified as follows:

<table>
<thead>
<tr>
<th>Material</th>
<th>Volumes</th>
<th>Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Sand</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Pea Gravel</td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

H. The Contractor may use a pre-packaged patching compound, such as: Poly-Patch by Euclid Chemical Company; Emaco R310 by BASF Chemical Company; Sikatop 122 Plus by Sika Chemical Corporation or equal only if approved by the Engineer for use and for color match.

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. The Engineer may have cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection or determining the continuation of concrete work. The right of the Engineer to take such cores shall not be construed as creating any obligation to take such cores, and not exercising this right to do so shall not relieve the Contractor from meeting the requirements of these Specifications.

C. Cooperate in obtaining cores by allowing free access to the work and permitting the use of ladders, scaffolding and such incidental equipment as may be required. Repair all core holes with non-shrink grout as specified in Section 03600. The work of cutting, testing and repairing the cores will be at the expense of the Contractor if defective work is uncovered. If no defective work is found, such cost will be at the expense of the Owner.

3.11 FAILURE TO MEET REQUIREMENTS

A. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the values given in Section 2.8, the Engineer may require changes in proportions or materials, or both, to apply to the remainder of the work. Furthermore, the Engineer may require additional curing on those portions of the structure represented by the test specimens which fall below the values given in Section 2.8. The cost of such additional curing shall be at no additional cost to the Owner. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Engineer may require strengthening or replacement of those portions of the structure which fail to develop the re-
required strength. Coring and testing and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be at no additional cost to the Owner. In such cases of failure to meet strength requirements the Contractor and Owner shall confer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in C94 is the Contractor.

B. When the tests on control specimens of concrete fall below the required strength, the Engineer will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In cases where tests of cores fall below the values given in Section 2.8, the Engineer, in addition to other recourses, may require load tests on any one of the slabs, walls, beams, and columns in which such concrete was used. Test need not be made until concrete has aged 60 days. The Engineer may require strengthening or replacement of those portions of the structure which fail to develop the required strength. All coring and testing and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be at no additional cost to the Owner.

C. Should the strength of test cylinders fall below 60 percent of the required minimum 28 day strength, the concrete shall be immediately rejected and shall be removed and replaced at no additional cost to the Owner.

END OF SECTION 033000
PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The Contractor shall furnish, place, finish and cure the following types of grouting mortars as called for herein and as shown in the Contract Documents

B. Perform all sampling and furnish all testing of materials and products by an independent testing laboratory acceptable to the Engineer but engaged by and at the expense of the Contractor

1. Non-Shrink Grout: This type of grout shall be used wherever grout is shown or called for in the Contract Documents, unless another type is specifically referenced.

2. Topping Grout: This type of grout shall be used for grouting clarifier bottoms.

3. Epoxy Grout: This type of grout shall be used for anchor bolt or reinforcing steel embedment, repairs and resurfacing.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Cast-In-Place Concrete. 033000

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Specifications, codes and standards is listed under Section 033000 entitled, "Cast-In-Place Concrete", and those additional commercial standards as follows:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRD-C 621-85</td>
<td>Corps of Engineers Specification for Non-Shrink Grout</td>
</tr>
<tr>
<td>ASTM C-827-87</td>
<td>Standard Test Method for Early Volume Change of Cementitious Mixtures</td>
</tr>
<tr>
<td>ASTM C150</td>
<td>Standard Specification for Portland Cement</td>
</tr>
<tr>
<td>ASTM C579</td>
<td>Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing and Polymer Concrete.</td>
</tr>
</tbody>
</table>
1.4 CONTRACTOR SUBMITTALS

A. Non-Shrink Grout: Submit manufacturer’s catalogue cuts, technical data including compressive strength and expansion data at plastic, flowable and fluid consistencies, storage requirements, product life, working time after mixing, temperature consideration, conformity to the specified ASTM standards, and Material Safety Data Sheets. Also submit manufacturer’s applications manual containing instructions and recommendations for mixing, handling, placement and appropriate uses for each type of non-shrink grout used in the work.

B. Topping Grout: Provide certified mix design including type and brand of cement, proportions and gradations of all materials, product data on any proposed admixtures, and compressive strength test results from at least one (1) trial batch. Tests shall be performed by a certified testing laboratory. All costs for such mix design and trial batch tests shall be borne by the Contractor.

C. Non-shrink Epoxy Grout: Submit manufacturer’s catalog cuts, technical data including strengths and application manual of instructions for mixing, handling and placing, storage requirements, product life, working time after mixing, temperature consideration, conformity to the specified ASTM standards, and Material Safety Data Sheets.

1.5 QUALITY ASSURANCE

A. Qualifications

1. Grout manufacturers shall have a minimum of 10 years experience in the production and use of the type of grout proposed.

2. Independent testing laboratory shall meet the requirements of ASTM E329 and ASTM C1077 and be acceptable to the Engineer. Laboratories affiliated with the Contractor or in which the Contractor or officers of the Contractor’s organization have beneficial interest are not acceptable.

B. Pre-installation Meeting

1. At least ten working days before grouting, hold a pre-installation meeting to review the requirements for surface preparation, mixing, placing and curing procedures for each product
proposed for use. Notify all parties involved with grouting, including the Engineer, of the meeting at least ten working days prior to its scheduled date.

C. Services of Manufacturer’s Representative

1. Provide services of a field technician of the non-shrink grout manufacturer who has performed at least five projects of similar size and complexity during the last five years, to attend the pre-installation meeting, to be present for the initial installation of each type of non-shrink grout, and to correct installation problems.

D. Field Testing

1. All field testing and inspection services will be provided by the Owner. Assist in the sampling of materials, and cooperate by allowing free access to the work and permitting the use of ladders, scaffolding, and such incidental equipment as may be required. Methods of testing will comply with the applicable ASTM Standards.

2. Field testing of concrete grout will be as specified for concrete in Section 03300.

3. Mix design tests for topping grout shall be performed per the standards referenced herein.

E. During the progress of construction the Engineer may have tests made of each type of grout used in the work to ensure compliance with the Contract Documents. These tests will be made in accordance with the standards referenced herein. The test expense during construction, except for the mix design and trial batch tests, will be borne by the Owner. The costs of additional tests including non-destructive tests and core drilling needed to verify or investigate the quality of questionable work or material shall be borne by the Contractor.

F. Grout for testing shall be supplied by the Contractor at no cost to the Owner.

G. If any grout fails to meet the requirements of these specifications, immediate corrective action shall be taken for all subsequent batches. Grout already in place which fails to meet these requirements is subject to removal and replacement with all costs borne by the Contractor.

H. Construction tolerances shall be as specified in Section 03300 entitled, "Cast-In-Place Concrete", except as modified herein and elsewhere in the Contract Documents.

PART 2 - PRODUCTS

2.1 NON-SHRINK GROUT

A. Non-shrink grout shall be a prepackaged, inorganic, non-gasliberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer’s instructions shall be printed on each bag or other container in which the materials are packaged.

B. Non-shrink grouts for use as herein specified shall conform to the Corps of Engineers specifications for Non-Shrink Grout, CRD-C621-85 and to these specifications. The grout shall have a 28-day compressive strength of 6,000 psi or greater.

C. Non-shrink grouts shall be as manufactured by: Tremcrete Systems Incorporated, Woodland, California; Gifford-Hill & Company, Inc., Dallas, Texas; or approved equal.
2.2 TOPPING GROUT

A. Cement topping grout for clarifiers or channels shall be composed of one part cement, three parts sand, and the minimum amount of water necessary to obtain the desired consistency. The minimum compressive strength at 28-days shall be 4,000 psi.

B. Cement grout materials shall be as specified in Section 033000 entitled, "Cast-In-Place Concrete".

2.3 EPOXY GROUT

A. Epoxy grout shall be a pourable, non-shrink, one-hundred percent (100%) solids system. The epoxy grout system shall have three components; resin, hardener, and specially blended aggregate, all premeasured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. The chemical formulation of the epoxy grout shall be that recommended by the manufacturer for the particular application. Manufacturer’s instructions shall be printed on each container in which the materials are packaged.

B. The mixed epoxy grout system shall have a minimum working life of 45 minutes at 75 degrees F. The epoxy grout shall develop a minimum compressive strength of 5,000 psi in 24-hours and 10,000 psi in 7-days.

2.4 CURING MATERIALS

A. Curing materials shall be as specified in Section 033000 entitled, "Cast-In-Place Concrete", for cement topping grout and as recommended by the manufacturer of non-shrink grouts.

PART 3 - EXECUTION

3.1 PLACING NON-SHRINK AND EPOXY GROUT

A. All forming, mixing, surface preparation, handling, placing and consolidated of non-shrink and epoxy grouts shall be done according to the instructions and recommendations of the manufacturer.

B. Curing shall be as specified herein.

END OF SECTION 036000
SECTION 042000 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment and incidentals required and construct all masonry work as shown on the Drawings and as specified herein.

B. Section Includes:

1. Concrete masonry units (CMU’s).
2. Decorative concrete masonry units.
3. Pre-faced concrete masonry units.
4. Steel reinforcing bars.
5. Installing miscellaneous metal items built into masonry.
6. Grouting as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Cast-In-Place Concrete. 033000

1.3 ACTION SUBMITTALS

A. Submit to the Engineer, product literature, representative samples of all required masonry sizes, types, textures, colors and accessory materials. Provide documentation that masonry units meet the minimum required fire resistance rating as indicated on the Drawings. Submit all certifications and test data required to prove compliance with this Section and the California Building Code, 2016 Edition.

B. Submit shop drawings and product data showing materials of construction and details of installation for:

1. Masonry reinforcement. Fabrication and placing drawings and details for mild steel and prefabricated joint reinforcement. Reinforcement placing drawings shall conform to the requirements of this Section. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

2. Cement, hydrated lime, and any mortar or grout admixtures.
   a. For admixtures, submit evidence of ICC approval for the proposed application.

3. Proposed mortar and grout proportions.

4. Material properties and test results letters for unit strength method.

5. Miscellaneous Items: Insulation, joint filler, and accessories.
C. Test Reports

1. For each type of masonry unit, certified preconstruction test reports, including compressive strength, absorption, dimensional analysis, unit weight, and moisture content in accordance with ASTM C140.

2. Mortar test results in accordance with ASTM C270.

3. Grout test results during construction in accordance with ASTM C1019.

4. Compression strength testing reports for masonry prisms before and during construction as specified.

D. Certifications

1. Certify that the Contractor is not associated with the independent testing laboratory and that the Contractor or its officers have no beneficial intent in the laboratory.

2. Submit certification that the concrete masonry unit meets ASTM C90, Type I moisture controlled, Grade N units and include data on material properties.

E. Qualifications

1. Independent testing laboratory: Name, address, and qualifications. Laboratories affiliated with the Contractor or in which the Contractor or its officers have a beneficial interest are not acceptable.

F. Resubmit as required until approved by Engineer

1.4 REFERENCE STANDARDS

A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

B. American Society for Testing and Materials (ASTM)

1. ASTM A82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement

2. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

3. ASTM C33 Standard Specification for Concrete Aggregates

4. ASTM C62 Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)

5. ASTM C90 Standard Specification for Loadbearing Concrete Masonry Units
6. ASTM C129  Standard Specification for Non-Load-Bearing Concrete Masonry Units
7. ASTM C140  Standard Test Methods of Sampling and Testing Concrete Masonry Units
8. ASTM C144  Standard Specification for Aggregate for Masonry Mortar
11. ASTM C270  Standard Specification for Mortar for Unit Masonry
12. ASTM C426  Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Block

C. Underwriters Laboratories (UL)
D. The California Building Code (CBC), 2016 Edition
E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.5 QUALITY ASSURANCE

A. Testing services required to demonstrate that the materials proposed for incorporation into the work comply with the requirement of the contract documents shall be provided by the Contractor. The cost of such testing, unless specifically stated otherwise, shall be paid by the Contractor.

B. All field testing and inspection services to confirm that the properties of the materials actually incorporated into the work conform to these specifications will be provided by the Owner. Facilitate such testing and inspection as follows:

1. Advise Engineer of installation far enough in advance to allow for assignment and scheduling of inspection and testing personnel.

2. Furnish any labor necessary to assist the Owner’s testing agency in obtaining and handling samples.

C. Methods of testing shall conform to ASTM or other standards as indicated. Include in reports for prisms or test specimens a description of the portion of construction represented by the specimen(s), and a summary of condition under which the specimens were stored prior to testing.

D. Inspection
1. All masonry shall be periodically inspected in accordance with the following paragraphs:
   a. Cost of inspection described in these paragraphs shall be paid by the Owner.

2. Make inspections as follows and as specified on Drawings:
   a. Observe the preparation of all masonry prisms and of all grout or mortar test specimens.
   b. Observe site sampling of masonry units for compression testing.
   c. For fully grouted open-end hollow unit masonry, observe the initial laying of masonry units. For masonry other than fully grouted open-end hollow unit masonry, observe the laying of all masonry units.
   d. Observe reinforcement placement including sizes, positioning, embedment, and splices.
   e. Observe the condition of grout spaces just prior to each grouting operation.
   f. Observe all grouting operations.

E. Compression strength of masonry, f'm shall be 2,000 psi. The Engineer has selected this compression strength in accordance with ACI 530.1/ASCE 6.

F. Confirm properties of materials used for construction and test result for compressive strength as follows:
   1. Before the delivery of any masonry units or materials.
      a. Submit a letter from the masonry unit supplier certifying that units conform to the reference standards specified when sampled and tested in compliance with ASTM C67 (brick and structural clay tile) or ASTM C140 (concrete masonry).
      b. Submit a letter certifying that the mortar type to be used conform to ASTM C270 and submit laboratory test data demonstrating that the mortar has the minimum compressive strength specified when sampled and tested in accordance with ASTM C270.
   2. During construction, test the following specimens for compressive strength. Provide and test one set of specimens for each 5,000 sq. ft. of masonry wall area, but not less than one set per project.
      a. One set of three masonry units tested in compliance with ASTM C140 (concrete masonry)
      b. One set of three 2-in diameter by 4-in cylindrical mortar specimens constructed and tested in compliance with ASTM C780, Appendix A7.
      c. One set of three grout specimens constructed and tested in compliance with ASTM C1019.
1.6 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Submit a description of procedures to be used.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Submit a description of procedures to be used.

C. Heat and enclosures will be the only protection method allowed for cold weather construction. No mortar additives shall be used for this purpose.

D. Review of hot and cold weather construction procedures will be for information only. The Contractor remains fully responsible for complying with the requirements of this Section and for the adequacy of procedures employed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. All perishable materials for the work of this Section shall be delivered stored and handled so as to preclude damage of any nature. Manufactured materials, such as cement and lime, shall be delivered and stored in their original containers, plainly marked with identification or material and maker. Materials in broken containers, or in packages showing water marks or other evidence of damage, shall not be used and shall be removed from the site.

B. All masonry shall be shipped stacked with hay or straw protection or other suitable protective device and shall be similarly stacked off the ground on the site. In addition, all masonry stored on the site shall be well protected from the weather and staining with the use of tarpaulins or other covering approved by the Engineer.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions. When applicable, saw cut masonry units when required to provide special size units.
B. Integral Water Repellent: Provide units made with liquid polymeric, integral water repellent admixture that does not reduce flexural bond strength for exposed units and where indicated. Amount used shall be as submitted and approved. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent Manufacturer’s mortar additive according to ASTM E514, using 4-in wythe units, with test period extended to 24 hours, shall show no visible water or leaks on the back of the test specimen.

C. Provide a list of not less than three (3) projects utilizing integrally-colored and integrally-waterproofed units manufactured by the same supplier.

D. Units shall be obtained from one Manufacturer to ensure even color and texture.

E. CMUs: ASTM C 90.

1. Hollow Concrete masonry units:
   a. Size: 8-inch x 8-inch x 16-inch
   b. Color:
      1) Interior: Owner Selected
      2) Exterior: Owner Selected
   c. The minimum masonry assemblage compressive strength, f’m, at age of 28 days shall be 2,000 psi.
   d. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2,800 psi.
   e. Density Classification: Medium weight
   f. Finish:
      1) Standard Finish – not textured

2. CMU shall be free from substances that will cause staining or pop-outs and shall be fine, even texture with straight and true edges. All units shall be wet steam cured for at least 18 hours and then air cured in covered storage for not less than 28 days before delivery.

3. Water absorption shall not exceed 15 lbs/cu. ft (average of three units) when tested in accordance with ASTM C140.

4. Moisture content at time of delivery to job site shall not exceed 35 percent of total absorption.

5. Oven dry weight of the concrete shall not be less than 130 lbs./cu ft.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type V. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.
D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.

E. Aggregate for Mortar: ASTM C 144.
   1. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   2. White-Mortar Aggregates: Natural white sand or crushed white stone.
   3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

F. Aggregate for Grout: ASTM C 404.

G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same manufacturer.

I. Water: Potable.

2.4 REINFORCEMENT, TIES, ANCHORS, AND MISCELLANEOUS

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M, Grade 60.
   1. Fabricate reinforcing for masonry in accordance with the provisions of Section 03200, except as amended by the following paragraphs.
   2. Hooks. The term “Standard Hook” as used herein or as shown on the Drawings for masonry reinforcement shall be as defined in the following paragraphs. Inside diameter of the bend shall not be less than that shown in Table 04220-1.
      a. A 180-degree bend plus an extension of at least 4 bar diameters, but not less than 2-1/2-in at the free end of the bar.
      b. A 90-degree bend plus an extension of at least 12 bar diameters at the free end of the bar.
      c. For stirrups or ties, either a 90-degree or a 135-degree bend plus an extension of at least 6 bar diameters but not less than 2-1/2-in at the free end of the bar.

<table>
<thead>
<tr>
<th>Bar</th>
<th>Minimum Inside Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stirrups &amp; Ties: #4 &amp; smaller</td>
<td>4 diameters</td>
</tr>
<tr>
<td>Other: #3 through #8</td>
<td>6 diameters</td>
</tr>
<tr>
<td>#9 through #11</td>
<td>8 diameters</td>
</tr>
</tbody>
</table>
B. Provide and install miscellaneous anchors and attachment members, required both for the anchorage of work of this Section and that of other trades requiring attachment to masonry, which are not specifically provided under separate Sections.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

A. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

C. Weepholes

1. Provide compressive filler in vertical joints designated for weepholes. Filler shall exclude all mortar from joint.

2. Weepholes shall be located above horizontal joint containing fabric flashing. Place at 24-inches on center. Remove filler from weeps after walls are completely set and when directed by the Engineer.

2.6 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use Portland cement-lime mortar unless otherwise indicated. Masonry cements shall NOT be used.
3. For exterior masonry, use Portland cement-lime mortar.
4. For reinforced masonry, use Portland cement-lime mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S.
3. For mortar parge coats, use Type S.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2500 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.
3.2 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

H. No material which is frozen or covered with frost or snow shall be used in the construction and no antifreeze salts or ingredients shall be mixed with the mortar.

I. Masonry shall not be laid at temperatures below 40 degrees F, without the approval of the Engineer and all work shall be done in such a manner as to ensure the proper and normal hardening of all mortar. All masonry work shall be protected and heated so that the temperature at the surface will not fall below 50 degrees F for a period of 72 hours after placing. Any completed work found to be affected by freezing shall be taken down and rebuilt at no additional cost to the Owner.

3.3 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.4 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

3.5 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.6 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Concrete masonry unit walls shall be laid in such a manner as to preserve the alignment and unobstructed vertical continuity of cells. Cross webs adjacent to vertical cores that are to be
filled with grout shall be fully bedded with mortar, to prevent grout leakage. Mortar fins protruding from joints shall be removed before grout is placed. The minimum clear dimensions of vertical cores to be grouted shall be 2-in by 3-in.

D. Reinforcement shall be free of dirt, oil, and other materials that will adversely affect bond, and shall be straight except where bends or hooks are detailed on the plans. Reinforcement which, in the opinion of the Engineer, is bent or otherwise damaged so as to affect its structural capacity shall not be incorporated into the Work.

E. Bond beams and horizontal joint reinforcing shall be continuous with lapped splices as specified except at vertical expansion and control joints, or at other locations noted on the Drawings.

F. Reinforcing Details

1. Provide reinforcement indicated in Drawings, fully embedded in grout and not in mortar or mortar joints.

2. Support and fasten masonry reinforcement to prevent displacement beyond the tolerances noted herein.

3. Position and accurately space reinforcement in units as shown on the Drawings. Maintain a clear distance between reinforcement and any masonry surface or adjacent bar or not less than ¼-in for fine grout or ½-in for coarse grout.

4. Tolerances for placing reinforcement shall be as follows, where d equals distance from centerline of steel to the compression face of masonry.

   a. Walls, beams, lintels, and bond beams:

      | “d” (in)   | Tolerance (in) |
      |------------|----------------|
      | D < 8      | +1/2           |
      | 8 < d < 24 | +1             |
      | 24 < d     | ±1 ¼           |

   b. If it becomes necessary to move reinforcement to avoid interferences with other reinforcement, conduits, or embeds, bars shall not be moved beyond their specified tolerances or more than one diameter without prior acceptance by the Engineer.

5. Splice deformed reinforcing steel at least 48 bar diameters (for grade 60 rebar) unless otherwise noted on the Drawings. When lapped bars are spaced 3-in apart or less, increase the lap length to 52 bar diameters or stagger the laps at least 24 bar diameters with no increase in lap length.

6. Clear spacing between vertical bars in columns or pilasters shall be not less than 2-1/2 times the bar diameter not 1-1/2-in. Stagger adjacent splices vertically.

7. Completely embed all reinforcing bars in mortar or grout with minimum cover (including the masonry unit) as follows:

   a. Interior exposure: 1-1/2-in
b. Exposed to soil or weather: 2-in

8. Provide masonry dowels cast into the supporting concrete at all corners of the structure in the first adjacent cell in each direction from the corner, at cells requiring vertical reinforcement, and elsewhere as shown on the Drawings.

G. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

2. Limit height of vertical grout pours to not more than 64 inches during any twenty-four (24) hour period.

3. All masonry shall be reinforced and all cells shall be solidly grouted.

4. Solid grout masonry walls retaining earth, or where indicated on Drawings.

5. Consolidate grout at time of pour by puddling with a mechanical vibrator, filling all cells of the masonry, and then reconsolidating later puddling before plasticity is lost.

3.7 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

B. Inspections:

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.8 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface. Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.9 REPAIRING, POINTING, AND CLEANING

Where ordered, remove masonry units which are loose, chipped, broken, stained or otherwise damaged and units which do not match adjoining units and install new units in fresh mortar or grout, pointed to eliminate, as approved by the Engineer, evidence of replacement.

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleared for comparison purposes.
2. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

END OF SECTION 042200
SECTION 051200 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Structural steel.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components. Shop and Erection Drawings: The shop drawings shall provide a material and specification list, construction and fabrication details, layout and erect diagrams, and the method of anchorage to adjacent construction. The shop drawings shall give the location, type, size and extend of welding and bolted connections, and clearly distinguish between shop and field connections. The drawings shall be stamped by a licensed engineer. Before submittal of the shop drawings, the Contractor shall coordinate the shop drawings and related trades to ensure proper mating of assemblies. All work shall conform to the approved shop drawings.

C. Delegated Design Submittal: For installed products indicated to comply with performance requirements and design criteria, as given in the Specifications and Drawings, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Qualification Data: For Installer.

E. Welding certificates.

F. Certified mill test reports for structural steel, including chemical and physical properties and bolting materials.

G. Source quality-control reports.

H. Field quality-control reports.

I. Documentation of certification of the steel fabricator under the AISC Quality Certification Program.
1.4 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC)
   1. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges
   4. AISC 348 - Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts (prepared by the Research Council on Structural Connections) B.

B. American Society for Testing and Materials (ASTM)
   1. ASTM A36 - Standard Specification for Carbon Structural Steel
   2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   4. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   5. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
   6. ASTM A490 - Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
   7. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
   8. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coating
   10. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
   11. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield-Strength

C. American Welding Society (AWS)
   1. AWS A2.4 - Standard Symbols for Welding, Brazing and Non-destructive Examination
   2. AWS A5.1 - Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
3. AWS D1.1 - Structural Welding Code - Steel

D. Code of Federal Regulations (CFR)
   1. 29 CFR - Part 1926 Subpart R - Steel Erection

E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply, unless otherwise noted.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with applicable provisions of the following specifications and documents:
   4. AISC 348 - RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials promptly so as to cause no delay with other parts of the work.

B. Store materials on skids and not on the ground. Pile and block materials so that they will not become bent or otherwise damaged.

C. Handle materials with cranes or derricks as far as practicable. Do not dump steel off cars or trucks nor handle in any other manner likely to cause damage.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

   1. Select and complete connections using AISC 360.

B. Moment Connections: Type PR, partially restrained.

C. Construction: Combined system of moment frame and braced frame.
2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels, Angles-Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M.

D. Square or Rectangular Hollow Structural Sections: ASTM A 500/A 500M, Grade B.

E. Steel Pipe: ASTM A 53/A 53M, or Type S, Grade B.

F. Welding Electrodes: Comply with AWS requirements, E70XX.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
   1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
   1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.

C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
   1. Finish: Hot-dip zinc coating.
   2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
   1. Finish: Plain.

E. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

F. Unheaded Anchor Rods: ASTM F 1554, Grade 55, weldable.
G. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.

H. Threaded Rods: ASTM A 36/A 36M.

2.4 PRIMER
   A. Primer: Comply with Section 098000, “Protective Coatings.”

2.5 GROUT
   A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

2.7 SHOP CONNECTIONS
   A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
      1. Joint Type: Snug tightened.

   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.

2.8 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.
      2. Surfaces to be field welded.

   B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits.
C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M.

D. Prepare test and inspection reports and submit to the Engineer.

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 according to AISC 303 and AISC 360.

   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten 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 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 shrinkage-resistant grouts.
C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

D. Furnish and install temporary bracing to provide stability during erection and to prevent distortion or damage to the framing due to wind, seismic, or erection forces. Remove temporary bracing when erection is complete.

E. After erection and field testing of connections, prime paint abrasions, field welds, and unprimed surfaces using shop primer, except surfaces designated to be unpainted or surfaces in contact with concrete.

F. After erection and field testing of connections, repair damaged galvanizing and prime paint abrasions and field welds at galvanized surfaces with surface primer containing zinc dust in accordance with ASTM A780. Provide a dry film thickness not less than 6 mils.

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

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 AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Allow the Engineer free access to the work. Notify the Engineer in writing 4 working days in advance of high strength bolting and field welding operations, including pre-installation verification of high strength bolt assemblies.

C. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M. Comply with all requests of inspectors to correct deficiencies.

E. The fact that steel work has been accepted at the shop and mill will not prevent its final rejection at the site, before or after erection, if it is found to be defective.

F. Remove rejected steel work from the site within 10 working days after notification of rejection.
END OF SECTION 051200
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for providing structural aluminum products, including sheet, pipe, extrusions, and associated accessories.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

B. American Welding Society (AWS):

1.3 SUBMITTALS

A. Quality Control Submittals:
   1. Shop Drawings and Erection Drawings: Shop drawings shall be provided for all structural aluminum. The shop drawings shall provide a material and specification list, construction and fabrication details, layout and erection diagrams, and the method of anchorage to adjacent construction. The shop drawings shall give the location, type, size and extent of welding and bolted connections, and clearly distinguish between shop and field connections. Before submittal of the shop drawings, the Contractor shall coordinate the shop drawings and related trades to ensure proper mating of assemblies. All work shall conform to the approved shop drawings.
   2. Shop Drawings: Include plans, sections, details and attachments to other work.
   3. Delegated-Design Submittal: Where noted on the Drawings as a deferred submittal with delegated design, the structural aluminum member and system design shall be performed and sealed by a professional engineer in the State of California.
   4. For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Perform welding of structural metals with welders who have current American Welding Society (AWS) certificate for the type of welding to be performed.
2. Notify the engineer 24 hour minimum before starting shop or field welding.
3. Engineer may check materials, equipment, and qualifications of welders.
4. Remove welders performing unsatisfactory work, or require to re-qualify.
5. Engineer may use gamma ray, magnetic particle, dye penetrant, or other aids to visual inspection to examine any part of welds or all welds.
6. Contractor shall bear costs of retests on defective welds.
7. Contractor shall also bear costs in connection with qualifying welders.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Sheet Aluminum: ASTM B 209, Alloy 6061-T06
B. Structural Aluminum: ASTM B 308 Alloy 6061-T6
C. Extruded Aluminum: ASTM B 221, Alloy 6063-T42
D. Miscellaneous Materials:
   1. Furnish supplementary parts necessary to complete each item even where such work is neither definitely indicated on the Drawings nor specified.
   2. Size, form, attachment, and location shall conform to the best of current practice.
   3. Conform to applicable ASTM Standards for materials not otherwise specified.

2.2 FABRICATION

A. Aluminum Layout:
   1. Center punch hole centers, and punch or scribe cutoff lines, except where marks would remain on fabricated material.
   2. Apply temperature correction where necessary in layout of critical dimensions. Use a coefficient of expansion of 0.00013 per degree of Fahrenheit.

B. Cutting Aluminum:
   1. Material ½ inch thick or less: Shear, saw, or cut with a router.
   2. Material more than ½ inch thick: Saw or rout.
   3. Make cut edges true and smooth, free from excessive burrs or ragged breaks.
   4. Avoid reentrant cuts wherever possible. Where used, fillet by drilling prior to cutting.
   5. Do not flame cut aluminum alloys.
   6. Punch or drill rivet or bolt holes to finished size before assembly.
      a. Make finished diameter of holes for bolts 1/16 maximum larger than nominal bolt diameter.
      b. Make holes cylindrical and perpendicular to principal surface.
      c. Do not permit holes to drift in a manner to distort metal.

C. Aluminum Forming and Assembly:
   1. Do not heat structural aluminum, except as follows:
      a. Heat aluminum to 400 degrees Fahrenheit for 30 minutes maximum, to facilitate bending or welding.
2. b. Heat only when proper temperature controls and supervision can ensure that limitations on temperature and time are observed.

D. Before assembly, remove chips lodged between contacting surfaces.

E. Welding Aluminum:
   2. Weld aluminum in accordance with the following:
      a. Preparation:
         1) Remove dirt, grease, forming or machining lubricants, and organic materials, from areas to be welded by cleaning with a suitable solvent or by vapor degreasing.
         2) Additionally, etch or scratch brush to remove oxide coating just prior to welding when inert gas tungsten arc welding method is used.
         3) Oxide coating may not need to be removed if welding is performed by automatic or semi-automatic inert gas shielded metal arc.
         4) Suitably prepare edges to assure 100 percent penetration in butt welds by sawing, chipping, machining, or shearing. Do not cut with oxygen.
      b. Filler Metal: Aluminum alloys conforming to the requirements of AWS A5.10 and AWS classification ER 4043, ER 5654, ER 5554, ER 5183, ER 5356, or ER 5556.
      c. Perform welding of structures which are to be anodized using filler alloys which will not discolor. When anodized, AWS ER 5654, ER 5554, ER 5183, ER 5356, or ER 5556.
      d. Perform welding by using a non-consumable tungsten electrode with filler material in an inert gas atmosphere (TIG) or using a consumable filler metal electrode in an inert gas atmosphere (MIG).
      e. Do not use welding processes that require use of a welding flux.
      f. Neatly make welded closures.
      g. Where weld material interferes with fit or is unsightly in appearance, grind it smooth.
      h. Make welds full penetration welds unless otherwise indicated on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine Work in place to verify that it is satisfactory to receive the Work of this Section. If unsatisfactory conditions exist, do not begin this Work until such conditions have been corrected.

3.2 INSTALLATION

A. Install structural aluminum products as indicated on the Drawings and specified.
B. Install structural aluminum products accurately and securely, true to level, plumb, in correct alignment and grade, with all parts bearing or fitting structure or equipment for which intended.

C. Do not cock out of alignment, redrill, reshape, or force fit fabricated items.

D. Place anchor bolts or other anchoring devices accurately and make surfaces which bear against structural items smooth and true to level. Unless noted otherwise all anchor bolts shall be 304 stainless steel.

E. Rigidly support and brace structural products needing special alignment to preserve straight, level, even, smooth lines, and keep braced until concrete, grout, or dry pack mortar has hardened for a minimum 48-hour period.

F. Interface with Other products - See specification section 098000.

END OF SECTION 051400
SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Composite Floor Steel deck.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of deck, accessory, and product indicated.
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. Product certificates.
B. Evaluation reports.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
B. 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 according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
2.2  FLOOR DECK

A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. **Or Equal**

B. **Floor Deck:** Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

2. Deck Profile: Verco “B” Formlok
3. Profile Depth: As indicated Drawings
4. Design Uncoated-Steel Thickness: As indicated.

2.3  ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. **Mechanical Fasteners:** Corrosion-resistant, low-velocity, powder-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 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, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. **Flat Sump Plates:** Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

G. **Galvanizing Repair Paint:** ASTM A 780.

H. 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 according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
B. 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.

C. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

D. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

E. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

F. Welds to supporting members and the method of sidelap attachment are to be as per the structural drawings.

G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

H. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions. Installers using powder-actuated shall be properly trained and experienced in the use of such equipment.

I. Miscellaneous Deck Accessories: Install, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
   1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

J. Pour Stops and Girder Fillers: Weld steel-sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

K. Floor-Deck Closures: Weld steel-sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Engineer.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.
3.3 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

END OF SECTION 053100
SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous steel framing and supports.
2. Shelf angles.
3. Metal ladders.
4. Ladder safety cages.
5. Metal floor plate and supports.
7. Miscellaneous steel trim.
8. Metal bollards.
10. Abrasive metal nosings, treads, and thresholds.
11. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Metal nosings and treads.
2. Paint products.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Samples for Verification: For each type and finish of extruded nosing and tread.

D. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.

B. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304 and Type 316.

D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

E. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

F. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.

G. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

H. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

I. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
   1. Size of Channels: As indicated.
   2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B, with G90 coating; 0.108-inch nominal thickness.
   3. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B; 0.0966-inch minimum thickness; hot-dip galvanized after fabrication.

J. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.


M. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.


O. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).


Q. Corrosion Protection: Unless otherwise shown, miscellaneous metalwork of fabricated steel, which will be used in a corrosive environment and/or will be submerged in water/wastewater shall be coated in accordance with Section 098000 “Protective Coatings”, and shall not be galvanized prior to coating. All other miscellaneous steel metalwork shall be hot-dip galvanized after fabrication as specified herein.

R. Stainless Steel: Stainless steel metal work shall be of Type 316 stainless steel.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.
4. Provide bronze fasteners for fastening bronze.

B. Steel Bolts and Nuts: Except as otherwise specified herein, steel for bolts, anchor bolts and cap screws shall be in accordance with the requirements of ASTM A 307 Grade B, or threaded parts of ASTM A 36 and shall meet the following additional requirements

1. The nut material shall be free-cutting steel.
2. The nuts shall be capable of developing the full strength of the bolts. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads. All bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.
3. The length of all bolts shall be such that after joints are made up, each bolt shall extend through the entire nut, but in no case more than 1/2-inch beyond the nut.

C. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1. Unless otherwise shown or approved, all bolts, anchor bolts, washers and nuts which are buried,
submerged or below the top of the wall inside any hydraulic structure shall be of Type 316 stainless steel.

D. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

F. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete".

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

C. Weld corners and seams continuously to comply 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. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.

E. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 8 inches from ends and corners of units and 24 inches o.c.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with primer specified in Section 098000 "Protective Coatings."

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.
2.8 METAL LADDERS

A. General:
   1. Comply with ANSI A14.3.

B. Steel Ladders:
   1. Ladders which may be partially or wholly submerged or which are located inside a hydraulic structure shall be entirely of Type 316 stainless steel. All other ladders shall be of carbon steel, hot-dip galvanized after fabrication unless noted otherwise on the drawings.
   2. Space siderails 18 inches apart unless otherwise indicated.
   3. Siderails: As indicated.
   4. Rungs: 1/2-inch-diameter steel bars.
   5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   6. Provide nonslip surfaces on top of each rung.

2.9 LADDER SAFETY CAGES

A. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.

B. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.

C. Hot-dip galvanize steel ladder safety cages, including brackets and fasteners.

2.10 METAL FLOOR PLATE

A. Fabricate from rolled-stainless-steel floor plate of thickness indicated below:
   1. Thickness: As indicated.

B. Provide stainless-steel angle supports as indicated.

C. Provide flush stainless-steel bar drop handles for lifting removable sections, one at each end of each section.

2.11 STRUCTURAL-STEEL DOOR FRAMES

A. Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with 5/8-by-1-1/2-inch steel channel stops. Plug-weld built-up members and continuously weld exposed joints. Reinforce frames and drill and tap as necessary to accept finish hardware.
   1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.
B. Galvanize exterior steel frames.

C. Prime exterior steel frames with primer specified in Section 098000 "Protective Coatings."

2.12 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

C. Galvanize exterior miscellaneous steel trim.

D. Prime exterior miscellaneous steel trim with primer specified in Section 098000 "Protective Coatings."

2.13 METAL BOLLARDS

A. Fabricate metal bollards from 1/4-inch wall-thickness, steel shapes, as indicated.

B. Prime and coat bollards with coatings specified in Section 098000 "Protective Coatings."

C. For removable bollard requirements, see Drawings.

2.14 PIPE GUARDS

A. Fabricate pipe guards from 3/8-inch- thick by 12-inch- wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.

B. Galvanize pipe guards.

C. Prime pipe guards with primer specified in Section 098000 "Protective Coatings."

2.15 ABRASIVE METAL NOSINGS, TREADS, AND THRESHOLDS

A. Cast-Metal Units: Cast aluminum, with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches from ends and not more than 12 inches o.c.

D. Apply bituminous paint to concealed surfaces of cast-metal units.
E. Apply clear lacquer to concealed surfaces of extruded units.

2.16 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.17 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.18 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

2.19 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with primers specified in Section 098000 "Protective Coatings" are indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
   4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with
edges and surfaces level, plumb, true, and free of rack; and measured from established lines and
levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are
not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after
fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

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. At exposed connections, finish exposed welds and surfaces smooth and blended so no
roughness shows after finishing and contour of welded surface matches that of adjacent
surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal
fabrications are required to be fastened to in-place construction.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete,
masonry, or similar construction.

3.2 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before
installing.

B. Anchor bollards in concrete. Fill annular space around bollard solidly with concrete.

C. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for
consolidation. Support and brace bollards in position until concrete has cured.

D. Fill bollards solidly with concrete, mounding top surface to shed water.

E. For removable bollard installation requirements see Drawings.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to
improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have
been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if
protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack
grout solidly between bearing surfaces and plates to ensure that no voids remain.
3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000
SECTION 055100 - METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel-framed stairs.
   2. Aluminum-framed stairs.
   3. Aluminum tube railings attached to metal stairs.

B. See Section 055213 "Pipe and Tube Railings" for pipe and tube railings not attached to metal stairs or to walls adjacent to metal stairs.

C. See Section 055300 “Metal Grating” for tread requirements.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
   1. Uniform Load: 100 lbf/sq. ft.
   2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
   3. Uniform and concentrated loads need not be assumed to act concurrently.
   4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
   5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
      b. Infill load and other loads need not be assumed to act concurrently.
D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor is 1.5.

1.3 ACTION SUBMITTALS

A. Product Data: For metal stairs.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: Provide design data and analysis signed and sealed by a registered professional engineer in the State of California, responsible for their preparation.

1.4 QUALITY ASSURANCE

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

1. Preassembled Stairs: Commercial class.
2. Industrial-Type Stairs: Industrial class.

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500 (cold formed).

D. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.

E. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

F. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

G. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

H. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.
I. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

J. Fasteners: Provide stainless steel fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

2.2 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.
3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without impairing work.

E. Weld connections to comply 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. Weld exposed corners and seams continuously unless otherwise indicated.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

G. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.3 ALUMINUM-FRAMED STAIRS

A. Stair Framing:

1. Fabricate stringers of aluminum plates or channels.
2. Construct platforms of aluminum plate or channel headers and miscellaneous framing members as needed to comply with performance requirements.
3. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.
5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

2.4 STEEL-FRAMED STAIRS

A. Stair Framing:
   1. Fabricate stringers of steel plates or channels.
   2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements.
   3. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
   4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.
   5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

B. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.
   1. At Contractor's option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.
   2. Provide epoxy-resin-filled treads, reinforced with glass fibers, with slip-resistant, abrasive surface.

C. Abrasive-Coating-Finished, Formed-Metal Stairs: Form risers, treads, and platforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.097 inch. Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish.

D. Metal Floor Plate Stairs: Form treads and platforms to configurations shown from rolled-steel floor plate of thickness needed to comply with performance requirements, but not less than 1/8 inch. Form treads with integral nosing and back edge stiffener. Weld steel supporting brackets to stringers and weld treads to brackets.

E. Metal Bar-Grating Stairs: Comply with NAAMM MBG 531, "Metal Bar Grating Manual."
   1. Fabricate treads and platforms from steel grating with crossbars at 4 inches o.c.
   2. Fabricate grating treads with nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.

2.5 ALUMINUM BAR GRATING

A. Where aluminum stairs are indicated, use aluminum bar grating, in accordance with Section 055300, “Metal Grating.”
2.6 STAIR RAILINGS

A. Aluminum Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: 1-1/2-inch- square top and bottom rails and 1-1/2-inch- square posts.
2. Picket Infill: 1/2-inch- square pickets spaced less than 4 inches clear.

B. Riveted Connections: Fabricate railings with riveted connections.

C. Form changes in direction of railings with fittings.

D. Form curves by bending members in jigs to produce uniform curvature without buckling.

E. Close exposed ends of railing members with prefabricated end fittings.

F. Provide wall returns at ends of wall-mounted handrails.

G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.

1. Connect posts to stair framing by direct welding.

H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, to transfer wall bracket loads through wall finishes. Size fillers to suit wall finish thicknesses.

2.7 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
B. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.

D. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

E. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."
   1. Install abrasive nosings with anchors fully embedded in concrete.

F. Install precast concrete treads with adhesive supplied by manufacturer.

G. Attach handrails to wall with wall brackets. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

3.2 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055100
SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aluminum pipe and tube railings.

B. See Section 055100 "Metal Stairs" for tube railings associated with metal stairs.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.

   2. Infill of Guards:
      a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
      b. Infill load and other loads need not be assumed to act concurrently.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

   1. Manufacturer's product lines of mechanically connected railings.
   2. Railing brackets.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

D. Delegated-Design Submittal: Provide design data and analysis signed and sealed by qualified registered professional engineer in the State of California, responsible for their preparation.
PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.2 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Bars and Tubing: ASTM B 221, Alloy 6063-T5/T52.


D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.


H. Perforated Metal: Aluminum sheet, ASTM B 209, Alloy 6061-T6, 0.063 inch thick, with 1/4-inch holes 3/8 inch o.c. in staggered rows.

2.3 MISCELLANEOUS MATERIALS

A. Fasteners: Provide the following:

1. Hot-Dip Galvanized Railings: Type 316 stainless-steel fasteners.
2. Aluminum Railings: Type 316 stainless-steel fasteners.
3. Stainless-Steel Railings: Type 316 stainless-steel fasteners.

B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

E. Support Brackets: Handrail support brackets shall match the same material of the handrails with a finish that matches the handrail or railing of which they are a part.

F. Toeboards: Toeboard for pipe railing shall be as indicated.

G. Socket Grout: Non-shrink grout for handrail post sockets shall consist of an inorganic, non-metallic, pre-mixed grout with a minimum 28-day compressive strength of 4,000 psi.

2.4 FABRICATION

A. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

B. Form work true to line and level with accurate angles and surfaces.

C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   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 flux immediately.
   4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

D. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

E. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

F. Bend members in jigs to produce uniform curvature without buckling or otherwise deforming exposed surfaces.

G. Close exposed ends of railing members with prefabricated end fittings.

H. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
   1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers to transfer loads through wall finishes.

2.5 ASSEMBLIES

A. Height and Spacing Requirements: Railing shall be a three (3) rail system with equal open spaces between rails (and toeboard when required). The spacing shall meet the IBC and
California OSHA requirements (whichever is more stringent). Top of upper railing shall be 42-inches above the working surface. Toeboards shall be not less than 4-inches in height or more than 1/4-inch off the working surface and shall be provided where indicated and/or required. Railings shall be mounted as shown on the Drawings. The posts shall be evenly spaced at not less than 4-feet (unless otherwise indicated on the Drawings) nor more than 6-feet on centers. Field conditions may require some adjustment of spacing. The top railings shall be as long as possible and the post shall not project through the top rails.

PART 3 - EXECUTION

3.1 GENERAL

A. Unless specified or shown otherwise, all handrails and railings shall be component systems, installed complete and ready for use with all anchors, attachments, balusters, brackets, caps, fasteners, gates, posts, sleeves, trim and all other related items required or necessary for the complete installation.

B. All installation work hereunder shall be performed by craftsmen experienced in the fabrication or architectural metal work. Exposed surfaces shall be free from defects or other surface blemishes. All dimensions and conditions shall be verified in the field in advance. All joints, junctions, miters and butting sections shall be precision-fitted with no gaps occurring between sections and all surfaces shall be flush and aligned.

3.2 INSTALLATION

A. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, in accordance with the requirements of technical specification 098000 “Protective Coatings”.

C. Weld finish: All exposed welds shall be ground smooth and flush and shall be polished and anodized. Discoloration of exposed aluminum surfaces, whether or not due to welding, shall constitute a basis for rejection of the entire assembly.

D. Expansion/Contraction: Exterior railing systems shall provide for 1/4-inch expansion and contraction per 20 linear feet of railing. Interior railing systems shall provide for 1/8-inch expansion or contraction per 20 linear feet of railing.
E. Railing Continuity and End Treatment: Handrails and railings shall be designed to form a continuous run system with elbow turns and bends that do not have interferences with hand movement. Handrails shall be continuous for the full length of the stairs and landings. The handrails shall extend not less than 6-inches beyond the top and bottom risers. Whenever possible, the extension shall be at least 18-inches for the possible use by handicapped people. The ends of handrails shall be returned to wall or shall be terminated in newel posts or safety terminals. Newel posts and safety terminals may be used only when approved by the Engineer.

F. Anchor posts in concrete by inserting into preset metal pipe sleeves and grouting annular space.

G. Anchor railing ends at walls with round flanges anchored to wall construction.

H. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.

I. Attach railings to wall with wall brackets. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

J. Secure wall brackets and railing end flanges to building construction as follows:

   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.
   3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
   4. For steel-framed partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
   5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
   6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055213
SECTION 055300 - METAL GRATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal bar gratings.
2. Formed-metal plank gratings.
3. Metal frames and supports for gratings.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design gratings and grating supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Floors: Uniform load of 125 lbf/sq. ft. or concentrated load of 2000 lbf whichever produces the greater stress.
2. Floors: Uniform load of 250 lbf/sq. ft. or concentrated load of 3000 lbf, whichever produces the greater stress.
3. Walkways and Elevated Platforms Other Than Exits: Uniform load of 60 lbf/sq. ft.
4. Walkways and Elevated Platforms Used as Exits: Uniform load of 100 lbf/sq. ft.
5. Sidewalks and Vehicular Driveways, Subject to Trucking: Uniform load of 250 lbf/sq. ft. or concentrated load of 8000 lbf, whichever produces the greater stress.
6. Unless noted otherwise, deflection of gratings shall not exceed ¼” under the loading described above.

C. Seismic Performance: Provide gratings capable of withstanding the effects of earthquake motions determined according to ASCE/SEI 7.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Formed-metal plank gratings.
2. Clips and anchorage devices for gratings.
3. Paint products.

B. Shop Drawings: Include plans, sections, details, and attachments to other work.

C. Delegated-Design Submittal: Provide design data and analysis signed and sealed by a registered professional engineer in the State of California, responsible for their preparation.
1.4 QUALITY ASSURANCE

A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual" and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."

PART 2 - PRODUCTS

2.1 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Bars for Bar Gratings: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.

C. Wire Rod for Bar Grating Crossbars: ASTM A 510 (ASTM A 510M).

D. Uncoated Steel Sheet: ASTM A 1011/A 1011M, structural steel, Grade 30 (Grade 205).

E. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 33 (Grade 230), with G90 (Z275) coating.

F. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

G. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

2.2 ALUMINUM

A. Extruded Bars and Shapes: ASTM B 221 (ASTM B 221M), alloys as follows:

1. 6061-T6 or 6063-T6, for bearing bars of gratings and shapes.
2. 6061-T1, for grating crossbars.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless steel fasteners for fastening stainless steel.

B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
2.4 MISCELLANEOUS MATERIALS

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.5 FABRICATION

A. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

B. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

C. Fit exposed connections accurately together to form hairline joints.

D. Fabricate toeplates for attaching in the field.

2.6 METAL BAR GRATINGS

A. Pressure-Locked, Aluminum I-Bar Grating, unless noted otherwise on drawings:
   1. Bearing Bar Spacing: 1-3/16 inches
   2. Bearing Bar Depth: 2 inch.
   4. Crossbar Spacing: 4 inches o.c.
   5. Traffic Surface: Grooved.
   6. Aluminum Finish: Class I, clear, anodized finish.

B. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.

C. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.
   1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.

D. Do not notch bearing bars at supports to maintain elevation.
2.7 GRATING FRAMES AND SUPPORTS

A. Frames and Supports for Metal Gratings: Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.

1. Unless otherwise indicated, fabricate from same basic metal as gratings.

2.8 STEEL FINISHES

A. Finish gratings, frames, and supports after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

C. Shop prime gratings, frames and supports unless otherwise indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

B. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Attach toeplates to gratings by welding at locations indicated.

D. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 INSTALLING METAL BAR GRATINGS

A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055300
SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Shear wall panels.
4. Rooftop equipment bases and support curbs.
5. Wood blocking, cants, and nailers.
7. Wood sleepers.
8. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.
C. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all rough carpentry unless otherwise indicated:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSIONAL LUMBER FRAMING

A. Maximum Moisture Content: 19 percent.

B. Wall Studs: Stud or No. 2 grade, Douglas Fir – Larch, WCLIB or WWPA grading rules.

C. Wall Plates: No. 2 or Construction grade, Douglas Fir – Larch, WCLIB or WWPA grading rules.

D. Framing Other Than Noted Above: No. 2 grade or better, Douglas Fir – Larch, WCLIB or WWPA grading rules.
E. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

F. Species: As indicated above for load-bearing construction of same type.

G. Grade: No. 1.

2.4 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are required, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

2.5 ENGINEERED WOOD PRODUCTS

A. Engineered Wood Products, General: Products shall contain no urea formaldehyde.

2.6 SHEAR WALL PANELS

A. Plywood: Plywood shall conform to the requirements of U.S. Product Standard PS 1 as specified herein. All plywood panels shall be marked with grade mark of the American Plywood Association. The mark shall identify the plywood as to species, glue type and grade in compliance with the applicable commercial standard. Except as otherwise specified below or shown, plywood shall be Douglas Fir, Exterior, C-D, SIS. Plywood for other specific applications shall be as follows:

1. Plywood for use in concrete forms shall conform to the requirements of Section 033000 “Cast-In-Place Concrete”.
2. Plywood for backup boards behind telephone equipment, electrical equipment or communication equipment shall be Douglas Fir, A-C EXT grade for interior and exterior locations.

B. Hardboard: Hardboard shall be temper-treated panels manufactured from interfelted lignocellulose fibers consolidated under heat and pressure in a hot press to produce a smooth, hard-surfaced material which is resistant to water and stains. Hardboard shall conform to the requirements of PS 58.

2.7 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
5. Furring.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
   1. Mixed southern pine; No. 2 grade; SPIB.
   2. Eastern softwoods; No. 2 Common grade; NeLMA.
   3. Northern species; No. 2 Common grade; NLGA.
   4. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.

2.8 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.


C. Bolts: Steel bolts complying with ASTM A 307, Grade B; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.9 METAL FRAMING ANCHORS

A. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.


1. Use for interior locations unless otherwise indicated.

C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.10 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
1. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

E. Shear Wall Panels: Install shear wall panels to comply with manufacturer's written instructions.

F. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

G. Do not splice structural members between supports unless otherwise indicated.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.10.1, "Fastening Schedule," in California Building Code.

END OF SECTION 061000
SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Roof sheathing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory or from the listings of another qualified testing agency."

2.2 WOOD PANEL PRODUCTS

A. DOC PS 1 unless otherwise indicated.

2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction, Use Category UC3b for exterior construction.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
C. Application: Treat all plywood unless otherwise indicated.

2.4 ROOF SHEATHING
A. Plywood Roof Sheathing: Exposure 1, Structural I sheathing.
B. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural I sheathing.

2.5 FASTENERS
A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

2.6 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS
A. Sealant for Paper-Surfaced Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."
B. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

2.7 MISCELLANEOUS MATERIALS
A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL
A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
C. Securely attach to substrate by fastening as indicated, complying with the following:
   1. ESR 1539 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION


B. Fastening Methods: Fasten panels as indicated below:

1. Roof Sheathing:
   a. Nail or staple to wood framing.
   b. Space panels 1/8 inch apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

   1. Fasten gypsum sheathing to wood framing with nails or screws.
   2. Fasten gypsum sheathing to cold-formed metal framing with screws.
   4. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Seal sheathing joints according to sheathing manufacturer's written instructions.

   1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
   2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.4 CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

END OF SECTION 061600
SECTION 061900 – PREFABRICATED TIMBER ROOF TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood trusses.
   2. Bridging, bracing and anchorage.
   3. Connectors, anchors and accessories.

1.2 SUBMITTALS

A. Product Data: Include ICC-ES report of truss metal plate connector.

B. Shop Drawings: In addition to other requirements, clearly indicate work Contractor is to perform.

C. Quality Assurance Submittals.

1.3 QUALITY ASSURANCE:

A. Standards: Trusses to comply with following.
   1. TPI: Truss Plate Institute application standards, including TPI-14.

B. Fabricator Qualifications:
   1. General: Refer to Division 1 requirements.
   2. TPI License: Authorized to apply TPI quality marks.
   3. Engineering Design: Fabricator to secure California-Registered Structural Engineer to design, stamp and sign design of trusses in conformance with requirements of Project and Authorities. Submit stamped calculations and drawings.
   4. Design Loads: In addition to other structural consideration, engineer trusses to design loads indicated on Structural Drawings and Sections.

   1. TPI Quality Marks
   2. WCLIB or WWPA grade marks for lumber components.

D. Single Source Responsibility: Refer to Division 1 requirements.
2.1 LUMBER COMPONENTS
   A. Grade: No. 1, unless otherwise indicated on Drawings.
   B. Species: Douglass-Fir Larch.
   C. Dressed: S4S.
   D. Sizes: As specified in Truss Drawings.
   E. Moisture Content: Moisture related defects in the lumber shall not exceed those normally encountered in 19% seasoned products. Replace defective material to satisfaction of Engineer.

2.2 RELATED MATERIALS
   A. Connector Plate: “Gang Nail” types, as required by structural design, but not less than ASTM A 446, Grade A structural properties, steel sheet, ASTM A 525, G-60 hot-dipped galvanized, 0.035” minimum thickness.
   B. Anchorage Devices: Stainless steel devices with matching metal fasteners.
   C. Wood Treatment: All wood products shall be pressure-preservative treated to Mainland AWPA Standards.

2.3 FABRICATION
   A. Fabrication: Fabricate units to design configurations required by Project. Repetitive units to be uniform. Build in camber and connector plates. Assemble with tight fitting joints.
   B. Overhangs: At eaves and other overhangs, fabricate overhang as integral part of each truss unit, unless otherwise indicated.
   C. Ceiling Features: Fabricate truss units to integrate all ceiling features into units; e.g.: coffers, vaults, etc.

1.1 INSTALLATION
   A. General: Comply with project applicable recommendations of TPI. Protect units from damage during installation. Accurately located. Temporarily brace until permanent anchorage and bracing are in place. Coordinate placement of decking/sheathing with work of this Section.

END OF SECTION 061900
SECTION 064020 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Interior standing and running trim.
   2. Wood cabinets (casework).
   3. Laminate-clad cabinets (plastic-covered casework).
   4. Solid surfacing material countertops and window sills.
   5. Shop finishing of woodwork.

B. Related Sections include the following:
   1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.

D. Samples for verification of the following:
   1. Lumber with or for transparent finish, 50 sq. in. for each species and cut, finished on one side and one edge.
   2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
   3. Thermoset decorative-overlay surfaced panel products, 8 by 10 inches), for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
4. Plastic-laminate-clad panel products, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Single-Source Responsibility for Fabrication and Installation: Engage a qualified woodworking firm to assume undivided responsibility for fabricating, finishing, and installing woodwork specified in this Section.

C. Quality Standard: Except as otherwise indicated, comply with the following standard:
   a. Provide AWI Certification Labels or Certificates of Compliance indicating that woodwork meets requirements of grades specified.

D. Mockups: Before fabricating and installing interior architectural woodwork, build mockups for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Engineer.
   2. Notify Engineer seven days in advance of dates and times when mockups will be installed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Obtain Engineer's approval of mockups before starting interior architectural woodwork fabrication.
   5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   6. Demolish and remove mockups when directed.
   7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination"

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."
1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.
   2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:

B. Wood Species and Cut for Transparent Finish: Select White Oak, plain sliced.

C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
   1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
      a. Formica Corporation.
      b. WilsonArt Corp.
      c. Nevamar Corp.
      d. Ralph Wilson Plastics Co.
D. Adhesive for Bonding Plastic Laminate: Contact cement.

E. Thermostet Decorative Overlay: Decorative surface of thermally fused polyester or melamine-impregnated web, bonded to specified substrate and complying with ALA 1992.
   1. Substrate: Medium-density particleboard.

2.2 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware."
   1. Hinges: 2-3/4" five-knuckle hospital-tip 270 degree swing hinge, 0.095" thick, satin chrome finish. Doors up to 48" in height shall have 2 hinges per door. Doors over 48" in height shall have 3 hinges per door. Hinges which require cutting the edge-banding off the door will not be allowed.
   2. Drawer Slides: Drawer slides for standard drawers shall be Blum BS230E or equal with 100 pound rating and baked enamel corrosion resistant finish. File drawers and paper drawer slides shall be KV 1429 or equal full extension with 150 pound rating.
   5. Magnetic Pressure Catches: HAFELE, 245.61.322, black plastic. Provide matching strike as required.
   6. Adjustable Shelf Supports: a. Adjustable shelves shall be supported on adjustable shelf supports inserted in shelf holes drilled into the case ends or partitions and adjustable on (1 1/2") centers. Supports to be KV 346 clips.
   7. Locks: Locks for drawers and 3/4" hinged doors shall be National Lock #8053 disc tumbler.
   12. Cable Grommets: HAFELE, 429.94.310, zinc die-cast, black finish.
   13. Screws: Reed and Prince square drive screws. Standard wood screws and sheet metal screws are not acceptable.

2.3 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.
   1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.
C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or stainless steel anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

E. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:
   1. Grade: Premium.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
   1. Corners of cabinets and edges of solid-wood (lumber) members and rails: 1/16 inch.

D. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Trial fit assemblies at the fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved shop drawings before disassembling for shipment.

E. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

2.5 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 300.

B. Grade: Premium.

C. For trim items wider than available lumber, use veneered construction. Do not glue for width.

D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.
E. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

F. Assemble casings in plant except where limitations of access to place of installation require field assembly.

G. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

H. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish): Clear, kiln-dried, select red oak, plain sliced, finished lumber (S4S).

2.6 WOOD CABINETS (CASEWORK) FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 400 requirements for wood cabinets.
   1. Grade: Premium.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Wood Species for Exposed Surfaces: Clear, kiln-dried, select red oak, plain sliced, finished lumber (S4S).
   1. Grain Matching: Run and match grain vertically for drawer fronts, doors, and fixed panels.

D. Semiexposed Surfaces: Provide surface materials indicated below:
   1. Surfaces Other than Drawer Bodies: Match species and cut indicated for exposed surfaces. Drawer Sides and Backs: Solid hardwood lumber, same species indicated for exposed surfaces, shop finished.
   2. Drawer Bottoms: Hardwood plywood, same species indicated for exposed surfaces, shop finished.

E. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers except where located directly under tops.

2.7 LAMINATE-CLAD CABINETS (PLASTIC-COVERED CASEWORK)

A. Quality Standard: Comply with AWI Section 400 requirements for laminate-clad cabinets.
   1. Grade: Premium.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
   1. Horizontal Surfaces Other than Tops: GP-50, 0.050-inch (1.270-mm) nominal thickness.
   2. Postformed Surfaces: PF-42, 0.042-inch (1.067-mm) nominal thickness.
3. Vertical Surfaces: GP-50, 0.050-inch (1.270-mm) nominal thickness.
4. Edges: GP-50, 0.050-inch (1.270-mm) nominal thickness.

D. Materials for Semiexposed Surfaces: Provide surface materials indicated below:
1. Surfaces Other than Drawer Bodies: High-pressure decorative laminate, Grade GP-28.
2. Drawer Sides and Backs: Thermoset decorative overlay.
3. Drawer Bottoms: Thermoset decorative overlay.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Match color, pattern, and finish indicated by reference to laminate manufacturer's standard designations for these characteristics.

F. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers except where located directly under tops.

2.8 SOLID-SURFACING-MATERIAL (BIOASSAY ROOM COUNTERTOPS)

A. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic epoxy resin complying with material and performance requirements for medium duty laboratory environments.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. UniLine Laboratory, Hemco
   b. Durcon, Wilsonart Company

B. Quality Standard: Comply with UL 1805 and SEFA8

C. Grade: Custom.

D. Solid-Surfacing-Material Thickness: 1 inch.

E. Colors: Submit to Engineer for selection from Manufacturers Standard Range.

F. Fabricate in one piece with shop-applied edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

2.9 SHOP FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.

B. General: The entire finish of interior architectural woodwork is specified in this Section, regardless of whether shop applied or applied after installation.
1. Shop Finishing: The extent to which the final finish is applied to architectural woodwork at the fabrication shop is the Contractor's option, except shop apply at least the prime/base coat to the greatest extent possible before delivery.
C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
   1. Backpriming: Apply one coat of sealer or primer compatible with finish coats to concealed surfaces of woodwork, including backs of trim, cabinets, paneling, and ornamental work and the underside of countertops. Apply 2 coats to back of paneling. Concealed surfaces of plastic laminate-clad woodwork do not require backpriming when surfaced with plastic laminate or thermoset decorative overlay.

D. Washcoat for Stained Finish: Apply a vinyl washcoat to woodwork made from closed-grain wood before staining and finishing.

E. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523:
   1. Grade: Premium.
   2. AWI Finish System TR-6: Catalyzed polyurethane.
   4. Wash Coat for Stained Finish: Apply a vinyl wash coat to woodwork made from closed-grain wood before staining and finishing.
   5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
   6. Filled Finish for Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.
      a. Apply vinyl wash coat sealer after staining and before filling.
   7. Sheen: Satin, 30-50 Gloss units.

PART 3 – EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level (including tops).

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk
and filled flush with woodwork and matching final finish where transparent finish is indicated.

E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches (2400 mm) long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.
2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).

F. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.

G. Tops: Anchor securely to base units and other support systems as indicated. Calk space between backsplash and wall with specified sealant.
1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
3. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
4. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

H. Window Sills: Anchor securely by screwing through corner blocks or other supports into underside of window sills.
1. Align adjacent solid-surfacing-material window sills and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

I. Complete the finishing work specified in this Section to the extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in the shop.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.
C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

END OF SECTION
PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Interior standing and running trim.
   2. Wood cabinets (casework).
   3. Laminate-clad cabinets (plastic-covered casework).
   4. Solid surfacing material countertops and window sills.
   5. Shop finishing of woodwork.

B. Related Sections include the following:
   1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.

D. Samples for verification of the following:
   1. Lumber with or for transparent finish, 50 sq. in. for each species and cut, finished on one side and one edge.
   2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
   3. Thermoset decorative-overlay surfaced panel products, 8 by 10 inches), for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
   4. Plastic-laminate-clad panel products, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.
1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Single-Source Responsibility for Fabrication and Installation: Engage a qualified woodworking firm to assume undivided responsibility for fabricating, finishing, and installing woodwork specified in this Section.

C. Quality Standard: Except as otherwise indicated, comply with the following standard:
      a. Provide AWI Certification Labels or Certificates of Compliance indicating that woodwork meets requirements of grades specified.

D. Mockups: Before fabricating and installing interior architectural woodwork, build mockups for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Engineer.
   2. Notify Engineer seven days in advance of dates and times when mockups will be installed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Obtain Engineer's approval of mockups before starting interior architectural woodwork fabrication.
   5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   6. Demolish and remove mockups when directed.
   7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination"

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.7 PROJECT CONDITIONS
A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.
2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:

B. Wood Species and Cut for Transparent Finish: Select White Oak, plain sliced.

C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
   a. Formica Corporation.
   b. WilsonArt Corp.
   c. Nevamar Corp.
   d. Ralph Wilson Plastics Co.

D. Adhesive for Bonding Plastic Laminate: Contact cement.

E. Thermoset Decorative Overlay: Decorative surface of thermally fused polyester or melamine-impregnated web, bonded to specified substrate and complying with ALA 1992.
1. Substrate: Medium-density particleboard.

2.2 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware."

1. Hinges: 2-3/4" five-knuckle hospital-tip 270 degree swing hinge, 0.095" thick, satin chrome finish. Doors up to 48" in height shall have 2 hinges per door. Doors over 48" in height shall have 3 hinges per door. Hinges which require cutting the edge-banding off the door will not be allowed.

2. Drawer Slides: Drawer slides for standard drawers shall be Blum BS230E or equal with 100 pound rating and baked enamel corrosion resistant finish. File drawers and paper drawer slides shall be KV 1429 or equal full extension with 150 pound rating.

3. Pulls:
   a. Type No. 1: HAFELE, 101.20.700, 168 x 32 x 128, steel with nickel matt finish.


5. Magnetic Pressure Catches: HAFELE, 245.61.322, black plastic. Provide matching strike as required.

6. Adjustable Shelf Supports:
   a. Adjustable shelves shall be supported on adjustable shelf supports inserted in shelf holes drilled into the case ends or partitions and adjustable on (1 1/2") centers. Supports to be KV 346 clips.

7. Locks: Locks for drawers and 3/4" hinged doors shall be National Lock #8053 disc tumbler.


12. Cable Grommets: HAFELE, 429.94.310, zinc die-cast, black finish.

13. Screws: Reed and Prince square drive screws. Standard wood screws and sheet metal screws are not acceptable.

2.3 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.

1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.

C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or stainless steel anchors and inserts on inside face of
exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

E. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:
   1. Grade: Premium.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
   1. Corners of cabinets and edges of solid-wood (lumber) members and rails: 1/16 inch.

D. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Trial fit assemblies at the fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved shop drawings before disassembling for shipment.

E. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

2.5 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 300.

B. Grade: Premium.

C. For trim items wider than available lumber, use veneered construction. Do not glue for width.

D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.

E. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
F. Assemble casings in plant except where limitations of access to place of installation require field assembly.

G. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

H. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish): Clear, kiln-dried, select red oak, plain sliced, finished lumber (S4S).

2.6 WOOD CABINETS (CASEWORK) FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 400 requirements for wood cabinets.
   1. Grade: Premium.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Wood Species for Exposed Surfaces: Clear, kiln-dried, select red oak, plain sliced, finished lumber (S4S).
   1. Grain Matching: Run and match grain vertically for drawer fronts, doors, and fixed panels.

D. Semiexposed Surfaces: Provide surface materials indicated below:
   1. Surfaces Other than Drawer Bodies: Match species and cut indicated for exposed surfaces. Drawer Sides and Backs: Solid hardwood lumber, same species indicated for exposed surfaces, shop finished.
   2. Drawer Bottoms: Hardwood plywood, same species indicated for exposed surfaces, shop finished.

E. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers except where located directly under tops.

2.7 LAMINATE-CLAD CABINETS (PLASTIC-COVERED CASEWORK)

A. Quality Standard: Comply with AWI Section 400 requirements for laminate-clad cabinets.
   1. Grade: Premium.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
   1. Horizontal Surfaces Other than Tops: GP-50, 0.050-inch (1.270-mm) nominal thickness.
   2. Postformed Surfaces: PF-42, 0.042-inch (1.067-mm) nominal thickness.
   3. Vertical Surfaces: GP-50, 0.050-inch (1.270-mm) nominal thickness.
   4. Edges: GP-50, 0.050-inch (1.270-mm) nominal thickness.

D. Materials for Semiexposed Surfaces: Provide surface materials indicated below:
1. Surfaces Other than Drawer Bodies: High-pressure decorative laminate, Grade GP-28.
2. Drawer Sides and Backs: Thermoset decorative overlay.
3. Drawer Bottoms: Thermoset decorative overlay.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Match color, pattern, and finish indicated by reference to laminate manufacturer's standard designations for these characteristics.

F. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers except where located directly under tops.

2.8 SOLID-SURFACING-MATERIAL (BIOASSAY ROOM COUNTERTOPS)

A. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic epoxy resin complying with material and performance requirements for medium duty laboratory environments.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. UniLine Laboratory, Hemco
   b. Durcon, Wilsonart Company

B. Quality Standard: Comply with UL 1805 and SEFA8

C. Grade: Custom.

D. Solid-Surfacing-Material Thickness: 1 inch.

E. Colors: Submit to Engineer for selection from Manufacturers Standard Range.

F. Fabricate in one piece with shop-applied edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

2.9 SHOP FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.

B. General: The entire finish of interior architectural woodwork is specified in this Section, regardless of whether shop applied or applied after installation.
1. Shop Finishing: The extent to which the final finish is applied to architectural woodwork at the fabrication shop is the Contractor's option, except shop apply at least the prime/base coat to the greatest extent possible before delivery.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
1. Backpriming: Apply one coat of sealer or primer compatible with finish coats to concealed surfaces of woodwork, including backs of trim, cabinets, paneling, and ornamental work and the underside of countertops. Apply 2 coats to back of
paneling. Concealed surfaces of plastic laminate-clad woodwork do not require backpriming when surfaced with plastic laminate or thermoset decorative overlay.

D. Washcoat for Stained Finish: Apply a vinyl washcoat to woodwork made from closed-grain wood before staining and finishing.

E. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523:
   1. Grade: Premium.
   2. AWI Finish System TR-6: Catalyzed polyurethane.
   4. Wash Coat for Stained Finish: Apply a vinyl wash coat to woodwork made from closed-grain wood before staining and finishing.
   5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
   6. Filled Finish for Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.
      a. Apply vinyl washcoat sealer after staining and before filling.
   7. Sheen: Satin, 30-50 Gloss units.

PART 3 – EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level (including tops).

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches (2400 mm) long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.
2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).

F. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.

G. Tops: Anchor securely to base units and other support systems as indicated. Calk space between backsplash and wall with specified sealant.
1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
3. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
4. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

H. Window Sills: Anchor securely by screwing through corner blocks or other supports into underside of window sills.
1. Align adjacent solid-surfacing-material window sills and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

I. Complete the finishing work specified in this Section to the extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in the shop.

3.3 ADJUSTING AND CLEANING
A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
B. Clean, lubricate, and adjust hardware.
C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION
A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

END OF SECTION
SECTION 065100 – FIBERGLASS REINFORCED PLASTIC WEIRS

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

A. Contractor shall supply and install all FRP weirs as indicated in the design drawings.

1.2 REFERENCES


E. ASTM D 696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C.


1.3 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Test results of fiberglass reinforced plastic laminate.

C. Shop Drawings:

D. Critical dimensions, jointing and connections, fasteners and anchors.

E. Materials of construction.

F. Sizes, spacing, and locations of structural members, connections, attachments, openings, fasteners, and loads.

G. Manufacturer's installation instructions.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Store products indoor and protect from construction traffic and damage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Warminster Fiberglass Company

B. Or Equal

2.2 WEIR PLATES

A. Weir Plates, Scum Baffles, Brackets, and Plates: Fiberglass reinforced polyester resin, compression molded in matched metal die molds; provide all required lap plates, cover plates, and support brackets.

B. Plates fabricated from cut plate stock with cut edges, notches, etc., will not be accepted.

C. Fiberglass Laminate Construction: Sheet Molding Compound (SMC) for use in water treatment systems.

1. Glass content of laminate; 20 percent plus/minus 3 percent by weight. Resin fillers: 40 percent plus/minus 2 percent of resin mixture.
3. Tensile strength (ASTM D 638): 10,000 psi.
5. Flexural modulus (ASTM D 790): 800,000 psi.
8. Water absorption (ASTM D 570): 0.2 percent at 24 hrs.
9. Coefficient of thermal expansion, ave. (ASTM D 696): 0.0000105 in/in/degree F.
10. Test coupons prepared in accordance with ASTM D 618.
11. Chemical resistance: Comply with ANSI/AWWA F102, Type II classification.

D. Weir Plates:

1. 1/4-inch nominal thickness.
2. Color: Turquoise.
3. Height: 10-inches.
4. Length: Nominal 5 OR 7 feet long.
5. Mounting holes on rectangular tanks: 4 each, 2 1/2-inches square at 12-inches on center to provide a minimum 2-inches vertical or horizontal adjustment.
6. Mounting: 5/8-inch diameter 316 stainless steel expansion anchor bolts and 5-inch square fiberglass cover plates to prevent short-circuiting of water.
7. Ends secured with 6 by 10 inch high lap plates to allow for horizontal expansion.

E. Lap Plates:

1. Size: 6 by 10 inches.
2. Provide as required to secure ends of weir plates.
3. Provide 316 stainless steel hardware to secure weir plates to concrete wall and to lap plates.

F. Assembly Hardware:
   1. Expansion Anchor Bolts w/ Nuts and Washers:
      a. Stainless Steel Type 316
      b. 5/8 inch diameter by 6 inches

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Verify that dimensions are correct and project conditions are suitable for installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL
   A. Install products in accordance with manufacturer's instructions.
   B. Ensure that products are installed plumb and true, free of warp or twist, within tolerances specified by the manufacturer and as indicated in the contract documents.
   C. Install in accordance with approved shop drawings and in true and proper alignment.
   D. Adjust weir plate elevation for flow indicated or as directed by the Engineer.
   E. When necessary to adjust lengths of plates due to field conditions and when approved by the Engineer, seal cut or machined edges thus exposed with polyester resin. Excessive cutting will not be acceptable.

3.3 ADJUST AND CLEAN
   A. Clean surfaces in accordance with manufacturer's instructions.

END OF SECTION 065100
SECTION 065400 - FIBERGLASS REINFORCED PLASTIC PANELS

PART 1 - GENERAL

1.1 SUMMARY

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

1.2 SUMMARY:

A. This section includes FRP Products & Fabrications for FRP Building Panel System

1.3 SCOPE OF WORK:

A. Furnish all labor, materials, equipment and incidentals governed by this section necessary to install the fiberglass reinforced polymer (FRP) products as specified herein.

1.4 QUALITY ASSURANCE:

A. The material covered by these specifications shall be furnished by an ISO-9001 certified manufacturer of proven ability who is regularly engaged in the manufacture, fabrication and installation of FRP systems.
B. Substitution of any component or modification of system shall be made only when approved by the Architect or Design Engineer.
C. Fabricator Qualifications: Firm experienced in successfully producing FRP fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.
D. In addition to requirements of these specifications, comply with manufacturer’s instructions and recommendations for work.

1.5 DESIGN CRITERIA:

A. The design of fiberglass building panel system, the fiberglass support structure, and associated structural connections, shall be in accordance with the governing building code(s), and approved standards as applicable.

1.6 SUBMITTALS:

A. Manufacturer’s catalog data showing:
   1. Materials of construction
   2. Dimensions, spacings, and construction of grating, handrails and building panels.

B. Detail shop drawings showing:
   1. Dimensions
   2. Sectional assembly
3. Location and identification mark

1.7 SHIPPING AND STORAGE INSTRUCTIONS:

A. All materials and equipment necessary for the fabrication and installation of FRP panel systems and appurtenances shall be stored before, during, and after shipment in a manner to prevent cracking, twisting, bending, breaking, chipping or damage of any kind to the materials or equipment, including damage due to over exposure to the sun. Any material which, in the opinion of the Design Engineer, has become damaged as to be unfit for use, shall be promptly removed from the site of work, and the Contractor shall receive no compensation for the damaged material or its removal.

B. Identify and match-mark all materials, items and fabrications for installation and field assembly.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Materials used in the manufacture of the FRP products shall be raw materials in conformance with the specification and certified as meeting the manufacturer’s approved list of raw materials.

B. All raw materials shall be as specified by the contract.

C. The visual quality of the pultruded shapes shall conform to ASTM D4385.

D. FRP building panel systems shall be manufactured using a pultruded process utilizing vinyl ester resin with flame retardant and ultraviolet (UV) inhibitor additives. A synthetic surface veil fabric shall encase the glass reinforcement. FRP shapes shall achieve a flame spread rating of 25 or less in accordance with ASTM test method E-84, the flammability characteristics of UL 94 V0 and the self-extinguishing requirements of ASTM D635.

E. If required, after fabrication, all cut ends, holes and abrasions of FRP shapes shall be sealed with a compatible resin coating.

F. FRP products exposed to weather shall contain an ultraviolet inhibitor. Additional ultraviolet one mil minimum UV coating can be applied.

G. The panels shall have a medium urethane grit surface applied to one side.

H. All exposed surfaces shall be smooth and true to form, consistent with ASTM D4385.

I. Manufacturers:
   1. Strongwell
   2. Or equal

J. Pultruded FRP products shall be manufactured and fabricated in the USA. Manufacturer shall provide a written Certificate of Compliance.

K. The materials covered by these specifications shall be furnished by an ISO-9001 certified manufacturer.

2.2 FRP BUILDING PANEL SYSTEM

A. Materials

1. Each panel, 3-way connector, hanger, 45º connector, toggle connector and end cap required to install the building panel shall be manufactured by the pultrusion process utilizing vinyl ester resin with flame retardant and UV inhibitor additives. A synthetic surface veil shall be the outermost layer covering the exterior surface. The FRP panel shall achieve a flame...
spread rating of 25 or less in accordance with ASTM test method E-84, flammability characteristics of UL 94 V0 and meet the self-extinguishing requirements of ASTM D635.

2. The following minimum mechanical properties shall apply:

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3. Fiberglass panels shall be 3-inch thick COMPOSOLITE® as manufactured by Strongwell or equal.

4. Provide factory installed, recessed handles for in planking panels where indicated in the drawings.

B. Connections

1. Panels utilize integrally molded longitudinal grooves into which a connector or toggle is inserted during assembly.
2. 3-way and 45º connectors are utilized in the system to develop corners and facilitate joining walls and sides.
3. Toggles are utilized to lock panels and connectors.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction.

B. Coordinate delivery of such items to project site.

3.2 INSPECTION AND TESTING:

A. The Design Engineer shall have the right to inspect and test all materials to be furnished under these specifications prior to their shipment from the point of manufacture.
B. All labor, power, materials, equipment and appurtenances required for testing shall be furnished by the Contractor at no cost to the Owner.

3.3 INSTALLATION, GENERAL:

A. Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous FRP fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as determined by the Design Engineer.

B. Cutting, fitting and placement: Perform cutting, drilling and fitting required for installation of miscellaneous FRP fabrications. Set FRP fabrication accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; measured from established lines and levels. Planking to be installed with no more than 1/4 – inch gap around any cut or drilled areas.

C. Provide temporary bracing or anchors in form work for items that are to be built into concrete masonry or similar construction.

3.4 ALL FRP INSTALLATION:

A. If required, all field cut and drilled edges, holes and abrasions shall be sealed with a catalyzed resin compatible with the original resin as recommended by the manufacturer.

B. Install items specified as indicated and in accordance with manufacturer’s instructions.

END OF SECTION 065400
SECTION 071400 - FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY
A. Provide and apply single-component, fluid-applied liquid waterproofing system to below grade concrete slabs, walls, and footings of non-hydraulic (liquid-retaining) structures including surface preparation.

1.2 RELATED SECTIONS
A. Section 033000 Cast-in-Place Concrete
B. Section 079200 - Joint Sealants.

1.3 REFERENCES
A. ASTM International (ASTM) standards, most recent editions:
   ASTM D41 Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
   ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
   ASTM D1644 Standard Test Methods for Nonvolatile Content of Varnishes
   ASTM D4263 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
   ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials

1.4 SUBMITTALS
A. Submit in accordance with Section 013300 – Contractor Submittals.
B. Product Data: For each type of product indicated. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
C. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions which may be required.
D. Qualification Data: For qualified Installer.
E. Product Test Reports: For waterproofing, based on evaluation of comprehensive tests performed by a qualified testing agency.

F. Field quality-control reports.

G. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved or licensed by manufacturer for installation of waterproofing required for this Project and is eligible to receive special warranties specified.

B. Source Limitations: Obtain waterproofing materials from single source from single manufacturer.

C. Preinstallation Conference: Conduct conference at Project site.
   1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, installation procedures, testing and inspection procedures, and protection and repairs.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 016100 – Product Requirements.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below 0 Degrees F.
   1. Do not apply membrane when air, material, or surface temperatures are expected to fall below 30 Degrees F within four hours of completed application.
   2. Do not apply membrane if rainfall is forecast or imminent within 12 hours.
   3. Do not apply waterproofing membrane to any surfaces containing frost.
   4. Consult manufacturer for applications to green concrete.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.8 WARRANTY

A. Special Warranty: The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents, and shall be in addition to, and run concurrent with, other warranties made under requirements of the Contract Documents.

B. Provide written warranty signed by waterproofing manufacturer and installer agreeing to repair or replace waterproofing that does not meet requirements or that does not remain watertight within the specified warranty period.
C. Warranty Period: 3 years after date of Substantial Completion.

D. Warranty does not include failure of waterproofing due to failure of substrate or formation of new joints and cracks in substrate that exceed 1/16 inch in width.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following Manufacturers and products are acceptable:
   1. Fluid Applied Waterproofing:
      a. Epro Services, Inc., Ecobase Waterproofing Membrane.
      b. Tremco Barrier Solutions, Tuff-N-Dri H8 Waterproofing.
      c. Engineer approved equal.

2.2 PERFORMANCE CRITERIA

A. Waterproofing Membrane:
   1. Single-component, polymer-enhanced liquid-applied membrane with the following minimum properties:
      a. Solids content, ASTM D1644, 60% minimum.
      b. Tensile Strength, ASTM D412: 15 psi, minimum.
      c. Elongation, ASTM D412: 1100%, minimum.
      d. Water Vapor Transmission, ASTM E96: 1 perms maximum (40 mil dry coat).
      e. Hydrostatic Pressure Resistance, 8 feet water head, minimum.
      f. Adhesion, ASTM C836, minimum 11 lb/inch to peel from concrete and masonry.

B. Sealants and Accessories: Manufacturer's recommended sealants and accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
   2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.
B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

3.3 JOINTS, CRACKS, AND TERMINATIONS

A. Prepare and treat substrates to receive waterproofing membrane, including expansion joints, construction joints, cracks, deck drains, corners, and penetrations according to manufacturer's written instructions.

3.4 MEMBRANE APPLICATION

A. Apply using appropriate equipment and nozzles, per manufacturer’s recommendations. Start application with manufacturer's authorized representative present.

B. Membrane: Spray apply asphalt emulsion membrane to substrates and adjoining surfaces indicated. Spread to a minimum wet thickness per manufacturer’s specification to achieve listed hydrostatic resistance, minimum of 60 mils.

C. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.

D. Allow product to cure prior to backfilling.

E. When buried surfaces that have been waterproofed are not backfilled within 30 days of membrane applications, membrane shall be coated with whitewash. Any formula for mixing the whitewash may be used which is not detrimental to the membrane and produces a uniformly coated white surface which remains until backfill is placed.

3.5 FIELD QUALITY CONTROL

A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; and application of the membrane, flashings, protection, and drainage components; furnish daily reports to Engineer.

3.6 CLEANING AND PROTECTION

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION
SECTION 071900 - WATER REPELLENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes exterior water repellent coatings for concrete unit masonry (unpainted and unglazed).
   1. Silicone Water Repellents

B. Related Sections
   1. Section 042000 – Concrete Unit Masonry

1.2 REFERENCES

A. ASTM International (ASTM) standards, most recent editions:
   - ASTM D3278: Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus

1.3 SUBMITTALS

A. Submit in accordance with Section 013300 – Contractor Submittals.

B. Product Data: Manufacturer’s technical data to include the following:
   1. Detailed installation instructions.
   2. Protection and cleaning instructions.
   3. Certified test reports indicating compliance with requirements specified herein.
   4. Data substantiating that materials are recommended by manufacturer for applications included in this Work.

C. Samples: Provide samples of each substrate indicated to receive water repellent, 8 inches square, with specified repellent treatment applied to half of the sample.

D. Applicator Certificates: Provide letter on Manufacturer’s letterhead certifying that the applicator is approved to apply products supplied.

E. Test and Evaluation Reports: Results of rilem tube testing and application rates determined therefrom.

F. Warranty Documentation.

1.4 QUALITY ASSURANCE

A. Qualifications
   1. Manufacturers: Use products from manufacturer with not less than 5 years’ experience.
2. Applicators: Firm experienced in application of systems similar in complexity to those required for this Project, plus the following:
   a. Acceptable to, or licensed by manufacturer.
   b. Not less than 3 years’ experience with systems.
   c. Successfully completed not less than 5 comparable scale projects using the same system.

B. Test Area: Test a minimum 4 feet by 4 feet area on each type of masonry surface in the Work.
   1. Use the manufacturer’s application instructions.
   2. Let test area protective treatment cure before inspection.
   3. Perform rilem tube testing to determine coverage rate to be used.
   4. Obtain Engineer’s approval of test areas and resulting application rates to be used before proceeding with full scale application.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 016100 – Product Requirements.

B. Packaging and Shipping: Deliver products in original unopened packaging with legible manufacturer’s identification.

C. Storage and Handling Requirements: Comply with manufacturer’s instructions.

1.6 SITE CONDITIONS

A. Maintain surface and ambient temperature above 40 degrees F during, and 24 hours after application.

B. Do not proceed with application on materials where ice and snow exist.

C. Do not proceed with application if surface temperature exceeds 100 degrees F.

D. Do not proceed with application when windy conditions exist that may cause water repellent to be blown onto vegetation or surfaces not intended to be coated.

E. Do not proceed with the application of materials in rainy conditions or when rain is anticipated within 6 hours after application.

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article 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.

B. Special Warranty: Submit a written warranty, executed by the applicator and water repellent manufacturer, covering materials and labor, agreeing to repair or replace materials that fail to provide water repellency within the specified warranty period. Warranty does not include deterioration or failure of coating due to unusual weather phenomena, failure of prepared and treated substrate, formation of new joints and cracks in excess of 1/16 inch wide, fire, vandalism, or abuse by maintenance equipment.
C. Warranty Period: 5 years from date of Substantial Completion.

D. Retreat all defective areas as identified by the Engineer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
   1. Silicone Water Repellent:
      a. Weather Seal Blok-Guard & Graffiti Control II; ProSoCo, Inc.
      b. Engineer approved equal

2.2 MATERIALS

A. Masonry: Refer to Section 042000 – Concrete Unit Masonry.

B. Silicone Sealer:
   1. Silicone emulsion water repellent for dense substrates.
   2. Water-based solution containing not less than 6% solids per ASTM D5095.
   3. Flash Point: Greater than 212 degrees F per ASTM D3278.
   4. Freeze Point: 32 degrees F.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine system components, substrate, and conditions where water repellents are to be installed. If unsatisfactory conditions exist, notify Engineer in writing of unsatisfactory conditions and do not begin this Work until such conditions have been corrected.

B. Commencing installation of this Work constitutes acceptance of conditions.

3.2 PREPARATION

A. Clean substrate of substances that might interfere with penetration or performance of water repellents.

B. Test for moisture content, according to repellent manufacturer's written instructions, to ensure surface is sufficiently dry.

C. Test for pH level, according to water repellent manufacturer's written instructions, to ensure chemical bond to silicate minerals.

D. Protect adjoining work, including sealant bond surfaces, from spillage or blow over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass.

E. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water repellent treatment have been installed and cured.
3.3 APPLICATION

A. Apply product as supplied by the manufacturer without dilution or alteration unless dilution is specifically included in the manufacturer’s instructions.
   1. Apply using low pressure spray equipment (<50 psi).
   2. Saturate the surface in a “wet-on-wet” application from the bottom up, creating a 6 inch to 8 inch rundown below the spray contact point.
   3. Avoid excessive overlapping.
   4. Allow the application to penetrate the masonry surface and immediately brush out runs and drips to prevent build-up.

B. Brush apply water repellent only at locations where overspray would affect adjacent materials and where not practicable for spray application.

C. Apply 2 coats at rate determined by the manufacturer as a result of the test panel evaluations. Comply with manufacturer’s written instructions on limitations on drying time between coats.

3.4 RESTORATION

A. Repair, restore, or replace to the satisfaction of Engineer, any materials, landscaping, and nonmasonry surfaces damaged by exposure to water repellents.

3.5 FIELD QUALITY CONTROL

A. Manufacturer Services: Provide services of a manufacturer-authorized technical service representative to approve the substrate before application and to instruct the applicator on the application rates and methods.

3.6 CLEANING

A. While Work Progresses: Clean spillage and overspray from adjacent surfaces using materials and methods as recommended by water repellent manufacturer.

B. Remove and dispose of all materials used to protect surrounding areas and nonmasonry surfaces, following completion of the work of this Section.

C. Clean site of all unused water repellents, residues, rinse water, wastes, and effluents in accordance with environmental regulations.

3.7 EXTERIOR SCHEDULE

A. Provide water repellent to exterior masonry surfaces of the following structures:
   1. As noted in the Architectural Schedule Drawings

END OF SECTION
SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Glass – Fiber Blanket Insulation
   2. Spray polyurethane foam insulation.
   3. Polystyrene rigid foam insulation.
   4. Vapor retarders.
   5. Insulation Fasteners

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research/evaluation reports.

1.4 QUALITY ASSURANCE

A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by r-values they represent the rate of heat flow through a homogenous material exactly 1” thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

C. Surface Burning Characteristics: ASTM E 84.


F. Maximum Allowable Asbestos Content of Inorganic Insulations: Provide insulations composed of mineral fibers or mineral ores which contain less than 0.25% by weight of asbestos of any
type or mixture of types occurring naturally as impurities as determined by polarized light microscopy test per Appendix A of 40 CFR 763.

1.5 DELIVERY, STORAGE AND HANDLING

A. General Protection: Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

B. Protection for Plastic Insulation:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of work.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Owens Corning.
3. Or Equal.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Polypropylene-Scrim-Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).

D. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

E. Reinforced-Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

F. Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
G. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

2.2 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Minimum density of 1.5 lb/cu. ft., thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

B. Acrylic Elastomer Coating: ASTM D6083, with resistance to accelerated weathering and wind driven rain. The coating shall withstand a loading of 29 psi with no tearing, cracking, rupturing or permanent deformation. Coating shall be United Coatings, Diathon or equal. Coating shall be white.

2.3 EXTRUDED POLYSTYRENE RIGID FOAM INSULATION

A. Closed-cell polystyrene insulation shall be moisture resistant rigid foam board and shall be suitable for installation between concrete and soil.

B. Insulative properties: R-5 per inch.

2.4 VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 10 mils thick, with maximum permeance rating of 0.13 perm.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.5 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulaon, of thickness indicated, securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches (50 mm) square.

2. Spindle: Copper-coated low carbon steel, fully annealed, 0.105 inches in diameter, length to suit depth of insulation indicated.

A. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
1. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap.

B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

C. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Adhesively Attached, Spindle-Type Anchors:
      a. TACTOO Insul-Hangers; AGM Industries, Inc.
      b. Spindle Type Gemco Hangers; Gemco.
   2. Anchor Adhesives:
      a. TACTOO Adhesive; AGM Industries, Inc.
      b. Tuff Bond Hanger Adhesive; Gemco.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

   1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

   1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.
3.3 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose.

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
6. For wood-framed construction, install blankets according to ASTM C1320 and as follows:
   a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
7. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
   a. Exterior Walls: Set units with facing placed as indicated on Drawings.
   b. Interior Walls: Set units with facing placed as indicated on Drawings.

C. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.
D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.5 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

   1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
   2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
   3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
   4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
   5. The spindles shall be spaced at 16” on center, or as indicated on the drawings.

3.6 INSTALLATION OF SPRAY POLYURETHANE FOAM INSULATION

A. Place insulation following required primer or surface preparation. Install insulation according to manufacturer's written instructions applicable to products and applications indicated.

   1. Place acrylic elastomer coating according to manufacturer's written instructions applicable to products and applications indicated.

3.7 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.

   1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
   2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
   3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

END OF SECTION 072100
PART 1 - GENERAL

1.1 SUMMARY
A. Section includes standing-seam metal roof panels.

1.2 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
C. Samples: For each type of metal panel indicated.

1.4 INFORMATIONAL SUBMITTALS
A. Product test reports.
B. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS
A. Maintenance data.

1.6 QUALITY ASSURANCE
A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.
1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Solar Reflectance Index: Not less than 29 when calculated according to ASTM E 1980.

B. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low-slope roof products.

C. Energy Performance: Provide roof panels with an aged Solar Reflectance Index of not less than 0.64 when tested according to CRRC-1.

D. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

E. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft..

F. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft..

G. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
H. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
   1. Uplift Rating: UL 90.

I. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
   1. Fire/Windstorm Classification: Class 1A-90.
   2. Hail Resistance: MH.

J. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
   1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
   2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.

B. Trapezoidal-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with raised trapezoidal ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. AEP Span; a BlueScope Steel company.
      b. MBCI; a division of NCI Building Systems, L.P.
      c. McElroy Metal, Inc.
      d. Or equal.
   a. Nominal Thickness: 0.028 inch.
   c. Color: As selected by Owner from manufacturer's full range.

4. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
   a. Thickness: 0.032 inch.
   b. Surface: Smooth, flat finish.
   d. Color: As selected by Owner from manufacturer's full range.

5. Clips: One-piece fixed to accommodate thermal movement.
   a. Material: 0.028-inch nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
   b. Material: 0.025-inch thick, stainless-steel sheet.

6. Panel Coverage: 8 inches.
7. Panel Height: 1.75 inches.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
   2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
   3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
      b. Grace Construction Products, a unit of W. R. Grace & Co.;
      c. Henry Company; Blueskin PE200 HT.
      d. Kirsch Building Products, LLC; Sharkskin Ultra SA.
      e. Metal-Fab Manufacturing, LLC; MetShield.
      f. Owens Corning; WeatherLock Metal High Temperature Underlayment.
      g. Or equal.

B. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.

C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.
2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters and Downspouts: Formed from same material as roof panels according to SMACNA's "Architectural Sheet Metal Manual." Finish to match metal roof panels and roof fascia and rake trim.

E. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.

F. Panel Fasteners: Self-tapping screws designed to withstand design loads.

G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.

2.5 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements.
demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA’s "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.6 FINISHES

A. Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
2. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.
3. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.
2. Apply over the roof area indicated below:
a. Roof perimeter for a distance up from eaves of 24 inches beyond interior wall line.
b. Valleys, from lowest point to highest point, for a distance on each side of 18 inches. Overlap ends of sheets not less than 6 inches.
c. Rake edges for a distance of 18 inches.
d. Hips and ridges for a distance on each side of 12 inches.
e. Roof-to-wall intersections for a distance from wall of 18 inches.
f. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches.

B. Felt Underlayment: Apply at locations indicated on Drawings, in shingle fashion to shed water, and with lapped joints of not less than 2 inches.

1. Apply over the entire roof surface.
2. Apply on roof not covered by self-adhering sheet underlayment. Lap over edges of self-adhering sheet underlayment not less than 3 inches, in shingle fashion to shed water.

C. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.

3.3 METAL PANEL INSTALLATION

A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
5. Watertight Installation:

a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074114
SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Manufactured reglets with counterflashing.
      2. Formed roof-drainage sheet metal fabrications.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Shop Drawings: For sheet metal flashing and trim.
      1. Include plans, elevations, sections, and attachment details.
      2. Distinguish between shop- and field-assembled work.
      3. Include identification of finish for each item.
      4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.
   C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS
   A. Product certificates.
   B. Product test reports.
   C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS
   A. Maintenance data.

1.5 QUALITY ASSURANCE
   A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

1.6 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: Mill phosphatized for field painting.
2. Exposed Coil-Coated Finish:
   a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Color: As selected by Owner from manufacturer's full range.
2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F; and complying with physical requirements of ASTM D 226/D 226M for Type I and Type II felts.

C. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

D. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
      b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
      c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
   2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel.

C. Solder:
   1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.


2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Obtain field measurements for accurate fit before shop fabrication.
2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
H. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.

B. Downspouts: Fabricate downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors

1. Fabricate from the following materials:
   a. Aluminum: 0.024 inch thick.

C. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

E. Splash Pans: Fabricate to dimensions and shape required and from the following materials:

1. Aluminum: 0.040 inch thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Fabricate from the Following Materials:
   a. Aluminum: 0.050 inch thick.

B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, solder or weld watertight. Shop fabricate interior and exterior corners.

1. Fabricate from the Following Materials:
   a. Galvanized Steel: 0.040 inch thick.

C. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
1. Galvanized Steel: 0.028 inch thick.

D. Counterflashing and Flashing Receivers: Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch thick.

E. Roof-Penetration Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch thick.

F. Roof-Drain Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel and aluminum sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
5. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.

H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.
3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.

D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement or elastomeric sealant compatible with the substrate.

E. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

F. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below scupper or gutter discharge.

G. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches in direction of water flow.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches.
F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 076200
SECTION 078410 – THROUGH PENETRATION FIRE STOP

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
1. The work of this section shall include, but not be limited to, all clips and other restraining devices necessary for holding fire protection material in place and other items necessary for a complete and integral installation thru out the entire perimeter and other penetrations.

B. Related Sections include the following:
2. Division 22 and 23 Sections specifying duct and piping penetrations.
3. Division 26 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

C. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
1. Fire-resistance-rated walls including fire walls, fire partitions, fire barriers, and smoke barriers.
2. Fire-resistance-rated horizontal assemblies including floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.

A. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:
1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
3. Penetrations located outside wall cavities.
4. Penetrations located outside fire-resistance-rated shaft enclosures.
5. **L-Rated Systems:** Where through-penetration firestop systems are indicated in smoke barriers, provide through-penetration firestop systems with L-ratings of not more than 3.0 cfm/sq. ft (0.01524cu. m/s x sq. m) at both ambient temperatures and 400 deg F (204 deg C).

   **B.** For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

6. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

7. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

8. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

**C.** For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

### 1.1 SUBMITTALS

**D.** **Product Data:** For each type of product indicated.

**E.** **Shop Drawings:** For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items. Retain subparagraph below only after verifying that authorities having jurisdiction will accept modifications handled by method in subparagraph.

**F.** **Through-Penetration Firestop System Schedule:** Indicate locations of each through-penetration firestop system, along with the following information:

1. Types of penetrating items.
2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

**G.** **Qualification Data:** For Installer.

**H.** **Product Test Reports:** From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

### 1.1 QUALITY ASSURANCE

**I.** **Installer Qualifications:** A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
J. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

K. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

L. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
   1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
   2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
      a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
      b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
         1) UL in its "Fire Resistance Directory."

M. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.2 DELIVERY, STORAGE, AND HANDLING

N. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

O. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.1 PROJECT CONDITIONS

P. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

Q. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.1 COORDINATION
R. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

S. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

T. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

U. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

V. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated that are produced by one of the following manufacturers:
2. Hilti, Inc.
4. 3M; Fire Protection Products Division.
5. Tremco; Sealant/Weatherproofing Division.

2.2 FIRESTOPPING, GENERAL

W. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

X. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
6. Permanent forming/damming/backing materials, including the following:
   a. Slag-rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Fillers for sealants.
2. Temporary forming materials.
5. Steel sleeves.
2.3 FILL MATERIALS

Y. General: Provide through-penetration firestop systems containing the types of fill materials indicated. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

Z. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

AA. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

BB. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

CC. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

DD. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

EE. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

FF. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2.4 MIXING

GG. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 – EXECUTION

3.1 EXAMINATION
HH. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

II. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
   2. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
   3. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
   4. Remove laitance and form-release agents from concrete.

JJ. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

KK. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

LL. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

MM. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   5. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

NN. Install fill materials for firestop systems by proven techniques to produce the following results:
   6. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   7. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   8. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION
OO. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

10. Contractor's name, address, and phone number.
11. Through-penetration firestop system designation of applicable testing and inspecting agency.
12. Date of installation.
13. Through-penetration firestop system manufacturer's name.

3.5 FIELD QUALITY CONTROL

PP. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

QQ. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

RR. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.6 CLEANING AND PROTECTING

SS. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

TT. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION
SECTION 079200 – JOINT SEALANTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
   1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:
      b. Control and expansion joints in unit masonry and cast stone units.
      c. Joints between metal panels.
      d. Joints between different materials listed above.
      e. Perimeter joints between materials listed above and frames of doors and windows.
      f. Control and expansion joints in ceilings and other overhead surfaces.
      g. Other joints as indicated.
   2. Exterior joints in the following horizontal traffic surfaces:
      a. Isolation and contraction joints in cast-in-place concrete slabs.
      b. Tile control and expansion joints.
      c. Joints between different materials listed above.
      d. Other joints as indicated.
   3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints of exterior openings where indicated.
      c. Tile control and expansion joints.
      d. Vertical joints on exposed surfaces of walls and partitions.
      e. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
      f. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      g. Other joints as indicated.
   4. Interior joints in the following horizontal traffic surfaces:
      b. Control and expansion joints in tile flooring.
      c. Other joints as indicated.

B. Related Sections include the following:
   1. Division 4 Section “Concrete Unit Masonry" for masonry control and expansion joint fillers and gaskets.
   2. Division 8 Section "Glazing" for glazing sealants.
3. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
4. Division 9 Section "Ceramic Tile" for sealing tile joints.
5. Division 9 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.
B. Samples for Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
D. Qualification Data: For Installer.
E. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
F. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
G. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
H. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant
manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

C. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect or design Engineer.

2. Conduct field tests for each application indicated below:
   a. Each type of elastomeric sealant and joint substrate indicated.
   b. Each type of nonelastomeric sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.

6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

D. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:

1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).

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JOINT SEALANTS

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2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Three years from date of Substantial Completion.

B. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
   1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Single-Component Neutral-Curing Silicone Sealant:
   1. Available Products:
      a. Pecora Corporation; 895.
   2. Type and Grade: S (single component) and NS (nonsag).
   3. Class: 50.
   4. Use Related to Exposure: NT (nontraffic).
   5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

F. Single-Component Acid-Curing Silicone Sealant:
   1. Available Products:
      a. Dow Corning Corporation; 999-A.
      b. GE Silicones; Construction
      c. Pecora Corporation; 860.
      d. Tremco; Proglaze.
   2. Type and Grade: S (single component) and NS (nonsag).
   4. Use Related to Exposure: NT (nontraffic).
   5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

G. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:
   1. Available Products:
      a. Pecora Corporation; 898.
      b. Tremco; Tremsil 600 White.
   2. Type and Grade: S (single component) and NS (nonsag).
   4. Use Related to Exposure: NT (nontraffic).
   5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
      a. Use O Joint Substrates: Ceramic tile.

H. Multicomponent Nonsag Urethane Sealant:
   1. Available Products:
      a. Pecora Corporation; Dynatrol II.
      b. Tremco; Dymeric 511.
   2. Type and Grade: M (multicomponent) and NS (nonsag).
   3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

I. Multicomponent Pourable Urethane Sealant:
   1. Available Products:
      a. Pecora Corporation; Dynatrol II-SG.
      b. Sika Corporation, Inc.; Sikaflex - 2c SL.
      c. Sonneborn, Division of ChemRex Inc.; SL 2.
   2. Type and Grade: M (multicomponent) and P (pourable).
   4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
   5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

J. Single-Component Nonsag Urethane Sealant:
   1. Available Products:
      a. Pecora Corporation; Dynatrol I-XL.
      b. Sika Corporation, Inc.; Sikaflex - 15LM.
      c. Tremco; DyMonic.
   2. Type and Grade: S (single component) and NS (nonsag).
   4. Use Related to Exposure: NT (nontraffic).
   5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

2.4 SOLVENT-RELEASE JOINT SEALANTS

A. Acrylic-Based Solvent-Release Joint Sealant: Comply with ASTM C 1311 or FS TT-S-00230.
   1. Available Products:
      a. Tremco; Mono 555.

   1. Available Products:
      a. Sonneborn, Division of ChemRex Inc.; Sonneborn Multi-Purpose Sealant.
      b. Tremco; Tremco Butyl Sealant.

2.5 LATEX JOINT SEALANTS

A. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.

   1. Sonneborn, Division of ChemRex Inc.; Sonolac.
   2. Tremco; Tremflex 834.

2.6 ACOUSTICAL JOINT SEALANTS
A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
   1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   2. Available Products:
      a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.

2.7 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 – EXECUTION

3.1 EXAMINATION
A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
   3. Remove laitance and form-release agents from concrete.
   4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.
      b. Glass.
      c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

1. Joint Sealant: Multicomponent nonsag urethane sealant.
   Joint-Sealant Color: As selected by Architect from manufacturer's full range.

   1. Joint Sealant: Multicomponent pourable urethane sealant.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

C. Joint-Sealant Application: Exterior vertical control and expansion joints in unit masonry.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

D. Joint-Sealant Application: Exterior butt joints between metal panels.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

E. Joint-Sealant Application: Exterior vertical joints between different materials listed above.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

F. Joint-Sealant Application: Exterior perimeter joints between unit masonry and frames of doors and windows.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

G. Joint-Sealant Application: Exterior control and expansion joints in ceilings and other overhead surfaces.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

H. Joint-Sealant Application: Vertical control and expansion joints on exposed interior surfaces of exterior walls.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

I. Joint-Sealant Application: Interior perimeter joints of exterior openings.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

J. Joint-Sealant Application: Interior ceramic tile expansion, control, contraction, and isolation joints in horizontal traffic surfaces.
   1. Joint Sealant: Multicomponent nonsag urethane sealant.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
K. Joint-Sealant Application: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

L. Joint-Sealant Application: Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

M. Joint-Sealant Application: Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION
PART 1 - GENERAL

1.01 SECTION INCLUDES

B. Fiberglass Door Frames.
C. Fiberglass Louvers.
D. Fiberglass Reinforced Plastic (FRP) Transoms.

1.02 RELATED SECTIONS

A. Section 087100 - Door Hardware.
B. Section 088000 - Glazing.

1.03 REFERENCES

E. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
F. SDI 100 - Recommended Specifications for Steel Doors and Frames.
G. UL 10B - Standard for Fire Tests of Door Assemblies.
H. UL 305 - Standard for Panic Hardware.

1.04 PERFORMANCE REQUIREMENTS

A. Door opening assemblies:
   1. Maximum flame spread 25 in accordance with ASTM E 84, self-extinguishing in accordance with ASTM D 635.
   2. USDA accepted.

B. Fire rated assemblies: Comply with requirements of UL10B, NFPA 252, and ASTM E
152; UL rating, with doors and frames bearing rating labels for appropriate fire code of the installation location/application.

C. Fire rated assemblies: Comply with requirements of UL10B, NFPA 252, and ASTM E 152; UL ratings indicated on drawings, with doors and frames bearing rating labels.

1.05 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings:
   1. Plans: Indicate location of each door opening assembly in project.
   2. Elevations: Dimensioned elevation of each type door opening assembly in project; indicate sizes and locations of door hardware, and lites and louvers, if specified.
   3. Details: Installation details of each type installation condition in project; indicate installation details of glazing, if specified.
   4. Schedule: Indicate each door opening assembly in project; cross-reference to plans, elevations, and details.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

F. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

G. Closeout: Submit warranty documents specified herein.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing fiberglass doors and frames with a minimum documented experience of ten years.

B. Installer Qualifications: Company specializing in installation of fiberglass doors and frames with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's unopened, undamaged packaging, with manufacturer's labels intact.

B. Inspect and report damage to doors at time of delivery.
C. Store products in manufacturer's unopened packaging until ready for installation.

D. Store door assemblies in on end, to prevent damage to face corners and edges.

1.08 WARRANTY

A. Manufacturer's Warranty: Manufacturer's 15-year warranty against failure due to corrosion from specified environment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Fib-R-Dor, Div. of Advance Fiberglass, Inc., which is located at: 7516 Counts Massie Rd.; N. Little Rock, AR 72113;

B. Substitutions: Or Equal

C. Provide all fiberglass doors and frames from a single manufacturer.

2.02 MATERIALS

A. Fiberglass Mat: Glass fiber chopped strand, minimum 1.5 ounces per square foot.

B. Resins: Manufacturer's formulation for fabricating units to meet specified requirements.

C. Anchors: Manufacturer's standard stainless steel expansion anchors for existing openings, and stainless steel masonry tee anchors for new construction.

D. Fasteners: Stainless steel.

E. Glazing: Type specified in Section 088000; factory installed.

F. Frames: 316 stainless steel unless noted otherwise in the Drawings.

2.03 COMPONENTS

A. Non-rated Fiberglass Reinforced Plastic (FRP) Doors:
   1. Thickness: 1-3/4 inches (45 mm).
   3. Construction:
      a. Core: End-grain balsa wood, resin-impregnated.
      b. Door Plates: Molded in one continuous piece, resin reinforced with hand-laid glass fiber mat, nominal 1/8 inch (3 mm) thick, minimum 15 mil gel-coated surface.
      c. Door Edges: Minimum 3 layers resin-reinforced glass fiber mat, nominal 3/8 inch (9.5 mm) thick, machine tooled.
   5. Finish: Smooth gloss surface, minimum value of 88 in accordance with ASTM D
B. Fire-rated Fiberglass Reinforced Plastic (FRP) Doors:
1. Thickness: 1-3/4 inches (45 mm).
3. Construction:
   a. Core: Fire-resistant mineral core.
   b. Door Plates: Molded in one continuous piece, resin reinforced with hand-laid glass fiber mat, nominal 1/8 inch (3 mm) thick, minimum 25 mil gel-coated surface.
   c. Door Edges: Minimum two layers resin-reinforced glass fiber mat, nominal 1/4 inch (6 mm) thick, machine tooled.
5. Finish: Smooth gloss surface, minimum value 88 in accordance with ASTM D 523.
   a. Color: By Owner

C. Non-rated Fiberglass Frames:
1. Construction: One-piece pultruded fiberglass reinforced plastic, minimum 1/4 inch wall thickness, jamb-to-head joints mitered and reinforced with FRP clips and stainless steel fasteners; conforming to SDI requirements for performance equivalent to 16 gage steel frames.
2. Frame profile: 5-3/4 inches (146 mm) deep, 2 inches (51 mm) wide face; double rabbeted with 5/8 inch (16 mm) high stop.
4. Finish: Satin Co-Extruded finish, with true and consistent color throughout frame thickness.
   a. Color: By Owner

D. Fire-rated Frames: UL approved, and as follows:
1. Construction: Type 316 stainless steel.
2. Sizes: For door sizes and frame profiles indicated on drawings.

E. Frame Anchors: Stainless Steel.

F. Louvers in Non-rated Doors:
1. Construction: Molded solid vanes; pultruded fiberglass reinforced plastic construction.
3. Finish: Satin pigmented finish, with true and consistent color throughout frame thickness.
   a. Color: By Owner

G. Lites in Non-rated Doors:
2. Glazing: Specified in Section 088000.

H. Lites in Fire-rated Doors: UL approved, and as follows:
1. Frames: Type 316 stainless steel.
2. Glazing: Specified in Section 088000.

I. Fiberglass Reinforced Plastic (FRP) Transoms: Match adjacent door construction and color.

J. Door Hardware: Specified Section 087100.

2.04 FABRICATION

A. Fiberglass Reinforced Plastic (FRP) Doors:
   1. Minimum glass fiber to resin ratio: 30 percent.
   2. Mortise for lockset, and recess for strike plate in lock stile.
   3. Embed steel reinforcement for hinges in fiberglass matrix; provide for hinge leaf recesses in hinge stile.

B. Fiberglass Frames:
   1. Mortise for lock strike, and recess for strike plate in lock jamb.
   2. Reinforce for hinges and other indicated hardware.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive work and opening dimensions and clearances are as indicated on approved shop drawings. Do not begin installation until openings have been properly prepared.

B. If opening preparation is the responsibility of another installer, notify Architect or Design Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Acclimate doors and frames to site conditions for a minimum of 24 hours before installation.

B. Do not remove labels from fire-rated doors and frames.

3.03 INSTALLATION

A. Install door opening assemblies in accordance with approved shop drawings, SDI 100, and manufacturer's printed installation instructions, using installation methods and materials specified in installation instructions.

B. Use anchorage devices to securely fasten sliding door assembly to wall construction without distortion or imposed stresses.

C. Coordinate installation of thermal insulation at shim spaces at frame perimeter.
D. Installation of door hardware is specified in Section 087100.

E. Install door hardware in accordance with manufacturer's printed instructions, using through-bolts to secure surface applied hardware.

F. Site Tolerances: Maintain plumb and level tolerances specified in manufacturer's printed installation instructions.

3.04 ADJUSTING

A. Adjust doors in accordance with door manufacturer's maintenance instructions to swing open and shut without binding, and to remain in place at any angle without being moved by gravitational influence.

B. Adjust door hardware to operate correctly in accordance with hardware manufacturer's maintenance instructions.

3.05 CLEANING

A. Clean surfaces of door opening assemblies and sight-exposed door hardware in accordance with manufacturer's maintenance instructions.

B. Remove labels and visible markings.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.07 SCHEDULE

A. Schedules: Refer to Door Schedule indicated on drawings.

END OF SECTION 082210
PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes electrically operated sectional doors.
   B. Related Requirements:
      1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type and size of sectional door and accessory.
   B. Shop Drawings: For each installation and for special components not dimensioned or detailed
      in manufacturer's product data.
   C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS
   A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS
   A. Maintenance data.

1.5 QUALITY ASSURANCE
   A. Wood Sectional Door Manufacturer Qualifications: A qualified manufacturer that is certified
      for chain of custody by an FSC-accredited certification body.
   B. Installer Qualifications: An entity that employs installers and supervisors who are trained and
      approved by manufacturer for both installation and maintenance of units required for this
      Project.

1.6 WARRANTY
   A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that
      fail in materials or workmanship within specified warranty period.
      1. Warranty Period: Five years from date of Substantial Completion.
B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.

1. Design Wind Load: Uniform pressure (velocity pressure) of 40 lbf/sq. ft., acting inward and outward.
2. Testing: According to ASTM E 330 or DASMA 108 for garage doors and complying with the acceptance criteria of DASMA 108.

C. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 DOOR ASSEMBLY

A. Steel Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Martin Door Manufacturing.
   b. Overhead Door Corporation.
   c. Or Equal

B. Operation Cycles: Door components and operators capable of operating for not less than 10,000.

C. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E 283 or DASMA 105.

D. Installed R-Value: 11.

E. Steel Sections: Zinc-coated (galvanized) steel sheet with G60 zinc coating.

2. Exterior-Face Surface: Flat.
F. Track Configuration: As noted in the schedule.

G. Weatherseals: Fitted to bottom and top and around entire perimeter of door. Provide combination bottom weatherseal and sensor edge.

H. Locking Devices: Equip door with slide bolt for padlock.

I. Electric Door Operator:

1. Usage Classification: Medium Duty, up to 10 cycles per hour.
2. Operator Type: Manufacturer's standard for door requirements.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
4. Motor Exposure: Interior, Humid, Dirt, Partially conditioned
7. Control Station: Interior-side mounted.

J. Door Finish:

1. Finish of Interior Facing Material: Finish as selected by Owner from manufacturer's full range.

2.3 STEEL DOOR SECTIONS

A. Exterior Section Faces and Frames: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, with backed-on polyester finish, with color by owner.

1. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weather-resistant seal, with a reinforcing flange return.
2. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.

B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet welded to door section. Provide intermediate stiles formed from galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches apart.

C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile and allowing installation of astragal.

D. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place.

E. Provide reinforcement for hardware attachment.

F. Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard CFC-free insulation, with maximum flame-spread and smoke-developed indexes of 75 and 450,
respectively, according to ASTM E 84. Enclose insulation completely within steel sections and the interior facing material, with no exposed insulation.

2.4 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings. Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides for required door type, size, weight, and loading. Hardware shall be, at a minimum, corrosion resistant steel with primer.

1. Track Reinforcement and Supports: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches apart for door-drop safety device.

B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.

C. Windows: Manufacturer's standard window units of type, size, and in arrangement indicated. Provide removable stops of same material as door-section frames.

2.5 HARDWARE

A. General: Heavy-duty, stainless-steel, corrosion-resistant fasteners.

B. Hinges: Heavy-duty, galvanized-steel hinges at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Provide 3-inch- diameter roller tires for 3-inch- wide track and 2-inch- diameter roller tires for 2-inch- wide track.

D. Push/Pull Handles: Equip each push-up operated or emergency-operated door with galvanized-steel lifting handles on each side of door, finished to match door.

2.6 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from inside only.

2.7 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.
B. **Cable Drums and Shaft for Doors:** Cast-aluminum or gray-iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft.

C. **Cables:** Galvanized-steel, multistrand, lifting cables.

D. **Cable Safety Device:** Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

E. **Bracket:** Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

F. **Bumper:** Provide spring bumper at each horizontal track to cushion door at end of opening operation.

### 2.8 MANUAL DOOR OPERATORS

A. **General:** Equip door with manual door operator by door manufacturer.

B. **Push-up Operation:** Lift handles and pull rope for raising and lowering doors, with counterbalance mechanism designed so that required lift or pull for door operation does not exceed 25 lbf.

C. **Chain-Hoist Operator:** Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

### 2.9 ELECTRIC DOOR OPERATORS

A. **General:** Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. **Door-Operator Type:** Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.

C. **Motors:** Reversible-type motor with controller (disconnect switch) for motor exposure indicated.

1. **Electrical Characteristics:**
   a. **Phase:** Single phase.
b. Volts: 115 V.
c. Hertz: 60.

2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.

D. Obstruction Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.

E. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure, push-button control labeled "Close."

1. Wall-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4X enclosure.


G. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

H. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Tracks: Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

E. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

F. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780/A 780M.

3.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 083613
SECTION 085313 - VINYL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes vinyl-framed windows.
B. Refer to Section 088000 for additional requirements.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
C. Product Schedule: For vinyl windows. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS
A. Product test reports.
B. Sample warranties.

1.4 WARRANTY
A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.
   1. Warranty Period:
      a. Window: 10 years from date of Substantial Completion.
      b. Glazing Units: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WINDOW PERFORMANCE REQUIREMENTS
   1. Minimum Performance Class: R.
   2. Minimum Performance Grade: 15.
B. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.60 Btu/sq. ft. x h x deg F.

C. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.

2.2 VINYL WINDOWS

A. Operating Types: As indicated on Drawings.

   1. Finish: Integral color, white.
   2. Gypsum Board Returns: Provide at interior face of frame.

C. Glass: Clear, Tempered Glass per Section 088000

D. Insulating-Glass Units: Clear, Tempered Glass in accordance with ASTM E 2190 and per Section 088000.

E. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

F. Hardware, General: Manufacturer's standard corrosion-resistant material sized to accommodate sash weight and dimensions.
   1. Exposed Hardware Color and Finish: As indicated by manufacturer's designations.

G. Hung Window Hardware:
   2. Locks and Latches: Operated from the inside only.
   3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis.

H. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

I. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
   1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.3 FABRICATION

A. Fabricate vinyl windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze vinyl windows in the factory.
C. Weather strip each operable sash to provide weathertight installation.

D. Provide mullions and cover plates, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units. Provide manufacturer's standard finish to match window units.

E. Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant reinforcement.

F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

D. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.

E. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 085313
SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Mechanical door hardware for the following:
   a. Swinging doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

   a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.

   b. Content: Include the following information:

      1) Identification number, location, hand, fire rating, size, and material of each door and frame.
      2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
      3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
      4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.

2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1.4  QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

B. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.

C. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.

D. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Comply with the following maximum opening-force requirements:
   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
   b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
   c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

F. Keying Conference: Conduct conference at Project site.

1.5  DELIVERY, STORAGE, AND HANDLING

A. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

B. Deliver keys and permanent cores to Owner by registered mail or overnight package service.
1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
   a. Exit Devices: Two years from date of Substantial Completion.
   b. Manual Closers: 10 years from date of Substantial Completion.
   c. Concealed Floor Closers: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled on Drawings or as described herein to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements.
2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

B. A minimum of three (3) hinges shall be provided for each door leaf up to and including 7-foot in height and an additional hinge shall be added for each 2-foot or fractions thereof of additional door height.

C. All hinges shall be full mortise, 4 inches high, heavy duty, 4-ball bearings, stainless steel, Hager Companies, BB1541 or equal, unless shown otherwise in the drawings.

2.3 SURFACE CLOSERS

A. BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's
written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force. All exposed materials of the closer shall be corrosion-resistant.

B. Closers shall be Dorma STA 8916 AF86P COV SNDPK or equal, unless shown otherwise in the drawings.

2.4 MECHANICAL LOCKS AND LATCHES

A. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

B. Bored Locks: BHMA A156.2; Grade 1; Series 4000.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Corbin Russwin
   b. Schlage Commercial Lock Division; an Ingersoll-Rand company
   c. Yale Security Inc.; an ASSA ABLOY Group company

C. Mortise Locks: BHMA A156.13; Operational Security Grade 1; stamped steel case with steel or brass parts; Series 1000.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Corbin Russwin
   b. Schlage Commercial Lock Division; an Ingersoll-Rand company
   c. Yale Security Inc.; an ASSA ABLOY Group company

2.5 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Yale Security Inc.
   b. Dorma-USA
   c. Corbin Russwin
2. All exit devices shall be Yale 2100 series, 630 finish, or equal, unless shown otherwise on the drawings. Trim shall be as indicated in the schedule.

2.6 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from stainless steel.
   1. Manufacturer: Same manufacturer as for locking devices.
   2. Cylinders must be compatible with existing cores.
   3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Corbin Russwin
      b. Schlage Commercial Lock Division; an Ingersoll-Rand company.
      c. Yale Security Inc.; an ASSA ABLOY Group company.

B. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

C. Construction Cores: Determine at keying conference.

2.7 KEYING


B. Keys: Nickel silver.
   1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
      a. Notation: "DO NOT DUPLICATE."
   2. Quantity: Determine at a keying conference. Such conference shall include, at a minimum, the plant manager.

2.8 MECHANICAL STOPS AND HOLDERS


C. Wall-Mounted stops shall be used, where possible.
2.9 DOOR GASKETING
   A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer. All mounting hardware shall be stainless steel.
   B. Gasketing shall be Pemko 303 AV or equal, unless shown otherwise in the drawings.

2.10 THRESHOLDS
   A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated, extruded aluminum with a maximum ½ inch rise. Thresholds shall be installed with a sealer to prevent water from seeping underneath.
   B. Thresholds shall be Pemko 171A or equal, unless shown otherwise in the drawings.

2.11 METAL KICKPLATES
   A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch-thick stainless steel; with manufacturer's standard stainless steel machine or self-tapping screw fasteners. Width shall be door size less 2 inches. Kickplates shall be Trimco 10” x 2” Less Door Width (LDW) 630 or equal.

2.12 DOOR SWEEP
   A. Door Sweeps: Stainless steel with black neoprene insert. Hardware shall be stainless steel. Sweep shall be Pemko 3151SSN or equal, unless shown otherwise in the drawings.

2.13 FABRICATION
   A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated. All fasteners shall be stainless steel.
      1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
      2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
      3. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
2.14 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

2. Custom Steel Doors and Frames: HMMA 831.

C. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

D. All hardware shall be installed or reinstalled after the final paint coat has been applied and has dried.

E. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

F. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.

G. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as directed by Owner.
H. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

I. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.

1. Configuration: Provide one power supply for each door opening with electrified door hardware.

J. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

K. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

L. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

M. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

N. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

O. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

END OF SECTION 087100
SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:

1. Design Wind Pressures: As indicated on Drawings.
2. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.4 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.
B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction adhesion and compatibility test report.

1.6 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.


B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge
separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Five years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Windborne-Debris-Impact Resistance: Provide exterior glazing that passes basic-protection testing requirements in ASTM E 1996 for Wind Zone 1 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.

1. Large-Missile Test: For glazing located within 30 feet of grade.
2. Small-Missile Test: For glazing located more than 30 feet above grade.
3. Large-Missile Test: For all glazing, regardless of height above grade.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
2.2 GLASS PRODUCTS


B. Heat-Strengthened Float Glass:  ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

C. Type A:  Tinted, colored float glass shall be not less than 1/4-inch minimum thickness. The glass color shall be gray. Type A glass shall be PPG, "Solargray"; LOF, "Monolithic Gray"; or equal.

D. Type B:  Tinted, colored, tempered float glass shall be heat-treated safety glass 1/4-inch minimum thickness, such as PPG, "Herculite - Solargray"; LOF, "Thermopane - Monolithic Gray"; or equal. The glass color shall be gray.

E. Type C:  Clear float glass shall conform to Federal Specification DD-G-451D and shall be not less than 1/4-inch thick. Type C glass shall be PPG, "Pennvernon"; LOF, "Monolithic Annealed Glass"; or equal.

F. Type D:  Clear, tempered float glass shall be heat-tempered safety glass conforming to Federal Specification DD-G-1403B(1) and shall be not less than 1/4-inch thick.

G. Type G: Clear insulating glass shall be metal-edged units of 1-inch thickness, consisting of an outside lite of 1/4-inch thick, tinted, colored gray float glass; 1/2-inch air space; and 1/4-inch thick, clear float glass inside lite. Provide tempered glass as described above where required by code and where indicated in the drawings.

2.3 INSULATING GLASS

A. Insulating-Glass Units:  Factory-assembled units consisting of sealed lites of tempered glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System:  Dual seal.
2. Spacer:  Manufacturer's standard spacer material and construction.
3. Fill space between lites with Argon.

2.4 GLAZING GASKETS

A. Dense Compression Gaskets:  Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.
2. EPDM complying with ASTM C 864.
4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

2.5 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers’ written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Colors of Exposed Glazing Sealants: As indicated by manufacturer's designations.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.6 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

F. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance or impair appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
3.2 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Apply heel bead of elastomeric sealant.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and...
backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 088000
SECTION 092400 - PORTLAND CEMENT STUCCO

PART 1 - GENERAL

1.1 SUMMARY

A. Materials and installation of exterior stucco wall covering backed with air/moisture barrier.

1.2 RELATED SECTIONS

A. Section 033000 Cast-In-Place Concrete
B. Section 042000 Unit Masonry
C. Section 061600 Sheathing
D. Section 072100 Thermal Insulation
E. Section 076200 Sheet Metal Flashing and Trim
F. Section 079200 Joint Sealants
G. Division 8 Openings

1.3 REFERENCED DOCUMENTS

A. ASTM Standards:
   1. A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
   2. A 653 Specification for Sheet Steel Zinc coated (Galvanized) by the Hot-Dip Process, Commercial Quality
   3. B 69 Specification for Rolled Zinc
   4. C 144 Specification for Aggregate for Masonry Mortar
   5. C 297 Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions
   6. C 578 Specification for Preformed, Cellular Polystyrene Thermal Insulation
   11. C 1177 Specification for Glass Mat Gypsum for Use as Sheathing
   12. C 1513 Standard Specification for Steel Tapping Screws for Cold-Formed Steel
   13. Framing Connections
17. E 84 Test Method for Surface Burning Characteristics of Building Materials
19. E 283 Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
26. G 154 Recommended Practice for Operating Light-and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials
27. AISI (American Iron and Steel Institute)
29. APA Engineered Wood Association
30. PS 1 Voluntary Product Standard, Structural Plywood
31. PS 2 Performance Standard for Wood-Based Structural-Use Panels
32. E 30 APA Engineered Wood Construction Guide
33. 2016 CBC (California Building Code)
34. ICC ES (International Code Council Evaluation Service)
35. AC 11 Acceptance Criteria for Cementitious Exterior Wall Coatings
36. AC 212 Acceptance Criteria for Water-resistant Coatings used as Water-resistant Barriers over Exterior Sheathing
37. ICC ESR 1233
38. ICC ESR 2323
39. National Fire Protection Association (NFPA) Standards
   NFPA 285 Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus
40. US EPA (United Stated Environmental Protection Agency)

1.4 DESIGN REQUIREMENTS

A. Structural (wind and axial loads)
   1. Design for maximum allowable deflection, normal to the plane of the wall of L/360.
   2. Design for wind load in conformance with building code requirements.
   3. Refer to applicable ICC ESR for wind load limitations that may apply.

B. Moisture Control
1. Prevent the accumulation of water into or behind the stucco, either by condensation or leakage into the wall construction, in the design and detailing of the wall assembly:
   a. Provide corrosion resistant flashing to protect exposed elements and to direct water to the exterior, including, above window and door heads, beneath window and door sills, at floor lines, at roof/wall intersections, decks, abutments of lower walls with higher walls, above projecting features, and at the base of the wall.
   b. Air Leakage Prevention – prevent excess air leakage in the design and detailing of the wall assembly. Provide continuity between air barrier components in the wall assembly.
   c. Provide Air/Moisture Barrier over sheathing, concrete and masonry.
   d. At through wall expansion joints and at joints formed with back-to-back casing beads, back joints with Transition Membrane.
   e. Seal stucco terminations and accessory butt joints with appropriate sealant. Seal all penetrations through the stucco wall assembly with appropriate sealant, or backer rod and sealant, as dictated by joint type.

C. Sloped surfaces, including Foam Trim and Projecting Architectural Features Attached to Stucco.
   1. Avoid the use of stucco on build-outs or weather exposed sloped and horizontal surfaces (refer to 2 and 3 below).
   2. Build out trim and projecting architectural features from the stucco wall surface with code compliant EPS foam. All foam trim and projecting architectural features must have a minimum 1:2 [27°] slope along their top surface. All foam horizontal reveals must have a minimum 1:2 [27°] slope along their bottom surface. Where trim/feature or bottom surface of reveal projects more than 2 inches from the face of the wall plane, protect the top surface with waterproof base coat.
   3. Do not use EPS foam on weather exposed projecting ledges, sills, or other projecting features unless supported by framing or other structural support and protected with metal coping or flashing.

D. Joints and Accessories
   1. Provide two piece expansion joints in the stucco assembly where building movement is anticipated: at joints in the substrate or supporting construction, where the system is to be installed over dissimilar construction or substrates, at changes in building height, at floor lines, at columns and cantilevered areas.
   2. Provide one piece expansion joints every 144 ft² (13 m²). Cut and wire tie lath to the expansion joint accessory so lath is discontinuous at or beneath the accessory. Do not exceed length to width ratio of 2-1/2:1 in expansion joint layout and do not exceed more than 18 feet (5.5 m) in any direction without an expansion joint. Where casing bead is used back-to-back as the expansion joint, back the joint with Transition Membrane.
   3. Provide one piece expansion joints at through wall penetrations, for example, above and below doors or windows.
   4. Provide minimum 3/8 inch wide joints where the system abuts windows, doors and other through wall penetrations.
   5. Provide appropriate accessories at stucco terminations and joints.
   6. Avoid the use of channel reveal accessories which can interfere with proper drainage and proper stress relief.
   7. Provide appropriate sealant at stucco terminations and at stucco accessory butt joints.

E. Fire Protection
1. Noncombustible Type Construction: provide full width firestops at floor lines, typically 4 pcf (64 kg/m³) semi-rigid mineral wool, where metal framing runs continuously past floor line and provide minimum ¾ inch (19 mm) uniform stucco thickness.

F. Solid Substrates (concrete and CMU)
1. Provide surface plane tolerance not to exceed ¼ inch in 10 feet (6 mm in 3.0 m).
2. Concrete Masonry – provide open texture concrete masonry units with flush joints.
3. Do not install air/moisture barrier materials over efflorescence, weak surface conditions, painted, coated, non-absorbent, salt-contaminated, or any concrete or CMU substrate where adhesion is in question. Proof test adhesion to prepared poured-in-place or pre-cast concrete surfaces and impose a regimen of quality control tests to verify adhesion throughout the project.

G. Stucco Thickness (does not include primer or textured finish coat)
1. Application to Metal Plaster Bases: stucco thickness shall be uniform ¾ inch. Stucco thickness shall not exceed 7/8 inch (22 mm).
2. Stucco shall be applied in 2 coats, scratch and brown coat, to achieve the prescribed thickness.
3. Thickness shall be uniform throughout the wall area.

1.5 PERFORMANCE REQUIREMENTS

A. Air/Moisture Barrier
1. Fluid-applied, vapor permeable air barrier and water resistive barrier.
2. Material Air Leakage Resistance, ASTM E 2178: 0.004 cfm/ft² at 1.57 psf
3. Assembly Air Leakage Resistance, ASTM E 2357: 0.04 cfm/ft² at 1.57 psf
4. Water Vapor Permeance, ASTM E 96, Method B: greater than 12 perms
5. VOC, calculation:
   a. Less than 100 g/L
   b. Compliant with Bay Area Air Quality Management District

B. Stucco Base
1. Stucco scratch and brown coat material in compliance with ASTM C 926.

C. Primers
1. Acrylic Primer for fully cured stucco surfaces:
   a. VOC: less than 50 g/L, compliant with Bay Area Air Quality Management District.

D. Finishes
   a. Silicone Enhanced Elastomeric Finish
   b. Accelerated Weathering, ASTM G 53: 2000 hours, no blistering, checking cracking, crazing, or other deleterious effects.
   c. Water Vapor Permeability, ASTM D 1653, Method B: > 12.5 perms.
   d. Mildew Resistance – No growth
   e. VOC: less than 50 g/L, compliant with Bay Area Air Quality Management District.
1.6 SUBMITTALS

A. Manufacturer's specifications, details, installation instructions and product data.

B. Manufacturer’s code compliance report for air barrier and water-resistive barrier.

C. Manufacturer's standard warranty.

D. Samples for approval.

E. Prepare and submit project-specific details

1.7 QUALITY ASSURANCE

A. Manufacturer requirements
   1. Stucco and air barrier products manufacturer for a minimum of twenty (20) years.

B. Contractor requirements
   1. Licensed, insured and engaged in application of portland cement stucco for a minimum of three (3) years.
   2. Employ skilled mechanics who are experienced and knowledgeable in portland cement stucco application, and familiar with the requirements of the specified work.

C. Testing
   1. Construct full-scale mock-up of typical stucco/window wall assembly with specified tools and materials and test air and water infiltration and structural performance in accordance with ASTM E 283, ASTM E 331 and ASTM E 330, respectively, through independent laboratory. Mock-up shall comply with requirements of project specifications. Where mock-up is tested at job site maintain approved mock-up at site as reference standard. If tested off-site accurately record construction detailing and sequencing of approved mock-up for replication during construction.
   2. Conduct air barrier adhesion testing in accordance with ASTM D 4541.
   3. Conduct air barrier assembly testing in accordance with ASTM E 783.
   4. Conduct pull-out or withdrawal capacity testing of proposed fasteners for lath attachment into concrete or masonry and verify adequacy with respect to negative design wind pressure. Conduct sufficient tests such that reliable and predictable pull-out values are obtained. Verify adequacy of pull-out or withdrawal capacity of fasteners used for frame construction with manufacturer in relation to negative design wind pressures.
   5. Conduct pH testing to check stucco surface alkalinity before application of primer or finish materials. Where alkaline resistant primer is used pH testing may be waived.
   6. Conduct wet sealant adhesion testing in accordance with sealant manufacturer’s field quality control test procedure.
   7. Notify design professional minimum 7 days prior to testing.

D. Inspections
   1. Provide independent third party inspection where required by code or contract documents.
   2. Conduct inspections in accordance with code requirements and contract documents.
1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.

B. Protect EPS insulation materials from prolonged UV exposure, keep away from sources of heat, sparks, flame, flammable or volatile materials. Store on a clean, flat surface, off the ground in a dry area.

C. Protect coatings (pail products) from freezing and temperatures in excess of 90°F (32°C). Store away from direct sunlight.

D. Protect portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

E. Handle all products as directed on labeling.

1.9 PROJECT/SITE CONDITIONS

A. Maintain ambient and surface temperatures above 40°F (4°C) during application and for 24 hours after set of stucco, and after application of air/moisture barrier and finish materials.

B. Provide supplementary heat for installation in temperatures less than 40°F (4°C) such that material temperatures are maintained as in 1.09A. Prevent concentration of heat on uncured stucco and vent fumes and other products of combustion to the outside to prevent contact with stucco.

C. Prevent uneven or excessive evaporation of moisture from stucco during hot, dry or windy weather. For installation under any of these conditions provide special measures to properly moist cure the stucco. Do not install stucco if ambient temperatures are expected to rise above 100°F (38°C) within a 24 hour period.

D. Provide protection of surrounding areas and adjacent surfaces from application of materials.

1.10 COORDINATION/SCHEDULING

A. Protect sheathing from climatic conditions to prevent weather damage until the installation of the air/moisture barrier.

B. Install diverter flashings wherever water can enter the wall assembly to direct water to the exterior.

C. Coordinate installation of foundation waterproofing, roofing membrane, windows, doors and other wall penetrations to provide a continuous air barrier and continuous moisture protection. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall and provide sill flashing. Coordinate installation of air/moisture barrier components with window and door installation to provide weather proofing of the structure and to prevent moisture infiltration and excess air infiltration.
D. Install window and door head flashing immediately after windows and doors are installed.

E. Protect air/moisture barrier with stucco cladding within 180 days of installation.

F. Commence the stucco installation after completion of all floor, roof construction and other construction that imposes dead loads on the walls to prevent excessive deflection (and potential cracking) of the stucco.

G. Sequence interior work such as drywall installation prior to stucco installation to prevent stud distortion (and potential cracking) of the stucco.

H. Provide site grading such that the stucco terminates above earth grade minimum 4 inches (100 mm) and above finished grade (pavers/sidewalk) minimum 2 inches (51 mm). Provide increased clearance in freeze/thaw climate zones.

I. Install copings and sealant immediately after installation of the stucco and when finish coatings are dry.

J. Attach penetrations through stucco to structural support and provide air tight and water tight seals at penetrations.

1.11 WARRANTY

A. Provide manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Air/Moisture Barrier, Portland Cement Stucco, Stucco Primers, and Stucco Finishes:
   1. Sto Corp., 3800 Camp Creek Parkway, Building 1400, Suite 120. Atlanta, GA 30331.
   2. Or equal.

2.2 AIR/MOISTURE BARRIER

A. Fluid applied air/moisture barrier for sheathing, concrete, and concrete masonry substrates consisting of multiple compatible components:
   1. Ready mixed acrylic based flexible joint treatment for rough opening protection, joint treatment of wall sheathing, CMU crack repair, and detail component for shiplap connections with flashing, weep screed, and similar ship lap details.
   2. Sto EmeraldCoat -- ready mixed flexible waterproof coating for wall sheathing, concrete and CMU wall surfaces
   3. StoGuard Mesh-- nominal 4.2 oz/yd2 (142 g/m2), self-adhesive, flexible, symmetrical, interlaced glass fiber mesh, with alkaline resistant coating for compatibility with Sto materials, used with Sto Gold Fill to reinforce rough openings, inside and outside corners,
sheathing joints, and detail component for shiplap connections with flashing, weep screed, and similar ship lap details
4. StoGuard Fabric – nonwoven cloth reinforcement used with Sto EmeraldCoat for rough opening protection, joint treatment of wall sheathing, and detail component for shiplap connections with flashing, weep screed, and similar ship lap details
5. StoGuard RediCorner – a preformed fabric piece used in the corners of rough openings in tandem with StoGuard Fabric for quicker installation
6. StoGuard Tape – self adhering rubberized asphalt tape for rough opening protection in wood or metal frame construction
7. StoGuard Primer – primer for use with StoGuard Tape
8. StoGuard Transition Membrane – flexible air barrier membrane for continuity at transitions: sheathing to foundation, dissimilar materials (CMU to frame wall), wall to balcony floor slab or ceiling, flashing shingle lap transitions, floor line deflection joints, masonry control joints, and through wall joints in masonry or frame construction.
9. One component quick drying waterproof air barrier material for rough opening protection, sheathing joints (with StoGuard Mesh), CMU crack repair, and for sealing fish mouths, wrinkles, seams, gaps, holes, or other voids in air barrier materials
10. One component rapid drying gun-applied joint treatment for sheathing. Also used at static transition joints or seams in construction and to seal fish mouths, wrinkles, seams, gaps, holes, or other voids in StoGuard air barrier materials. Also used as a detail component for shiplap connections to flashing, weep screed, and similar ship lap details

2.3 WATER-RESISTIVE BARRIER
A. Minimum No. 15 asphalt saturated felt complying with ASTM D 226, Type 1, or one layer of Grade D kraft building paper, or paper-backed stucco lath conforming to 2.04.

2.4 LATH
A. Minimum 2.5 lb./yd2 (1.4 kg/m2) self-furred stainless steel diamond mesh metal lath in compliance with ASTM C 847

2.5 MECHANICAL FASTENERS
A. Non-corroding fasteners in compliance with AISI S200 – 2007 and ASTM C 1513:
   1. Concrete or Masonry – minimum # 8 wafer head fully threaded corrosion resistant screws for masonry with minimum 1 inch (25 mm) penetration into substrate.
   2. Tie Wire – 18 gauge galvanized and annealed low-carbon steel in compliance with ASTM A 641 with Class I coating.

2.6 ACCESSORIES
A. Weep screed, casing bead, corner bead, corner lath, expansion and control joint accessories. All accessories shall meet the requirements of ASTM C 1063 and its referenced documents.
   1. PVC plastic in compliance with ASTM D 1784, cell classification 13244C.
2.7 JOB MIXED INGREDIENTS
   A. Water: clean and potable.
   B. Sand: in compliance with ASTM C 897 or ASTM C 144, for use with one coat and ASTM C 926 stucco concentrates

2.8 STUCCO

2.9 FOAM TRIM AND BUILD-OUTS
   A. Use materials recommended by the system manufacturer.

2.10 CRACK DEFENSE
   A. Reinforcing Mesh
      1. Nominal 4.5 oz./yd2, symmetrical, interlaced open-weave glass fiber mesh made with alkaline resistant coating for compatibility with System materials.

2.11 PRIMER
   A. Acrylic based tinted primer for fully cured (minimum 28 day old or pH less than 10) stucco surfaces.

2.12 FINISH COAT
   A. Integrally colored, factory blended, silicone enhanced elastomeric textured wall finish with graded marble aggregate.

2.13 MIXING
   A. Refer to mix instructions provided by system and system components manufacturer.
   B. Mix only as much material as can readily be used.
   C. Do not add lime, anti-freeze compounds, or other additives to any of the materials.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect surfaces for:
1. Contamination – algae, chalkiness, dirt, dust, efflorescence, form oil, fungus, grease, laitance, mildew or other foreign substances.
2. Surface absorption and chalkiness.
3. Crack – measure crack width and record location of cracks.
4. Damage and deterioration.
5. Moisture damage – record any areas of moisture damage.

B. Report deviations from the requirements of project specifications or other conditions that might adversely affect the air/moisture barrier or stucco installation to the General Contractor. Do not proceed with air/moisture barrier or stucco installation until deviations are corrected.

3.2 SURFACE PREPARATION

A. Concrete and Concrete Masonry (CMU)
1. Remove surface contamination such as oil, grease, dust, dirt, algae, mildew, salts, paint or coatings. Correct weak surface conditions such as laitance. Use chemical cleaners such as TSP (trisodium phosphate) detergent to remove oil and grease and rinse with potable water. Use chemical cleaners to remove efflorescence or other surface contamination in accordance with manufacturer’s written instructions. Use mechanical methods such as waterblasting, sandblasting, and wire brushing to remove weak surface conditions.
2. Repair cracks up to 1/8 inch (3 mm) wide by raking with a sharp tool to remove loose, friable material and blow clean with oil-free compressed air. Apply joint treatment material over crack, embed reinforcement (where applicable), and smooth joint treatment material with a trowel, drywall or putty knife to cover the reinforcement.
3. Remove projecting fins, ridges, and mortar by mechanical means.
4. Fill honeycombs, aggregate pockets, holes and other voids with compatible patching material.
5. Where the surface is excessively “rough” or out of plane, skim coat the wall surface with base coat material to provide a smooth, level surface.

3.3 STUCCO SYSTEM INSTALLATION

A. Install all system components in accordance with system manufacturer recommendations. Coordinate all required work with other disciplines and general contractor.

B. Hot or dry conditions accelerate drying and moisture loss from stucco which can diminish strength and resistance to cracking. Under these conditions adjustments in the application, scheduling and curing of stucco to prevent rapid loss of moisture are necessary to achieve a satisfactory stucco installation. Cold temperatures retard drying and strength gain and adjustments may have to be made in the application, scheduling and curing of stucco to prevent damage from frost and other trades. Do not install stucco during extremely hot, dry and/or windy conditions. Do not install stucco during freezing conditions or on frozen substrates. Do not install stucco onto grounds of
accessories. Completely embed lath and flanges of accessories and completely cover fastener attachments with stucco. Moist cure stucco minimum 48 hours for optimum strength gain and resistance to cracking. Allow final stucco application to completely dry (28 days) before applying primer or finish. The finished installation must be true, plumb and square. Should stucco get into control or expansion joints, remove the stucco from within the joint before the stucco sets.

3.4 PROTECTION

A. Provide protection of installed materials from water infiltration into or behind them.

B. Provide protection of installed stucco from dust, dirt, precipitation, and freezing.

C. Provide protection of installed primer and finish from dust, dirt, precipitation, freezing and continuous high humidity until fully dry.

D. Provide sealant and backer material at stucco terminations and at fixture penetrations through the stucco to protect against air, water and insect infiltration. Provide weeps at floor lines, window and door heads, and other areas to conduct water to the exterior.

3.5 CLEANING, REPAIR AND MAINTENANCE

A. Clean and maintain the stucco finish for a fresh appearance and to prevent water entry into and behind the stucco. Repair cracks, impact damage, spalls or delamination promptly.

B. Maintain adjacent components of construction such as sealants, windows, doors, and flashing, to prevent water entry into the wall assembly.

END OF SECTION 092400
SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior gypsum board.
   2. Tile backing panels.
   3. Joint Treatment Materials
   4. Accessories and Trim

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:
   1. Board: Submit a 6 inch square sample of each panel product.
   2. Trim: Submit a 6 inch sample of each trim product.

1.3 QUALITY ASSURANCE

A. Qualifications: Installer shall have experience with installation of gypsum board under similar conditions.

B. Mock-ups:
   1. Install mock-up using approved gypsum products, including fasteners and related accessories per manufacturer’s current printed instructions and recommendations.
      a. Mock up size: 8’ by 8’
      b. Provide mock-up for each type of gypsum board used
      c. Mock-up Substrate: Match wall assembly construction
      d. Mock up may remain as part of the work

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer’s original packaging indicating manufacturer and product name.

B. Store products in accordance with manufacturer’s recommendations.
PART 2 - PRODUCTS

2.1 MANUFACTURER

A. CertainTeed Gypsum
B. National Gypsum Company
C. USG Corporation
D. Or Equal

2.2 INTERIOR GYPSUM BOARD

A. Moisture and Mold Resistant Gypsum Board: Gypsum core panel with enhanced core formulated for resistance to moisture and mold; for use in fire-resistant Type X designs. Surfaced with moisture/ mold resistant paper on front, back, and long edges. Complying with ASTM C1396.

1. ProRoc® Moisture and Mold Resistant With M2TECH™ Type X Gypsum Board by CertainTeed Gypsum, Inc., or Equal
2. Thickness: 5/8 inch
3. Width: 48 inches
4. Length: Use longest length to minimize joints
5. Edges: Tapered
6. Mold Resistance: Panel score of 10 (highest rating available) when tested in accordance with ASTM D3273

2.3 TILE BACKING PANELS

A. Fully embedded glass mat moisture resistant gypsum tile backer meeting the requirements of ASTM C 1178.

1. CertainTeed Gypsum, Inc. Diamondback™ GlasRoc® Tile Backer” with EGRG™ technology, or equal
2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
3. Standard Size: 4 feet by 8 feet
4. Mold Resistance: Panel score of 10 (highest rating available) when tested in accordance with ASTM D3273.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
   3. Fill Coat: For second coat, use drying-type, all-purpose compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:
   1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

E. Material shall be moisture-resistant and not affected by humidity after final hardening.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer’s written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Screws shall be self-drilling, self-tapping, bugle head for use with power tools, length as recommended by Gypsum Association referenced standards and the Building Code.
      a. Type "S" for wallboard to sheet metal application.
      b. Type "W" for wallboard to wood application.
      c. Type "G" for wallboard to wallboard application.
      d. Type "S" or "S-12", 1-1/4 inch for tile backing board to metal studs application.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing).

E. Acoustical Joint Sealant: ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings as demonstrated by testing according to ASTM E 90.
   1. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

G. Vapor Retarder: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

A. Comply with ASTM C 840.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

D. Install trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
   1. Aluminum Trim: Install in locations indicated on Drawings.

E. Prefill open joints and damaged surface areas.

F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 2: Panels that are substrate for tile.
   3. Level 3: Areas to receive heavy or medium textured coatings; heavy grade wall coverings.
   4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
      a. Primer and its application to surfaces are specified in Section 099000 "Architectural Paint Finishes"
   5. Level 5: Areas to receive gloss, semi-gloss sheen paints
      a. Primer and its application to surfaces are specified in Section 099000 "Architectural Paint Finishes"
H. Texture Finish Application: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

I. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

J. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900
SECTION 093100 – CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Glazed wall tile.
   2. Wall and floor accent tile.
   3. Waterproof membrane for tile installations.
   4. Thresholds installed as part of tile installations.

B. Related Sections include the following:
   1. Division 3 Section "Cast-in-Place Concrete".
   2. Division 7 Section "Joint Sealants".
   3. Division 9 Section "Gypsum Board".

1.3 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
   1. Level Surfaces: Minimum 0.6.

B. Load-Bearing Performance: For ceramic tile installed on walkway surfaces, provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project:
   1. Heavy: Passes cycles 1 through 12.

1.5 SUBMITTALS

A. Product Data: For each type of tile, mortar, grout, and other products specified.

B. Tile Samples for Selection: Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.
C. Grout Samples for Selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
   1. Stone thresholds.
   2. Waterproofing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Tile Products:
      c. Florida Tile Industries, Inc.
   2. Tile-Setting and Grouting Materials:
      c. Laticrete International, Inc.
      d. Mapei Corporation.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
   2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.


C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
   1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
   2. Provide tile trim and accessories that match color and finish of adjoining flat tile.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.
   1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for these kinds of installations and has a record of successful in-service performance.
F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 TILE PRODUCTS

A. Unglazed Wall and Floor Tile: Provide flat tile complying with the following requirements:
   3. Face: Plain with square or cushion edges.
   5. Trim: Provide 3 by 12 bullnose trim at top edge of interior wainscots.
   6. For latex-portland cement-mortared and -grouted paver tile, precoat with temporary protective coating.
   7. Available Products:
      a. Refer to Color Schedule and Drawings for location and type of porcelain tiles.

B. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
   1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
   2. Shapes: As follows, selected from manufacturer's standard shapes:
      b. Base for Thin-Set Mortar Installations: Coved.
      c. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose.
      d. External Corners for Thin-Set Mortar Installations: Surface bullnose.
      e. Internal Corners: Field-butted square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.

C. Accessories for Glazed Wall Tile: Provide vitreous china accessories of type and size indicated, in color and finish to match adjoining wall tile, and intended for installing by same method as adjoining wall tile.

2.4 THRESHOLDS

A. General: Provide thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
   1. Fabricate thresholds to heights indicated, but not more than 1/2 inch above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.

2.5 WATERPROOFING FOR TILE INSTALLATIONS

A. General: Provide products that comply with ANSI A118.10 and the descriptions in this Article.
B. Polyethylene Sheet Waterproofing: Manufacturer's standard proprietary product consisting of composite sheets, 60 inches wide by a nominal thickness of 0.030, composed of an inner layer of chlorinated polyethylene sheet faced on both sides with laminated high-strength nonwoven polyester material, designed for embedding in latex-portland cement mortar, and as substrate for latex-portland cement mortar setting bed.

1. Available Products:
   a) Polyethylene Sheet Waterproofing:
      1) "Nobleseal TS"; Noble Co. (distributed by H.B. Fuller Co.).

2.6 SETTING MATERIALS

A. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:
   1. Mixture of Dry-Mortar Mix and Latex Additive: Mixture of prepackaged dry-mortar mix and liquid-latex additive complying with the following requirements:
      a. Latex Additive: Styrene butadiene rubber.
      b. Equal to: Laticrete 3701.
      c. For wall applications, provide nonsagging, latex-portland cement mortar complying with ANSI A118.4 for mortar of this type defined in Section F-2.1.2.

2.7 GROUTING MATERIALS

A. Latex-Portland Cement Grout: ANSI A118.6 for materials described in Section H-2.4, composed as follows:
   1. Mixture of Dry-Grout Mix and Latex Additive: Mixture of factory-prepared, dry-grout mix and latex additive complying with the following requirements:
      a. Unsanded Dry-Grout Mix: Dry-set grout complying with ANSI A118.6 for materials described in Section H-2.3, for joints 1/8 inch and narrower.
      b. Sanded Dry-Grout Mix: Commercial portland cement grout complying with ANSI A118.6 for materials described in Section H-2.1, for joints 1/8 inch and wider.
      c. Latex additive (water emulsion) described below, serving as replacement for part or all of gaging water, of type specifically recommended by latex additive manufacturer for use with job-mixed portland cement and aggregate mortar bed.
         1) Equal to: Laticrete 1776.
      d. Colors: Three (3) colors will be selected.

2.8 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other non-
porous substrates that are subject to in-service exposures of high humidity and temperature extremes.

D. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

E. Available Products: Subject to compliance with requirements, products which may be incorporated into the Work include, but are not limited to, the following:

1. One-Part, Mildew-Resistant Silicone Sealants:
   a. Dow Corning 786; Dow Corning Corporation.
   b. Sanitary 1700; GE Silicones.
   c. Pecora 898 Sanitary Silicone Sealant; Pecora Corp.
   d. Tremsil 600 White; Tremco, Inc.

2. Multipart, Pourable Urethane Sealants:
   a. Chem-Calk 550; Bostik.
   b. Vulkem 245; Mameco International, Inc.
   c. NR-200 Urexpans; Pecora Corp.
   d. THC-900; Tremco, Inc.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayment and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: White-zinc-alloy terrazzo strips, 1/8 inch wide at top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated.

C. Movement Profile Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for scheduled applications, soft black chlorinated polyethylene (CPE) exposed-edge material.

1. Equal to: Schluter - DILEX-BWS 100.

D. Trim: Extruded accessories of profiles and dimensions indicated.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Fry Reglet Corp.
      1) Equal to: Channel Screed, PCS-375-50.
   2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221ASTM B 221M, alloy 6063-T5.

E. Temporary Protective Coating: Provide product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; is compatible with tile, mortar, and grout products; and is easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F (49 to 60 deg C) per ASTM D 87.
F. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

G. Grout Sealer: Solvent-based, no-sheen, natural-look penetrating sealer for all sanded and non-sanded grout joints.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials and additives in accurate proportions. Do not use or add any water to mortar or grout when mixing, use only latex additive.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
   1. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
   2. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

B. Provide concrete substrates for tile floors installed with dry-set or latex-Portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field- Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of temporary protective coating indicated below, taking care not to coat unexposed tile surfaces:
   1. Petroleum paraffin wax, applied hot.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.


C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
   1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Locate joints in tile surfaces directly above joints in concrete substrates.
   2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."
H. Grout tile to comply with the requirements of the following tile installation standards:
   1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

3.4 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with waterproofing manufacturer’s written instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Ceramic Tile Floor Installation Schedule, including those referencing TCA installation methods and ANSI A108 series of tile installation standards.
   1. Installation Methods:
      a. Tile over Concrete Surfaces: TCA F112.
      b. Tile over Concrete Surfaces (Thin Set): TCA F113.
      c. Tile over Concrete Surfaces with Waterproof Membrane: TCA F121.

B. Joint Widths: Install tile on floors with the following joint widths:

C. Back Buttering: For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
   1. Tile floors in wet areas.
   2. Tile floors composed of tiles 8 by 8 inches or larger.

D. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
   1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

E. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

F. Apply two (2) coats of grout sealer in accordance with manufacturer's printed instructions and recommendations. Remove sealer remaining on the tile within 3 to 5 minutes of application.

3.6 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Ceramic Tile Wall Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
   1. Installation Methods:
      a. Tile over Masonry Surfaces: TCA W211.
      b. Tile over Cementitious Backer Unit Surfaces: TCA W244.
c. Tile over Masonry in Wet Areas: TCA W211.
d. Tile over Gypsum Board in Wet Areas: TCA B415.

B. Joint Widths: Install tile on walls with the following joint widths:
2. Wall Tile: 1/16 inch.

C. Back Buttering: For installations indicated, obtain 100 percent mortar coverage by com-
plying with applicable special requirements for back buttering of tile in referenced
ANSI A108 series of tile installation standards:
1. Tile wall installations in wet areas, including showers.
2. Tile wall installations composed of tiles 8 by 8 inches or larger.

D. Apply two (2) coats of grout sealer in accordance with manufacturer’s printed instructions
and recommendations. Remove sealer remaining on the tile within 3 to 5 minutes of ap-

3.7 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so
they are free of foreign matter.
1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Unglazed tile must be cleaned with acid solutions or other cleaner permitted by
tile and grout manufacturer’s written instructions, prior to final sealer installation.
Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of
acid cleaning. Flush surface with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by
coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove
coating to prevent it from clogging drains.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, bro-
ened, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer
and Installer, that ensure tile is without damage or deterioration at the time of Substantial
Completion.
1. When recommended by tile manufacturer, apply a protective coat of neutral pro-
tective cleaner to completed tile walls and floors. Protect installed tile work with
kraft paper or other heavy covering during construction period to prevent stain-
ing, damage, and wear.
2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting
is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile
surfaces.

E. Apply joint tape over gypsum board joints, except for trim products specifically indicated
as not intended to receive tape.

F. See "Gypsum Board Finish Levels" Article in the Evaluations for a discussion of re-
quirements of various levels.

G. Texture Finish Application: Prepare and apply primer to gypsum panels and other sur-
faces receiving texture finishes. Mix and apply finish using powered spray equipment, to
produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

H. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

I. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 093100
PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes acoustical panels and exposed suspension systems for ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.3 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordinate Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
   1. Ceiling suspension members.
   2. Method of attaching hangers to building structure.
   3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

C. Samples for Initial Selection: For components with factory-applied color finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
   1. Acoustical Panel: Set of 6-inch square Samples of each type, color, pattern, and texture.
   2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch long Samples of each type, finish, and color.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
F. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations:
   1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
   2. Suspension System: Obtain each type through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
   1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
      a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
      b. Identify materials with appropriate markings of applicable testing and inspecting agency.
   2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
      a. Smoke-Developed Index: 450 or less.

D. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:

E. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
   1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they
will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
3. Hold-Down Clips: Equal to 2.0 percent of amount installed.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

B. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following manufacturers:
   a. Armstrong World Industries, Inc.
   b. USG Interiors, Inc.

2.2 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

2. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.3 WATER-FELTED, MINERAL-BASE ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

D. Available Products:

E. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for Type III, mineral base with painted finish; Form 2, water felted; and pattern as follows:
   1. Pattern: C (perforated, small holes)/D (fissured).

F. Color: White.

G. LR: Not less than 0.80.

H. NRC: Not less than 0.55.

I. CAC: Not less than 35.

J. Edge Detail: Beveled tegular reveal sized to fit flange of exposed suspension system members.

K. Thickness: 5/8 inch.

L. Size: 24 by 24 inches.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
   1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
      a. Type: Postinstalled expansion anchors.
      b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

E. Hanger Rods/Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

F. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.

G. Wire Rope: Wherever hangers are visible, such as at perimeter of acoustical clouds, provide 1-by-19 wire rope made from wire complying with ASTM A 492, Type 316. Provide with all necessary clips, clamps, and accessories required for a complete installation.

H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

I. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation, with prefinished 15/16-inch-wide metal caps on flanges.
4. Structural Classification: Heavy-duty system.
5. End Condition of Cross Runners: Butt-edge type.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.

2.7 ACOUSTICAL SEALANT
A. Available Products:
   1. Acoustical Sealant for Exposed and Concealed Joints:
      Pecora Corp; AC-20 FTR Acoustical and Insulation Sealant.
      United States Gypsum Co.; SHEETROCK Acoustical Sealant.

B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, GENERAL

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
   4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and
that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
   2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.66 m). Miter corners accurately and connect securely.
   3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
   1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
   2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   3. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
   4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095100
SECTION 098000 - PROTECTIVE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and application of coating systems.
   1. **System A**: Concrete – Immersion, Non-Potable, Corrosive Environment
   2. **System B**: Concrete – Immersion in Acidic Liquids
   3. **System C**: Concrete – Exposed Reinforcement Protection
   4. **System D**: Concrete – Sealant (Non-Paint Finish)
   5. **System E**: Concrete Masonry Unit (CMU) Sealer – Non-Paint Finish
   6. **System F**: Ferrous Metal – Exterior, Non-Immersion excluding buried surfaces
   7. **System G**: Ferrous Metal – Interior, Non-Immersion excluding buried surfaces
   8. **System H**: Ferrous Metal – Immersion, Non-Potable
   9. **System I**: Galvanized Steel and Non-Ferrous Metal – Non-Immersion
   10. **System J**: Aluminum – Embedded or in contact with concrete
   11. **System K**: Wood – Interior and Exterior
   12. **System L**: PVC Pipe – Exterior and Interior Exposure
   13. **System M**: Buried ferrous metal piping and fittings; miscellaneous surfaces requiring tar epoxy
   14. **System N**: Hot-Dip Galvanizing
   15. **System O**: Wall Board – Water and Light Chemical Exposure
   16. **System P**: Ferrous Metal – Moderate to Severe Chemical Exposure Including H₂S Exposure.

1.2 DESCRIPTION

A. Scope of Work
   1. The Contractor shall furnish all materials, labor, equipment, and incidentals required to provide a protective coating system for the surfaces listed herein and not otherwise excluded.
   2. The work includes surface preparation and cleaning, painting and finishing of interior and exterior exposed items and surfaces such as ceilings, walls, floors, miscellaneous metal, doors, frames, construction signs, guardrails, posts, pipes, fittings, valves, equipment, and all other work obviously required to be painted unless otherwise specified herein or on the Drawings. The omission of minor items in the schedule of work shall not relieve the Contractor of his obligation to include such items where they come within the general intent of the Specifications as stated herein.

1.3 REFERENCES

A. American National Standards Institute:


B. ASTM International

C. Occupational Safety and Health Act (OSHA):
   2. OSHA 1910.145, Specifications for accident prevention signs and tags.

D. The Society for Protective Coatings (SSPC):
   1. Surface Preparation Specifications:
      a. PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
      c. SSPC-SP 1, Solvent Cleaning.
      d. SSPC-SP 2, Hand Tool Cleaning.
      e. SSPC-SP 3, Power Tool Cleaning.
      f. SSPC-SP 5, White Metal Blast Cleaning.
      g. SSPC-SP 6, Commercial Blast Cleaning.
      h. SSPC-SP 7, Joint Surface Preparation Standard Brush-Off Blast Cleaning.
      i. SSPC-SP 10, Near-White Blast Cleaning.
      j. SSPC-SP 11, Power Tool Cleaning To Bare Metal.
      k. SSPC-SP12, Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating.
      l. SSPC-SP13, Surface Preparation of Concrete.
      m. Guide 15, Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates.


F. National Fire Protection Association (NFPA).

G. National Sanitation Foundation (NSF).

H. International Concrete Restoration Institute (ICRI).

1.4 DEFINITIONS

A. "Paint" as used herein means all coating systems, materials, including primers, emulsions, enamels, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

B. The term “exposed” as used in this Section shall mean all items not covered with concrete, masonry, or similar material.
1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.

1. Submit to the Engineer as provided in the General Conditions and Section 013300: Contractor Submittals, Working Drawings, and Samples; shop drawings, manufacturer's specifications and data on the proposed paint systems and detailed surface preparation, application procedures and dry film thickness (DFT).

2. Submit material manufacturer's technical information, including paint label analysis and application instructions for each material proposed
   a. List each material and cross-reference to specific paint and finish system and application. Identify by manufacturer's catalog number and general classification.
   b. Submit copies of manufacturer's complete color charts for each coating system.
   c. Provide certifications from manufacturers verifying that factory applied prime coats are compatible with specified finish coatings.
   d. Pipe Markers and Safety Signs: Submit copies of manufacturer's technical brochure, including color chart and list of standard signs. Owner will set titles on pipe markers and safety signs.

B. Schedule:

1. The Contractor shall submit for approval to the Construction Manager, a complete typewritten Schedule of Painting Operations within 90 days after the Notice to Proceed. This Schedule is imperative so that the various fabricators or suppliers may be notified of the proper shop prime coat to apply. It shall be the Contractor's responsibility to properly notify and coordinate the fabricator's or suppliers' surface preparation and painting operations with these specifications. Record of notification shall be transmitted to the Construction Manager or be available for review. This Schedule shall include for each surface to be painted, the brand name, generic type, solids by volume, application method, the coverage and the number of coats in order to achieve the specified dry film thickness, and color charts. When the Schedule has been approved, the Contractor shall apply all material in strict accordance with the approved Schedule and the manufacturer's instructions. Wet and dry paint film gauges may be utilized by the Owner to verify the proper application while work is in progress.

2. It is the intent of this section that as much as possible all equipment and piping utilize coating systems specified herein supplied by a single manufacturer. All exceptions must be noted on the Schedule. For each coating system, only one (1) manufacturer's product shall be used.

3. Contractor is responsible for the compatibility of all shop primed and field painted items in this Contract. Furnish information on the characteristics of the finish materials proposed to use, to ensure that compatible prime coats are used. As directed by the Engineer, provide barrier coats over incompatible primers or remove and re-prime. Notify the Engineer in writing of anticipated problems using the coating systems as specified with substrates primed by others.

C. Color Samples: Manufacturer's standard color charts for color selection by Owner.
D. Samples – Painting:

1. Paint colors will be selected by Owner unless other standards are noted. Compliance with all other requirements is the exclusive responsibility of the Contractor.

E. Applicator Qualifications: Submit qualifications as specified under Quality Assurance article.

F. Closeout Submittals:

1. Submit certificate stating Work was properly prepared and painted in accordance with Specifications.

2. Submit manufacturer's certificate stating quantity of paint furnished was sufficient to properly coat all surfaces.

3. Maintenance Manual: Upon completion of work, furnish copies of a detailed maintenance manual including following information:
   a. Product name and number.
   b. Name, address and telephone number of manufacturer and local distributor.
   c. Detailed procedures for routine maintenance and cleaning.
   d. Detailed procedures for light repairs such as dents, scratches and staining.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. 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.

1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

1.7 QUALITY ASSURANCE

A. Provide the best quality grade of the various types of coatings suitable for use in corrosive water and wastewater treatment and pumping environments as regularly manufactured by approved paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best grade product will not be acceptable.

B. Provide undercoat paint produced by the same manufacturer as the finish coats. Undercoat and finish coat paints shall be compatible. Use only thinners approved by the paint manufacturer and list the manufacturer, and use only within recommended limits as listed on the manufacturer's product data sheets.

C. Painting shall be accomplished by experienced painters specializing in industrial painting familiar with all aspects of surface preparations and applications required for this project. Work shall be done in a safe and workmanlike manner.

D. Applicator Qualifications:

1. Successfully painted water and wastewater utility installations for at least five (5) years. Submit name and experience record of painting applicator to Engineer. A list of at least
five (5) utility installations painted within the last five (5) years, along with responsible officials, architects or engineers involved with the project, and the approximate contract price may be requested by the Owner or Engineer.

2. Painting applicators whose submissions indicate a lack of experience required to perform the work, or have performed work in an unsatisfactory manner, will not be approved.

E. Acceptable Manufacturers:

1. Tnemec Co. (Where noted otherwise in the coating specification use specified product or equal).

2. Or Equal. No substitutions will be considered that decrease film thickness, number of coats, surface preparation or generic type of coating specified. Furnish same color selection of substituted manufacturers as manufacturer specified, including accent colors in coating systems. Substitutions must meet the performance requirements of the materials selected.

1.8 DELIVERY, HANDLING AND STORAGE

A. Deliver, store and handle paint in accordance with manufacturer's recommendations, and as supplemented below.

B. Delivery of Materials:

1. Deliver materials to job site in original, new, and unopened packages and containers bearing manufacturer's name and label with following information:

   a. Name or title of material.
   b. Manufacturer's stock number, batch number and date of manufacture (shelf life).
   c. Manufacturer's name.
   d. Contents by volume, for major pigment and vehicle constituents.
   e. Thinning instructions where recommended.
   f. Application instructions.
   g. Color name and number.

C. Storage of Materials:

1. Store only acceptable project materials on project site.
2. Store in a suitable location approved by Owner. Keep area clean and accessible.
3. Restrict storage to paint materials and related equipment.
4. Comply with health and fire regulations including the Occupational Safety and Health Act of 1970. Flammable materials shall be separated and stored in a suitable area as required.
5. Keep temperature of storage area above 50° F or manufacturer's recommended storage temperature, whichever is higher. Consult the manufacturer’s written literature for storage condition requirements.
6. Containers shall be clearly marked to indicate any hazards connected with the use of the paint and steps which should be taken to prevent injury to those handling the product.
1.9 WARRANTY AND GUARANTEES

A. All paint and coatings work performed under these specifications shall be guaranteed by the coatings applicator for 100 percent of the total coated area for both materials and labor against failures during the warranty period.

B. Failure under this warranty shall include flaking, peeling, or delaminating of the coating due to aging, chemical attack, or poor workmanship; but it shall not include areas which have been damaged by unusual chemical, thermal, or mechanical abuse.

1.10 SURFACES TO BE COATED

A. Design Requirements:

1. Ensure surfaces are properly prepared, proper primer applied to correct mil thickness, and finish coat is compatible with primer coat and applied to correct mil thickness. This requirement applies to all equipment and material, whether the total process is done in the shop, in the field, or partially in shop and partially in field.

2. Provide paint products supplied by one manufacturer unless otherwise approved by the Engineer.

B. Paint all exposed surfaces, except where natural finish of material is specifically noted as a surface not to be painted.

C. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.

D. The following items will not be painted unless otherwise noted.

1. Any code-requiring labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.

2. Any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts, unless otherwise indicated.

3. Aluminum except where in contact with dissimilar metals.

4. Fiberglass items including but not limited to handrails, walkways, toeboards, windows, louvers, fans, grating, and tanks.

5. Stainless steel, chromium plate/polished chrome, anodized aluminum, nickel and similar finished products.

6. Brass and bronze other than exposed utility tubing.

7. Flexible couplings, lubricated bearing surfaces, insulation and plastic pipe or duct interiors.

9. Signs and nameplates.

10. Finish hardware.

11. Packing glands and other adjustable parts, unless otherwise indicated.

12. Portions of metal, other than aluminum, embedded in concrete. This does not apply to the back face of items mounted to concrete or masonry surfaces which shall be painted before erection. Aluminum to be embedded in, or in contact with, concrete shall be coated to prevent electrolysis.

13. Galvanized metals unless specifically noted otherwise.

   a. Unless otherwise shown or specified, factory finishing such as baked-on factory porcelain, polyvinyl fluoride or other similar finish is specified for such items as, but not limited to, mechanical and electrical equipment such as instruments, light fixtures and distribution cabinets. Touch up factory finished items with paint supplied by the item manufacturer. As directed by Engineer, field paint damaged prefinished items or return them to the factory for repair and repainting.
   b. Any prefinished item not having generic type of paint or proper mil thickness to withstand corrosive atmosphere of water treatment plants, wastewater treatment plants and/or pumping stations shall be returned to the factory for painting or shall have additional coats applied in the field.

1.11 PROTECTION OF SURFACES NOT TO BE COATED
   A. Protect surfaces and equipment which are not to receive coatings during surface preparation, cleaning and painting operations.
   B. Remove mask, or otherwise protect hardware, lighting fixtures, switchplates, machines, surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting. Mask openings in motors and equipment to prevent abrasives, paint and other materials from entering.
   C. Exercise care not to damage adjacent work during sandblasting operations. Conduct spray painting under controlled conditions. Promptly repair any damage to adjacent work or adjoining property occurring from sandblasting or spray-painting operations.

1.12 PROJECT CONDITIONS
   A. Environmental Requirements:
      1. Adhere to manufacturer's data on air and surface temperature limits and relative humidity during application and curing of coatings. Note that on some coatings for concrete, applications may be required during declining temperatures only.
2. Do not spray apply paint when wind velocity is above 15 mph.

3. Schedule coating work to avoid dust and airborne contaminants.

4. Apply exterior finishes during daylight hours only.

5. When painting in confined spaces, or because of unfavorable ambient conditions, longer drying times will be necessary.

6. Provide supplementary ventilation such as fans and blowers in confined or enclosed areas to carry off solvents during evaporation stage.

B. Existing Conditions:

1. Broom clean area before painting is started. Remove dirt and dust.
   a. After painting operations begin, broom cleaning will not be allowed. Clean only with commercial vacuum cleaning equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All paint shall be manufactured by one of the suppliers listed in Paragraph 1.7 F., herein, and shall be their highest grade of paint.

B. The following coating systems list a product by name to establish a standard of quality; other products of the same generic types may be submitted to the Engineer for approval as described in Paragraph 1.7 F., herein. When other than the specified coating system is proposed, the Contractor shall submit on a typewritten list giving the proposed coatings, brand, trade name, generic type and catalog number of the proposed system and the requested test results for the Engineer's approval.

C. Paint used in successive field coats shall be produced by the same manufacturer. Paint used in the first field coat over shop painted or previously painted surfaces shall cause no wrinkling, lifting, or other damage to underlying paint. Shop paint shall be of the same type and manufacturer as used for field painting by the Contractor.

D. Emulsion and alkyd paints shall contain a mildewcide and both the paint and mildewcide shall conform to OSHA and Federal requirements, including Federal specification TT-P-19.

E. Finish coats containing lead shall not be allowed.

F. Rags shall be clean painters rags, completely sterilized.

G. Provide paints, pipe marker and safety signs of durable and washable quality. Use materials which will withstand normal washing as required to remove grease, oil, chemicals, etc., without showing discoloration, loss of gloss, staining, or other damage.
2.2 COLORS AND FINISHES

A. Provide surface treatments and finishes as specified in paragraph 2.3 of this Section.

B. Color Schedule: Colors for painted surfaces will be selected by Owner or as shown on Drawings.

C. Piping Color Code: Colors for piping will be in accordance with Section 220553 “Identification for Plumbing Piping and Equipment”.

D. Use representative colors when preparing samples for Engineer's review. Final acceptance of colors will be from samples applied on the job.

E. Color Pigments: Pure, nonfading, applicable types to suit substrates and service indicated.

F. Paints specified for application on submerged metal in contact with potable water shall meet NSF 61 and be approved by the governing health and safety codes.

2.3 COATING SYSTEMS

General: Where exposures and/or coating are not specified or when two (2) classifications can apply, the worst-case condition shall be used to determine the coating system.

A. System A: Concrete - Immersion, Non-Potable:

1. Examples of application areas for this system include the following surfaces:

   a. Interior walls of hydraulic structures with potential for H2S exposure.
   
   b. Floors and interior surfaces of concrete covers/slabs of hydraulic structures with potential for H2S exposure.
   
   c. Concrete exposed to corrosive environments.
   
   d. Other immersed concrete areas.

2. Surface Preparation: All oil, grease, waste and chemical contaminants must be removed from the surface of the concrete prior to preparation in accordance with NACE SP0892 and SSPC-SP13/NACE 6. Surface preparation requirement is to expose a sound, uniform surface texture confirming to the minimum recommended ICRI-CSP5. Existing concrete to receive protective coating system must be sound and capable of supporting the Protective Lining System.

3. Coating System (Use a, b, and c):

   a. Surfacer/Filler: The appropriate cementitious repair mortar or epoxy cementitious resurfacematerial shall be applied to the entire, prepared surface to level surface suitable for coating.

      1) For concrete deteriorated greater than a depth of 1/4-inch: Tnemec Series 217 Mortarcrete - Trowelable grade, rapid-setting, cementitious repair
mortar and when recommended by the Manufacturer to rehabilitate and restore concrete and provide level substrate for application of the protective lining.

2) For new or existing concrete to a depth up to 1/4-inch: Tnemec Series 218 MortarClad Epoxy cementitious resurfacers shall be used for filling voids, bugholes, static cracks and joints, and for general concrete patching, and to provide a uniform, void free surface for Epoxy Lining application. The Series 218 shall be applied to the entire surface at a minimum thickness of 1/16 inch.

b. Epoxy Lining (basecoat): Tnemec Series 434 Perma-Shield H2S at 125 mils

c. Epoxy Lining Glaze Protective Lining (topcoat): Tnemec Series 435 Perma-Glaze at 15 – 20 mils

B. System B: Concrete – Immersion in Acidic Liquids

1. Area of application: Odor Control System concrete slab.

2. Surface Preparation: All oil, grease, waste and chemical contaminants must be removed from the surface of the concrete prior to preparation in accordance with NACE SP0892 and SSPC-SP13/NACE 6. Surface preparation requirement is to expose a sound, uniform surface texture confirming to the minimum recommended ICRI-CSP5. Existing concrete to receive protective coating system must be sound and capable of supporting the Protective Lining System.

3. Coating System (Use a, b and c):

a. Surfacer/Filler: The appropriate cementitious repair mortar or epoxy cementitious resurfacers material shall be applied to the entire, prepared surface to level surface suitable for coating.

1) For concrete deteriorated greater than a depth of 1/4-inch: Tnemec Series 217 Mortarcrete - Trowelable grade, rapid-setting, cementitious repair mortar and when recommended by the Manufacturer to rehabilitate and restore concrete and provide level substrate for application of the protective lining.

2) For new or existing concrete to a depth up to 1/4-inch: Tnemec Series 218 MortarClad Epoxy cementitious resurfacers shall be used for filling voids, bugholes, static cracks and joints, and for general concrete patching, and to provide a uniform, void free surface for Epoxy Lining application. The Series 218 shall be applied to the entire surface at a minimum thickness of 1/16 inch.

b. Epoxy Lining (basecoat): Tnemec Series 434 Perma-Shield H2S at 125 mils

c. Epoxy Lining Glaze Protective Lining (topcoat): Tnemec Series 435 Perma-Glaze at 15 – 20 mils

C. System C: Exposed Reinforcement Protection
1. Area of Application: Exposed sawcut concrete face and exposed existing reinforcement.

2. Surface Preparation: According to manufacturer’s recommendations.

3. Coating: Sika Armatec 110 EpoCem, or equal (Coverage per manufacturer’s recommendations. Minimum 20 mil. thickness).

D. System D: Concrete Sealer – Non-Paint Finish

1. Area of application:
   a. Concrete Floors in the UV Disinfection Building, Electrical Building, Public Restrooms and Storage Building.
   b. Interior Concrete Floors not exposed to weather and corrosion.

2. Surface Preparation:
   a. Follow manufacturer’s recommendations for surface preparation.

3. Product:
   a. Tnemec CT Densyfier Series 629 at 300 to 350 sf per gallon.

E. System E: Concrete Masonry Unit (CMU) Sealer: Non-Paint Finish

1. Area of application: All exterior and interior masonry, where paint or other coating is not specified in drawings.

2. Surface Preparation:
   a. Follow manufacturer’s recommendations for surface preparation for each type of masonry.

3. Coating:
   a. Tnemec Prime A Pell H2O series 633 at 50-75 sf per gallon.

F. System F: Ferrous Metal: Exterior, Non-Immersion excluding Buried Surfaces:

1. Exterior metal surfaces that are exposed to the atmosphere but which do not come into contact with water, wastewater, or corrosive atmosphere. Examples of this classification include, but not limited to, the following surfaces:
   a. Exterior or Above Ground Pipe.
   b. Piping and valves inside below ground valve vaults.
   c. Pumps, Motors, Equipment.
   d. Steel plate and shapes.
   e. Doors and frames.

2. Surface Preparation:
a. For Structural Steel, Equipment, and steel tanks: SSPC-SP6 Commercial Blast Cleaning with a minimum angular profile of 1.5 mils.

b. For Ductile or Cast Iron Piping, Valves, Pumps: Prepare all surfaces as per NAPF 500-03 — Uniformly abrasive blast the entire exterior surface using abrasive to an NAPF 500-03-04 with a minimum angular anchor profile of 1.5 mils.

3. Coating System

a. For Structural Steel, Equipment, and Steel Tanks:
   1) Primer: Hydro-Zinc Series 94 H20 at 2.5 - 3.5 mils dft
   2) Intermediate: Hi-Build Epoxoline II L69 at 3.0 – 5.0 mils dft
   3) Finish: Endura-Shield Series 1095 2.0 to 3.0 mils dft

b. For Ductile or Cast Iron Piping, Valves, Pumps:
   1) Primer: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
   2) Intermediate: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
   3) Finish: Endura-Shield Series 1095 2.0 to 3.0 mils dft

G. System G: Ferrous Metal: Interior, Non-Immersion excluding Buried Surfaces:

1. Interior metal surfaces that are exposed to the atmosphere but which do not come into contact with water, wastewater, or corrosive atmosphere. Examples of this classification include, but not limited to, the following surfaces:
   a. Piping, valves, appurtenances and supports.
   b. Pumps, Motors, Equipment.
   c. Exposed surfaces of electric panels, conduit, ventilation fans, etc.

2. Surface Preparation:

   a. For Structural Steel, Equipment, and steel tanks: SSPC-SP6 Commercial Blast Cleaning with a minimum angular profile of 1.5 mils.
   b. For Ductile or Cast Iron Piping, Valves, Pumps: Prepare all surfaces as per NAPF 500-03 — Uniformly abrasive blast the entire exterior surface using abrasive to an NAPF 500-03-04 with a minimum angular anchor profile of 1.5 mils.

3. Coating System

   a. For Structural Steel, Equipment, and Steel Tanks:
      1) Intermediate: Hi-Build Epoxoline II L69 at 3.0 – 5.0 mils dft
      2) Finish: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
   b. For Ductile or Cast Iron Piping, Valves, Pumps:
      1) Primer: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
      2) Intermediate: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft

H. System H: Ferrous Metal - Immersion, Non-Potable:

1. Examples of this classification include, but not limited to, the following surfaces:
   a. Pipe.
b. Metal surfaces in dry and wet wells or in immediate vicinity of corrosive environments.

c. Other submerged or partially submerged ferrous metal.

2. Surface Preparation: SSPC-SP10 Near White Blast Cleaning with a minimum angular anchor profile of 1.5 mils.

3. Coating System:
   a. Primer: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
   b. Intermediate: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
   c. Finish: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft

I. System I: Galvanized Steel and Non-Ferrous Metal - Non-Immersion:

1. Examples of this classification include the following surfaces:
   a. Galvanized steel pipe where specifically noted or specified.
   b. Galvanized or zinc-coated steel fabrications where specifically noted or specified.
   c. Aluminum fabrications where specifically noted or specified.
   d. Aluminum or other non-ferrous pipe or tubing.
   e. Copper pipe and tubing.

2. Surface Preparation: SSPC-SP16 Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals to achieve a uniform anchor profile of 1.0 – 2.0 mils

3. Coating System:
   a. Primer: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
   b. Interior Finish: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
   c. Exterior Finish: Endura-Shield Series 1095 2.0 to 3.0 mils dft

J. System J: Dissimilar Metal Insulation: Aluminum embedded or in contact with concrete:

1. Examples of this classification include the following surfaces:
   a. Aluminum embedded or in contact with concrete, Stainless steel in contact with Carbon Steel:
      1) Portions of slide gate frames.
      2) Portions of hatch cover frames.
      3) Portions of stair stringers.
      4) Portions of grating and floor plate frames.

2. Surface Preparation: SSPC-SP16 Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals to achieve a uniform anchor profile of 2.0 – 3.0 mils.

3. Coating System:
   a. Primer: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
   b. Intermediate: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
c. Finish: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft

K. System K: Wood - Interior and Exterior:

1. Examples of this classification include the following surfaces:
   a. Wood trim.
   b. Wood Panels

2. Surface Preparation: Sand rough areas. Clean and dry.
   a. Prime: Elasto-Grip FC Series 151-1051 at 0.7 – 1.5 mils dft
   b. Intermediate: Enduratone Series 1028 at 2.0 – 3.0 mils dft
   c. Finish: Enduratone Series 1028 at 2.0 – 3.0 mils dft

L. System L: PVC/CPVC Pipe

1. This classification includes exteriors of exterior and interior PVC/CPVC pipe, valves and accessories

2. Surface Preparation: As specified in Paragraph 3.3, herein.

3. Coating System:
   a. Exterior Exposed:
      1) Primer: Hi-Build Epoxoline II L69 at 2.0 – 4.0 mils dft
      2) Finish: Endura-Shield Series 1095 2.0 to 3.0 mils dft
   b. Interior Exposed:
      1) Primer: Hi-Build Epoxoline II L69 at 2.0 – 4.0 mils dft
      2) Finish: Hi-Build Epoxoline II L69 at 2.0 – 4.0 mils dft

M. System M: Buried ferrous metal piping:

1. Examples of this classification include the following surfaces:
   a. Buried steel, ductile iron piping and appurtenances.

2. Surface Preparation:
   a. Steel Surface Preparation: SSSPC-SP10 Near White Blast Cleaning.
   b. Ductile Iron Surface Preparation: Ductile Iron Surface Preparation: Prepare all surfaces as per NAPF 500-03 - Uniformly abrasive blast the entire exterior surface using abrasive to an NAPF 500-03-04 with a minimum angular anchor profile of 1.5 mils.

3. Coating System:
   a. Steel Surface:
      1) Primer: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
      2) Intermediate: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
      3) Finish: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
b. **Ductile Iron Surface:**
   1) **Primer:** Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
   2) **Intermediate:** Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
   3) **Finish:** Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft

N. **System N: Hot-Dip Galvanizing**

1. This classification includes but is not limited to stair stringers, grating embeds, fasteners, support members, and interior structural members not epoxy coated per Systems “Ferrous Metal: Interior, Non-Immersion” and “Ferrous Metal - Immersion, Non-Potable”.

2. **Surface Preparation:** The Fabricator shall remove all welding slag, splatter, anti-splatter compounds and burrs prior to delivery for galvanizing. Avoid unsuitable marking paints. Consult with the galvanizer about removal of grease, oil paint and other deleterious material prior to fabrication. Remove by blast cleaning or other methods surface contaminants and coatings, which would not be removable by the normal chemical cleaning process in the galvanizing operation.

3. **Coating System:**
   a. Pre-clean steelwork in accordance with accepted methods to produce an acceptable surface for quality hot-dip galvanizing.
   b. Galvanize steel members, fabrications, and assemblies after fabrication by the hot dip process in accordance with ASTM A123. Galvanize bolts, nuts and washers and iron and steel hardware components in accordance with ASTM A153.
   c. Safeguard products against steel embrittlement in conformance with ASTM A143.
   d. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.
   e. Coating Weight: conform with paragraph 5.1 of ASTM A123, Table 1 of A767, or Table 1 of ASTM A153, as appropriate.
   f. **Surface Finish:** Continuous, adherent, as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article.
   g. **Adhesion:** Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

4. **Testing:**
   a. Inspection and testing of hot dip galvanized coatings shall include visual examination and tests in accordance with ASTM A123, A767 or A153 as applicable to determine the thickness of the zinc coating on the metal surface.
   b. Furnish Notarized Certificate of Compliance with ASTM Standards and Specifications herein listed. The Certificate must be signed by the galvanizer and contain a detailed description of the material processed. The Certificate shall include information as to the ASTM standard used for the coating.

5. **Repair or Damaged Coating:**
   a. The maximum area to be repaired is defined in accordance with ASTM A123 Section 4.6 current edition.
1) The maximum area to be repaired in the field shall be determined in advance by mutual agreement between parties.

b. Repair areas damaged by welding, flame cutting or during handling, transport or erection by one of the approved methods in accordance with ASTM A780 whenever damage exceeds 3/16” in width. Minimum thickness requirements for the repair are those described in ASTM A123 section 4.6 current edition.

O. System O – Wall Board, Water Resistant – Interior Wall Light Chemical Exposure

1. Examples of this classification include the following surfaces:
   a. Wall board where exposed to Water and/or light chemicals.

2. Surface Preparation:
   a. Clean & Dry
   b. Surfacer/Filler for joints and screw holes: Surfacing Epoxy Series 215 and Series 273 Part D fiberglass tape

3. Coating System:
   a. Primer: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft
   b. Finish: Hi-Build Epoxoline II L69 at 4.0 – 6.0 mils dft

P. System P – Ferrous Metal – Immersion – Moderate Chemical Exposure including H₂S vapor exposure.

1. Examples of this classification include the following surfaces:
   a. Primary Clarifier Mechanisms

2. Surface Preparation: SSPC-SP10 Near-White Blast Cleaning with a minimum angular anchor profile of 2.0 mils.

3. Coating System:
   a. Primer: Tneme-Liner Series 61 at 10.0 – 12.0 mils dft
   b. Finish: Tneme-Liner Series 61 at 10.0 – 12.0 mils dft

PART 3 - EXECUTION

3.1 SHOP PAINTING

A. Surface Preparation - All ferrous metal to be primed in the shop shall have all rust, dust and scale, as well as all other foreign substances, removed by sandblasting or pickling in accordance with SSPC-SP10. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent new rusting. Under no circumstances will cleaned metal be allowed to sit overnight before priming, or pretreatment and priming. All nonferrous metals shall be solvent cleaned
prior to the application of primer. In addition, galvanized surfaces which are to be topcoated shall first be degreased then primed. Refer to manufacturer’s printed literature for the correct blast profile for the product used.

B. Materials Preparation:

1. Mix and prepare painting materials in strict accordance with manufacturer's recommendations and directions, stirring materials before and during application to maintain a mixture of uniform density, free of film, dirt and other foreign materials.

2. No thinners shall be used except those specifically mentioned and only in such quantity as directed by the manufacturer in his instructions. If thinning is used, sufficient additional coats shall be applied to assure the required dry film thickness is achieved. The manufacturer's recommended thinner or cleanup solvent shall be used for all clean-up. Application by brush, spray, airless spray or roller shall be as recommended by the manufacturer for optimum performance and appearance.

C. Applications:

1. All painting shall be done by skilled and experienced craftsmen and shall be of highest quality workmanship. Coating systems shall be as specified herein.

2. Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited for the type of material being applied.

3. All paint and coatings materials shall be stored under cover and at a temperature within 10°F of the anticipated application temperature and at least 5°F above the dew point.

4. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance.

5. Paint shall be applied in a neat manner with finished surfaces free of runs, sags, ridges, laps and brush marks. Each coat shall be applied in a manner that will produce an even film of uniform and proper thickness.

6. Paint back sides of access panels and removable or hinged covers to match the exposed surfaces.

7. Equipment manufacturer or supplier shall provide touch-up paint for items with shop applied finish coats.

8. Where specified in the individual sections, primer coat(s) shall be applied in the shop by the equipment manufacturer. The shop coats shall be as specified and shall be compatible with the field coat or coats.

D. Certification: The Contractor shall obtain from the equipment manufacturer or supplier, prior to shipment of equipment, a written certification that surface preparation, coating brand, material, DFT and application method complied with this section.
3.2 EXAMINATION

A. Examine areas and conditions where painting work is to be performed. Notify Engineer in writing of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

C. Remove by blast cleaning to SSPC-SP 10 any bitumastic coating or improper primer on any material or equipment which is to be painted and arrives at the construction site with a bitumastic coating or a priming system not specified in paragraph 2.3 Coating Systems.

3.3 SURFACE PREPARATION

A. General:

1. Perform all preparation and cleaning procedures as specified and in strict accordance with paint manufacturer's instructions for each particular substrate and atmospheric condition.

2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items not to be finish painted, or provide surface applied protection prior to surface preparation and painting operations. Following completion of painting of each space or area, reinstall removed items by workmen skilled in the trades involved or remove applied protection, if applicable.

3. Clean sand, dirt, dust and all other foreign matter from surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program cleaning and painting so that dust and other contaminants from cleaning process will not fall in wet, newly painted surfaces.

4. Prepare surfaces which were not shop painted or were improperly shop painted or damaged, and all abraded or rusted surfaces, which are to be painted, as specified under 3.2 C. and as follows.

5. Priming Blast Cleaned Metal: Prime blast cleaned metal within 24 hours or before any rust bloom occurs.

6. Primed surfaces, exposed to sunlight for 60 days or more, must be scarified by lightly sanding or whip blasting to assure proper adhesion of final coat(s). The surface to be painted shall be solvent cleaned by SSPC SP1 to remove any grease, dirt, etc. If structures which require painting have been near the coast and exposed to salt air, a salt remover such as Chlor-rid may be required before cleaning.

7. If there is a time period in excess of five (5) months from application of a shop or field primer coat to proposed date to apply the first field finished coat, first field finished coat will not be applied. Instead, blast clean primer completely off to obtain the SSPC-SP surface specified for particular application in Painting Systems. Then, reapply primer and
finish paint as specified. Cost of removing primer by blast cleaning and reapplying primer will be at no expense to Owner.

8. Terminate shop prime coats on steel six inches from edges that are to be field welded.

B. Ferrous Metal Surfaces:

1. Shop or Field Primed for Submerged or Intermittently Submerged in Liquid Service:
   a. Grind smooth to a rounded contour sharp edges and welds, and remove weld splatter.
   b. Except for insides of pipes, blast clean in accordance with SSPCSP10 Near-White Finish and to obtain a minimum blast profile of 1.5 mils.
   c. After blast cleaning, remove dust and spent sand from surface by brushing or vacuum cleaning.
   d. Apply prime coat before rust bloom forms or within 24-hours, whichever is earlier.
   e. Do not allow blast cleaned or bare surfaces to stand overnight before coating.

2. Not Shop Primed and Non-Submerged:
   a. Grind smooth to a rounded contour sharp edges and welds, and remove weld splatter.
   b. Solvent clean in accordance with SSPC-SP 1 so that all surfaces are free of oil and contaminants with a non-petroleum based solvent recommended by the coating manufacturer.
   c. Pressure wash all areas to be painted with a minimum 3000 psi pressure washer using potable water. Use a cleaner such as Chlor*Rid or equivalent to remove all dirt, salt, and contamination before proceeding and prevent any salts from being driven into the metal by blasting. Exercise caution around any operating electrical equipment.
   d. Sweep blast clean in accordance with SSPC-SP 7. On areas that have been removed to bare metal, taper back edges to tightly adhered coating. Protect all rotating equipment and concrete from the abrasive blasting. On interior metal surfaces where abrasive blasting may damage electrical components, rotating equipment, thin gauge conduit, etc., Power Tool Cleaning per SSPC-SP3 or Hand Tool Cleaning per SSPC-SP2 may be used if requested and approved by the Engineer prior to beginning.
   e. After blast or other cleaning, remove dust and spent sand from surface by brushing or vacuum cleaning.
   f. Apply prime coat before surface starts to rust or within 24-hours, whichever is earlier.
   g. Do not allow blast cleaned or bare surfaces to stand overnight before coating.

3. Not Shop Primed and Non-Submerged, Reservoir & Potable Water Storage Tanks:
   a. Grind smooth to a rounded contour sharp edges and welds, and remove weld splatter.
   b. Solvent clean in accordance with SSPC-SP 1 so that all surfaces are free of oil and contaminants with a non-petroleum based solvent recommended by the coating manufacturer.
c. Pressure wash all areas to be painted with a minimum 3000 psi pressure washer using potable water. Use a cleaner such as Chlor*Rid or equivalent to remove all dirt, salt, and contamination before proceeding and prevent any salts from being driven into the metal by blasting.
d. Commercial blast clean in accordance with SSPC- SP 6 to obtain a minimum 1.5 mils blast profile. Protect all rotating equipment and concrete from the abrasive blasting.
e. After blast cleaning, remove dust and spent sand from surface by brushing or vacuum cleaning.
f. Apply prime coat before surface starts to rust or within 24-hours, whichever is earlier.
g. Do not allow blast cleaned or bare surfaces to stand overnight before coating.

4. Shop Primed:
   a. Immediately before paint application, clean sand, dust, mud, dirt and other foreign matter from shop coat.
   b. Touch-up damaged or destroyed shop paint.
   c. Surface preparation of surfaces to be touched-up must be as effective as those specified for shop painting. A minimum SSPC SP3 should be used. Immersion service will require abrasive blasting.

5. Ferrous metal surfaces previously exposed to sulfides shall be sandblasted, washed, and sandblasted again in accordance with the recommended surface preparation for the particular service in question.

6. Where blast cleaning is done in the field, only "virgin" sand, grit, or abrasive will be used.

7. Inaccessible areas, such as, behind tank rafters or skip-welded lap joints, or in between back-to-back angle iron bracing, shall be coated before assembly to prevent corrosive action from taking place in these in accessible areas. All surface voids shall be sealed-welded and back-to-back bracing and tank rafters either coated before assembly or eliminated from the design and construction. Sharp corners and edges shall be ground to a smooth contour and welds prepared as described above.

C. Concrete Surfaces:

1. All concrete surfaces to be coated shall be clean and dry. "Dry" is defined for new concrete as free of moisture and fully cured which is a minimum of 28 days at 75°F and 50 percent Relative Humidity or some equivalent cure time at other conditions (7 days minimum for stucco). Moisture content of concrete shall be checked by taping a one-foot square piece of 20 mil thick minimum plastic film on the surface (“plastic film tapedown test” ASTM D 4263). Test film should be placed at various locations that are likely to be slow drying out, such as below grade, low spots in floors, inside corners and lower wall areas. The film should be carefully sealed with tape to prevent the escape of any moisture or vapor that would be trapped behind the film. The film should be left in place over night or longer to allow sufficient time for moisture migration. After 48 hours remove and examine the backside for moisture condensation and inspect the concrete surface for darkened areas. The source of the moisture, if present, shall be located, and the cause corrected prior to coating. All oil, grease, dirt, etc., shall be removed either by
steam cleaning with detergent or by scrubbing with a hot trisodium phosphate solution consisting of 2 pounds of trisodium phosphate to each gallon of hot water (160°F). Repeat the cleaning operation until the contamination is removed and flush the area with clean water to remove residual cleaning solution. Allow to dry thoroughly before coating.

2. Old paint and unremoved tar stains shall be solvent cleaned with naphtha, trichloroethylene, or perchloroethylene. Proper safety precautions shall be observed if this step is necessary. The surface shall be flushed with fresh water and dried.

3. Do not use form oils incompatible with coating, concrete curing agents or concrete hardeners on concrete surfaces to be coated.

4. Concrete and/or cinder block walls to receive a coating shall be air-blasted with 100 psi clean, dry, oil-free air to remove dust, etc., and wire brushed to remove all loose and/or weak mortar. See requirements for sumps, tanks and other water-bearing structures below. These surfaces may also be pressure washed with a minimum 3,000 psi.

5. Concrete floors shall be thoroughly swept clean and prepared in accordance with an ICRI CSP profile dependent on the material used. Contact the paint manufacturer for specific surface preparation requirements.

6. The floors or concrete sumps, tanks or other water-bearing structures should be prepared in accordance with the appropriate ICRI CSP standard for the system used (typically ICRI CSP3 or CSP5). Patch voids and cracks that will cause discontinuities in the coating or unsightly appearance using a patching compound compatible with the coating system.

D. Masonry and Precast Concrete:

1. Clean out cracks, loose mortar, chips, indentations and open pores.

2. Patch with mortar all depressions.

3. Perform work only on cured, dry and dust free masonry surfaces.

4. Apply surfacer recommended by paint manufacturer in accordance with manufacturer's procedures.

E. Wood Surfaces: Wood should be clean and dry. Remove surface deposits of sap or pitch by scraping and wiping clean with rags dampened with mineral spirits or VM & P Naphtha. Seal knots and pitch pockets with shellac reduced with equal parts of shellac thinner (denatured alcohol) before sandpaper finishing with fine grit and remove sanding dust. After the prime coat is dry, fill cracks and holes with putty or spackling compound. When filler is hard, sand flush with the surface using fine grit sandpaper. Sand lightly between coats with fine grit, open-coated sandpaper.

F. Stainless Steel:

1. Stainless steel will only be coated when so specified.
2. Stainless steel requires only solvent cleaning prior to coating using any one of the methods in SSPC-SP1. Only solvents and cleaning solutions containing less than 200 ppm of halogens should be used to prevent stress corrosion cracking.

3. Stainless steel may be shot-blasted to provide a surface profile to increase the mechanical bond of the coating system. The height of the profile and the texture required should be defined for the operator and as a standard for the acceptance of the work. Pictorial standards for the surface cleanliness of carbon steel are not applicable to stainless steel, since there are no corrosion products or mill scale to remove from the surface.

4. Abrasive blast cleaning procedures outlined by Steel Structures Painting Council for carbon steel may also be used for stainless steel. Only very hard silica sand or other abrasive media should be used for a fast cutting action and to obtain a sharp angular profile.

G. Gypsum Drywall:

1. Sand joint compound with fine grit, open-coated sandpaper to provide a smooth flat surface. Avoid heavy sanding of the adjacent wall board surfaces, which will raise the nap of the paper covering. Remove dust from the surface by wiping with clean rags or other means. If additional joint finishing is required to provide a smooth surface, the same joint compound of a ready-mixed spackling compound should be used. Putty, patching pencils, caulking or masking tape should not be applied to dry wall surfaces to be painted. Finish level 4 or 5 must be achieved prior to beginning to paint. Level shall be suitable for coating system to be applied.

2. Lightly scuff-sand tape joints after priming to remove raised paper nap. Take care not to sand through the prime coat and remove dust by wiping with clean rags.

H. Galvanized Steel, and Non-Ferrous Metal:

1. Galvanized steel and aluminum will only be coated when so specified.

2. Surfaces shall be clean and dry. Remove dust and dirt by blowing off the surface with high pressure air or wiping clean with dry rags. Oil, grease and protective mill coatings should be removed by solvent cleaning in accordance with SSPC-SP1.

3. All galvanized surfaces for non-immersion service should be cleaned with a minimum of SSPC SP3 or brush blasted to remove any passivation layer and to provide a surface profile.

4. Other surface preparation as outlined in the coating manufacturer's latest written Application Instructions shall be observed for more demanding exposures.

I. Previously-Painted Surfaces (except ferrous metal, non-immersion):

1. Careful examination of the old coating is necessary in order to determine the condition of the coating prior to recommending the degree of surface preparation that will be needed. The old coating should be shaved with a knife to ascertain its present adhesion to the substrate, as well as the flexibility of the film. If the old coating has a tendency to
powder or shatter easily under the knife, or disbands freely from the substrate or underfilms, it would indicate total removal is necessary.

a. When up to 10 percent of the total area has failed, spot blasting back to at least one-inch into sound film, feathering of edges and spot priming is required.

b. When the coating system has deteriorated to approximately 25 percent of the total area, or if the coating is brittle, eroded or underfilm rusting is present, completely remove original coating system by sandblasting as specified.

2. Tank linings, immersion-service coatings, and some other types of high performance coatings require total removal before recoating. Consult manufacturer's recommendations for which of the other types of high performance coatings require total removal.

3. In instances where the film has been eroded due to weathering or worn thin due to abrasion or impingement with no rusting, the surface contaminants may be removed through water blasting (approximately 3,000 psi or more, over 4 gallons per minute) with emulsifying agents or cleaners, rinsed and dried. Roughening of the surface shall be used to improve the adhesion of subsequent coats. Recoat with the recommended finish coat(s).

J. PVC or Other Plastic Piping or Ductwork:

1. Remove any grease or oily residue on PVC.

2. Lightly sand off sheen and clean. Abrade surface.

3. If recommended by manufacturer, lightly abrade surface with medium grade sandpaper. Remove dust by wiping with clean rags.

4. Remove dust and sand by wiping with a dry cloth. Apply coating before any contamination.

K. Shop Bituminous Coated Pipe:

1. Hand tool clean in accordance with SSPC-SP 2.

2. Wipe or brush clean.

3. Recoat with compatible bituminous coating.

3.4 MATERIALS PREPARATION

A. General:

1. Mix and prepare painting materials in strict accordance with manufacturer's directions.

2. Do not mix coating materials produced by different manufacturers.

3. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.
4. Stir all materials before application to produce a mixture of uniform density, and as required during application of materials. Do not stir any film which may form on surface into material. Remove film and, if necessary, strain material before using.

5. If material has thickened or must be diluted for application, buildup coating to same film thickness achieved with undiluted material. Do not use thinner to extend coverage of paint unless recommended by the manufacturer and listed on their product literature.

B. Tinting:

1. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat. Provide code number that identifies material tinted by manufacturer.

3.5 APPLICATION

A. General:

1. Strictly follow paint manufacturer's label instructions for proper application, spreading rate and drying time.

2. Apply paint by brush, roller, air spray, or airless spray in accordance with manufacturer's directions, and recommendations of Paint Application Specifications No.1 in SSPC Vol. 2, where applicable. Use brushes best suited for type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by paint manufacturer for material and texture required. Do not use rollers having nap exceeding 3/8-inch.

   a. Apply by brush to newly welded seams.
   b. Apply prime coats by roller, brush, or spray.

3. Apply paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 and 95 degrees F, and will remain in this range during curing, unless otherwise permitted by paint manufacturer's printed instructions.

4. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or to damp or wet surfaces.

5. Painting may be continued during inclement weather only if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

6. Provide adequate illumination and ventilation in areas where painting operations are in progress.

7. Maintain number of coats and minimum paint film thickness per coat required regardless of application method. Do not apply succeeding coats until previous coat has completely dried or the minimum time recommended by manufacturer has elapsed, whichever is longer.
8. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, and until paint film is of uniform finish, color and appearance. This requirement is of particular importance regarding intense primary accent colors. Ensure surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.

9. Surfaces not exposed to view do not require color coding and in some cases do not require painting.

10. Paint interior surfaces of ducts (in accordance with materials), where visible through registers or grilles, with a flat, non-specular black paint as specified, before final installation of equipment.

11. Paint backs of access panels, and removable or hinged covers to match exposed surfaces.

12. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces, unless otherwise specified.

13. Do not apply paint over sealants and caulking compounds until integral solvents have been released from compound. Conform to sealant and caulking manufacturer's recommendations.

14. Paint existing structural steel to match new structural steel.

15. Spray painting of sound-absorbing concrete masonry units containing sound insulation material is prohibited. This requirement prevents insulation material from being sprayed, resulting in a consequent loss of sound attenuation effectiveness. Apply paint on sound-absorbing masonry by rolling or brushing.

16. Sprayed Finishes: Spray paint finish doors, frames and windows, where required. Brush or roller finishes will not be acceptable.

17. Install piping markers and safety signs only after painting and finish work is completed.

B. Minimum Coating Thickness: Apply each material at not less than the manufacturer's recommended spreading rate, and provide total dry film thickness as specified. In no case allow area coverage per gallon to exceed manufacturer's recommendations. Apply extra coat at no additional expense to obtain specified total dry film thickness.

C. Scheduling Painting:

1. Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

   a. Apply primers before rust bloom forms but in no case allow cleaned steel to be exposed for more than 24-hours.

2. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of
adhesion of undercoat. In no case apply an additional coat until manufacturer's minimum recommended drying time between coats has elapsed.

D. Prime Coats: Recut primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects caused by insufficient sealing.

E. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularities in texture, skid marks, or other surface imperfections.

F. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

G. Brush Application:

1. Brush-out and work all blush coats onto surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections are not acceptable. Neatly draw all glass and color break lines.

2. Brush apply all primer or first coats, unless otherwise permitted to use mechanical applicators.

H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements as required by the Engineer.

I. Placing Into Service: Do not place painted items into service until paints and coatings are fully cured (dry-hard).

J. Safety Signs: Apply safety signs at locations directed by Engineer.

3.6 RE-PAINT SURFACE PREPARATION

A. Assume complete responsibility for quality of repaint work insofar as proper surface preparation will affect finished appearance. Quality of finishes is subject to Engineer's approval or rejection. Recut work as a result of rejection will be at no expense to Owner.

B. Prepare previously painted surface where rust, powdering, scaling, peeling or flaking is present by wire brushing, scraping, sanding and blast cleaning to solid material. Sand solid edges smooth. Taper back edges to tightly adhered coating.

C. Prepare hard, glossy, repaint surfaces for paint adhesion by sandpapering, followed by surface washing and rinsing. When a de-glosser is used, washing and rinsing may be eliminated.

D. To avoid rust showing from nails' heads in repainted wood surfaces, countersink nails and fill holes, together with all other crevices, with wood filler similar to DAP 33 after priming coat has dried. Lightly sand wood filler to a smooth surface. Coat knots and sappy spots with shellac before painting.

E. Just prior to application of paint or coatings, re-paint surfaces must be dry, clean and free of loose dirt, dust and grit.
F. Patch test unknown old coatings for compatibility.

3.7 FIELD QUALITY CONTROL

A. Engineer reserves right to invoke following material testing procedure at any time, and any number of times during the period of field painting.

1. Engage the service of an independent testing laboratory to sample any paint being used. Samples of materials delivered to Project site will be taken, identified and sealed, and certified in presence of Contractor.

2. Have independent testing laboratory perform appropriate tests for any or all of following characteristics: abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance, quantitative materials analysis, and compatibility of coatings.

3. If test results show that material being used does not comply with specified requirements, a directive may be made, at no expense to Owner, to stop painting work and remove non-complying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two (2) coatings are non-compatible.

B. Testing Equipment:

1. Provide calibrated magnetic type dry film thickness gauge to test coating thickness specified in mils, as manufactured by ElektroPhysik U.S.A., Arlington Heights, IL, MikroTest Digital or other Engineer-approved manufacturer.

2. Provide low-voltage wet sponge electrical holiday detector to test completed coating systems, 20 mils dry film thickness or less, except zinc primer, high-build elastomeric coatings, and galvanizing, for pinholes, holidays, and discontinuities, as manufactured by Tinker and Rasor, San Gabriel, CA, Model M-1.

3. Provide high-voltage spark tester to test completed coating systems in excess of 20 mils dry film thickness. Unit as recommended by coating manufacturer.

C. Testing:

1. Thickness and Continuity Testing:

a. Measure coating thickness specified in mils with a magnetic type, dry film thickness gauge, in accordance with SSPC PA 2. Check each coat for correct millage. Do not make measurement before coat has dried.

b. Holiday detect coatings 20 mils thick or less, except zinc primer and galvanizing, with low voltage wet sponge electrical holiday detector in accordance with NACE RP0188.

c. Holiday detect coatings in excess of 20 mils dry with high voltage spark tester as recommended by coating manufacturer and in accordance with NACE RP0188.
d. After repaired and recoated areas have dried sufficiently, retest each repaired area. Final tests may also be conducted by Engineer.

D. Inspection: Leave staging and lighting in place until Engineer has inspected surface or coating. Replace staging removed prior to approval by Engineer. Provide additional staging and lighting as requested by Engineer.

E. Unsatisfactory Application:
   1. If an item has an improper finish color or insufficient film thickness, clean surface and topcoat with specified paint material to obtain specified color and coverage. Obtain specific surface preparation information from coating manufacturer.
   2. Evidence of runs, bridges, shiners, laps, or other imperfections is cause for rejection.
   3. Repair defects in accordance with written recommendations of coating manufacturer.

F. Damaged Coatings, Pinholes, and Holidays:
   1. Feather edges and repair in accordance with recommendations of paint manufacturer.
   2. Hand or power sand visible areas of chipped, peeled, or abraded paint, and feather the edges. Follow with primer and finish coat. Depending on extent of repair and appearance, a finish sanding and topcoat may be required.
   3. Apply finish coats, including touchup and damage-repair coats in a manner that will present a uniform texture and color-matched appearance.

3.8 PROTECTION

A. Protect work of other trades against damage caused by painting and finishing work. Correct damages by cleaning, removing paint splatter, repairing or replacing, and repainting, as acceptable to Engineer.

B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided after completion of painting operations.

C. Protect painted surfaces from damage. Touch up and restore damaged or defaced painted surfaces as determined by Engineer.

3.9 CLEANING

A. The Contractor shall perform the work under this Section while keeping the premises free from accumulation of dust, debris and rubbish and shall remove all scaffolding, paint cloths, paint, and brushes from the building when completed.

B. Cleaning: All paint brushed, splattered, spilled or splashed on any surface not specified to be painted shall be removed.
C. The Contractor shall insure that all glass throughout that portion of the facility in which he worked is cleaned of dirt and paint before he leaves the job site. Further, the Contractor shall insure that all glass in this area is thoroughly washed and polished.

D. Upon completion of the project, the job site shall be left neat and clean.

END OF SECTION 098000
SECTION 09900 - ARCHITECTURAL PAINT FINISHES

PART 1 – GENERAL

1.01 THE REQUIREMENT:

A. The Contractor shall prepare surfaces for painting and shall paint all surfaces not specifically included under the requirements of Section 098000 entitled, "Protective Coatings", as required or indicated on Drawings, all in accordance with the requirements of the Contract Documents.

B. Materials not to be painted hereunder shall include the following:
   1. Work having complete factory finish other than prime coat.
   2. Stainless steel, anodized aluminum, brass, bronze and plated finished metals designed and used for architectural trim.
   3. Finish hardware except prime-coated items, fusible links, UL labels, nameplates, numbers and identifying data.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Painting and coating intended for industrial purposes or protecting the coated surface from abrasion, wear, corrosion, oxidation, decomposition or other effects of exposure shall conform to the requirements of Section 098000 entitled, "Protective Coatings". For the purposes of definition, all surfaces listed in the coating system schedules of the Protective Coatings Section 098000, shall be deemed to be surfaces requiring such special coating, and in case of conflict between the provisions of the Protective Coatings section and the Architectural Paint Finishes specified herein, the provisions of the Section entitled, "Protective Coatings" shall take precedence.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS:

A. Codes: References herein to "Building Code" or CBC shall mean the 2016 edition of the California Building Code.

B. In case of conflict between codes, reference standards, drawings and these Specifications, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or labor.

1.04 CONTRACTOR SUBMITTALS:

A. At least thirty (30) days prior to painting operations the Contractor shall submit for acceptance, a complete list of all paint materials proposed for use, identifying each material by manufacturer's name, product name and number. The list shall include all primers, thinners and coloring agents, together with manufacturer's catalog data fully describing each material as to contents, recommended usage and preparation and application methods.
Color samples and stain samples shall also be submitted for color selection by the Engineer. Submittals shall conform to the provisions of Section entitled, "Contractor Submittals". Stain samples shall be provided on the same material as the stain will be applied in the final installation.

B. Upon completion of the project, the Contractor shall provide the Owner with one (1) new unopened gallon of each type and color of paint used on the project. The cost thereof shall be included as part of the work required under this Section.

1.05 QUALITY ASSURANCE:

A. The Contractor shall give the Engineer a minimum of three (3) days advance notice of the start of any field or shop surface preparation and painting application work. All such work shall be performed only in the presence of the Engineer, unless the Engineer has granted prior approval to perform such work in its absence. Inspection by the Engineer, or the waiver of inspection of any particular portion of the work, shall not relieve the Contractor of its responsibility to perform the work in accordance with these Specifications.

B. The painting sub-contractor must possess a valid State license as required for performance of the painting and coating work called for in this Specification and must provide five (5) references which show that the painting sub-contractor has previous successful experience with the specified painting systems. Include the name, address and telephone number of a responsible individual of each installation for which the painting sub-contractor provided the work.

C. The Contractor shall require the protective coating manufacturer to furnish a qualified technical representative to visit the project site for technical support as may be necessary to resolve field problems attributable or associated with the manufacturer's products furnished under this Contract or the application thereof.

D. A warranty inspection will be conducted during the eleventh (11th) month following application of each painting system. The Contractor and a representative of the coating material manufacturer may be called upon to attend this inspection. All defective work shall be repaired in accordance with these Specifications and to the satisfaction of the Owner. The Owner may, by written notice to the Contractor, reschedule or cancel the warranty inspection. If the warranty inspection is not held, the Contractor is not relieved of its responsibility under the Contract Documents.

PART 2 – PRODUCTS

2.01 GENERAL:

A. The paint materials shall be delivered to the job site sealed in containers that plainly show the manufacturer's name, product class, manufacturer's code, color, date of manufacture, hazardous ingredients and flammability classification, extinguishing media and fire fighting procedures, health hazard data and emergency first aid procedures.

B. Stored paints, thinning agents and solvent shall be kept covered and precautions shall be taken for the prevention of fire. Empty containers and paint-soiled or oily rags shall be removed
from the site at the end of each day's work. Paint thinner shall not be stored in a room scheduled to receive resilient flooring.

C. Unless otherwise approved paint materials shall be from the catalogs of the companies listed herein. Materials by other manufacturers are acceptable provided that they are established as being compatible with and of equal quality to the coatings of the companies listed. In accordance with the requirements of the Supplemental General Conditions Section entitled, "Contractor Submittals", the Contractor shall provide satisfactory documentation from the firm manufacturing the proposed substitute or "or equal" material that their product meets the specified requirements and is equivalent or better than the listed materials. The cost of all testing and analyzing of the proposed substitute materials that may be required by the Engineer shall be paid by the Contractor. If the proposed substitution requires changes in the Contract work, the Contractor shall bear all such costs involved and the costs of allied trades affected by the substitution.

D. All finish colors shall be as selected or specified by the Engineer from the manufacturer's color samples.

2.02 ARCHITECTURAL PAINT SYSTEMS:

A. Vinyl Acrylic Latex Interior Wall and Ceiling Finish: Premium quality vinyl acrylic latex coating with minimum solids content of thirty-two percent (32%) by volume.

1. Primer-Sealer Drywall, Wood or Masonry: (DFT = 2.0 mils)
   Carboline: Sanitile 120, or Equal

2. Finish Coats (two or more) (DFT = 3 mils)
   Carboline: Carbocrylic 3359 (Semi-Gloss)

PART 3 – EXECUTION

3.01 GENERAL REQUIREMENTS:

A. Unless otherwise specified, all architectural paint materials shall be applied by brush or roller in strict accordance with the manufacturer's printed instruction. The manufacturer's recommended amount of thinner shall not be exceeded. Unless otherwise approved, finish coat material shall be applied as taken from manufacturer's container. Spray painting is only allowed on metal doors primed and painted in a shop setting. Each coat shall be applied at proper consistency and shall be free of brush or roller marks, sags, runs or any other evidence of poor workmanship. The splattering of paint on glass, hardware, tile, trim and other surfaces not to be painted shall be avoided. Masking shall be applied as required. Floor, fixtures, equipment and similar surfaces shall be protected with impervious protective covers and/or drop cloths. The Contractor shall maintain barricades and wet paint signs for duration of period needed.

3.02 SURFACE PREPARATION:

A. General: The Contractor shall properly prepare surfaces to receive finishes as indicated and specified. Finish hardware shall be removed prior to painting and finishing and re-installed as specified.
B. **Ferrous and Galvanized Metal:** Ferrous metal surfaces shall be cleaned of rust, scale, grease, oil and other deleterious matter by wire brushing, scraping, washing with solvent, sandblasting or other means necessary to properly prepare surfaces for painting. Shop painted ferrous metal surfaces that show rusting when initially installed shall be touched up with a rust inhibitor approved by the Engineer. Galvanized metals shall be cleaned with suitable organic solvent.

### 3.03 APPLICATION:

**A.** No coating shall be applied under the following circumstances:

1. When the surrounding air temperature or the temperature of the surface to be coated is below 40 deg. F.;
2. When surfaces are too wet or damp, or in rain, fog or mist;
3. When the temperature is less than 5 deg. F. above the dewpoint; or
4. When it is expected the air temperature will drop below 40 deg. F., or less than 5 deg. F. above the dewpoint within 8 hours after application of coating.

   Dewpoint shall be measured by use of a sling psychrometer in conjunction with U. S. Department of Commerce Weather Bureau psychometric tables.

**B.** The Contractor shall apply complete paint system required for exposed surfaces behind permanent cabinets, cases, counters and similar work before such items are installed.

### 3.05 CLEANUP:

**A.** Upon completion of the work, all staging, scaffolding and containers shall be removed from the job site and disposed of in a manner approved by State and Local environmental regulations. Coating spots and oil or stain upon adjacent surfaces shall be removed and the job site cleaned. All damage to adjacent surfaces or facilities resulting from the work performed under the Contract shall be cleaned, repaired or refinished to the satisfaction of the Engineer at no additional cost to the Owner.

### 3.06 OUTLINE OF PAINTING AND FINISHING WORK:

**A.** **Exterior:** Where noted in drawings, all exposed exterior surfaces of the building shall be painted and finished in accordance with the requirement herein specified for paint materials and surfaces. Exposed surfaces of miscellaneous metal, sheet metal items, mechanical equipment and all other items, as required, shall be painted with the required primers and coats of paint, as per the building manufacturer.

**B.** **Interior:** Where noted in drawings, exposed surfaces of the building shall be painted and finished in accordance with the requirements herein specified for paint and finish materials and surface:

1. Surfaces of gypsum wallboard, plywood sheeting, and doors and frames shall be primed and painted as specified.
2. Metal items in partitions and ceilings such as registers, grilles and similar items shall be painted to match finish of room or area in which they occur, unless directed otherwise by the Engineer.

3. Painted doors opening into rooms or spaces having different finishes or colors shall have the edges finished as directed by the Engineer.

END OF SECTION 099000
SECTION 102813 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. This Section includes the following:
   1. Toilet and bath accessories.
   2. Under lavatory guards.

1.2 SUBmittals

A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

B. Samples: For each accessory item to verify design, operation, and finish requirements.
   1. Approved full-size Samples will be returned and may be used in the Work.

C. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.

E. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.3 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect/Engineer.

B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
   1. Products of other manufacturers listed in Part 2 with equal characteristics, as judged solely by Architect/Engineer, may be provided.
   2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's/Engineer's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect/Engineer for review.

1.4 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.5 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
   1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:
   1. Toilet and Bath Accessories:
      a. A & J Washroom Accessories, Inc.
      b. American Specialties, Inc.
      c. Bobrick Washroom Equipment, Inc.
      d. Bradley Corporation.
   2. Underlavatory Guards:
      a. Brocar Products, Inc.
      b. Truebro, Inc.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.

C. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60.

E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.

G. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.


I. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

A. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.

D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
   1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
   1. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

F. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
C. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

A. Toilet and Bath Accessory Schedule is included in the drawings. Products listed in the schedule are “basis-of-design” products.

B. Underlavatory Guard: Where this designation is indicated, provide underlavatory guard complying with the following:
   1. Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.

END OF SECTION
SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS
A. Operation and maintenance data.

1.4 COORDINATION
A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.5 WARRANTY
A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period. Warranty Period: Six years from date of Substantial Completion.

1.6 QUALITY ASSURANCE
A. All extinguishers shall be checked and tagged by a certified tester in accordance with applicable standards and codes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.

   1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Multipurpose Dry-Chemical Type: UL-rated 4-A:80-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

   1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine fire extinguishers for proper charging and tagging.

   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

   1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416
SECTION 108113 - STAINLESS STEEL BIRD BARRIER SPIKES

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. All Stainless Steel Bird Barrier Spike Models: Physical surface barriers designed to prevent all types of pest birds and climbing animals from landing, roosting, nesting or climbing on architectural surfaces, in all infestation levels.

B. Bird Spike Mounting Hardware: Stainless steel mounting clips combined with mechanical fasteners to hold the Bird Spikes to all types of architectural surfaces. All mounting hardware shall be made of stainless steel or non-corrosive materials.

C. Surface Cleaning System: Surface disinfectants, deodorizers and personal protection equipment (PPE) that help keep installers safe when neutralizing the potentially hazardous bird or animal wastes that may be present. The cleaning system then sanitizes and deodorizes the surface in preparation of the Bird Spike installation.

1.2 QUALITY ASSURANCE

A. Installer to obtain, review and understand manufacturers planning guides, estimating worksheets and installation instructions.

B. Installer must be completely familiar with the proper installation procedures for the All Stainless Steel Bird Spike models specified for installation. Product Data: For each type of process and factory-fabricated product.

C. Installer must be completely familiar with the specified mounting hardware and mounting hardware installation procedures.

D. Installer must obtain and record accurate and complete dimensions for each surface specified for Bird Spike installation.

1.3 SUBMITTALS

A. Manufacturers literature including: Planning Guide, completed Estimate Worksheet(s) and installation instructions for the specified Bird Spike Model and specified mounting hardware.

B. Sample of specified Bird Spike Model - not less than 2” (5.1cm) in length.

C. Sample of specified Bird Spike Mounting Hardware.
1.4 STORAGE & HANDLING

A. Provide storage and/or protection to keep Bird Barrier Spike shipping boxes dry, clean and undamaged. Do not stack or place other packaging or objects on the Bird Barrier Spike shipping boxes.

B. Keep All Stainless Steel Bird Barrier Spikes and Mounting Hardware in original packaging until needed for installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. Nixalite of America Inc 1025 16th Avenue, PO Box 727, Dept. NI, East Moline, Illinois 61244; U.S.A.

B. Or equal.

2.2 BIRD BARRIER STRIPS

A. Wires: Stainless steel, 0.041” (1 mm) diameter, full-hard spring temper.

B. Base Strip: Stainless steel, 0.25” wide x 0.02” thick (6.3 mm x 0.5 mm), full anneal for flexibility, easy strip cutting and surface shape memory.

C. Spike Strip Lengths: 24” strip lengths.

D. Premium Nixalite Model S (or equal): Full row spike, 4” high (10.2 cm), 4” wide (10.2 cm) NO LESS THAN 120 wire points per foot. Full 180-degree wire coverage. For all bird species on all types of surfaces. Use in conjunction with Premium Nixalite Model W for climbing animal barrier and mud-nest building bird control applications.

E. Premium Nixalite Model W (or equal): Wall mount spike. 5-1/2” high (14.0 cm), 3” wide (7.6 cm), NO LESS THAN 120 wires per foot, 180-degree wire coverage. Designed for vertical surfaces only. Use above surfaces less than 2” in depth (5.1 cm) or over other Nixalite Models when specified. Use in conjunction with Premium Nixalite Model S for climbing animal barrier and mud-nest building bird control applications.

F. Finish: Natural stainless steel finish or manufacturers ColorCoat finish.

2.3 BIRD SPIKE MOUNTING HARDWARE

A. Use the Bird Spike Mounting Hardware that best suits the installation surface. All hardware is made of either stainless steel.

<table>
<thead>
<tr>
<th>Installation Surface</th>
<th>Nixalite Bird Spike Mounting Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masonry, stone, concrete;</td>
<td>Mounting clip, sheet metal screw, masonry anchor</td>
</tr>
</tbody>
</table>

LGVSD                        BIRD CONTROL DEVICES
SECONDARY TREATMENT & RWTF UPGRADE  108113 - 2
Wood, plywood, shingles; Mounting clip, sheet metal screw, washer
Sheet metal, plastic, PVC; Mounting clip, sheet metal screw, washer
Steel, cast iron, brass, bronze; Mounting clip, drive screw, washer
Pipes, cables, conduit, grates; Wire tie, wire tying tool, adhesive

B. Apply adhesive or sealant in all holes that penetrate the installation surface. After mounting hardware is installed, apply additional adhesive or sealant over the heads of the sheet metal screws and/or the drive screws. Do not get adhesive or sealant in the hook end of the mounting clips.

C. Optional Fastening:
1. Glue Clips & Adhesive:
   If surface conditions do not allow for the use of the supplied Bird Spike Mounting Hardware, use the Glue Clip and Adhesive installation method. Follow the Glue Clip installation instructions available from the manufacturer.

2.4 SURFACE CLEANING SYSTEM

A. Steri-Fab (or equal): Surface disinfectant and bactericide designed to neutralize bird waste, making it safe for removal. Steri-Fab quickly kills disease causing bacteria, parasites, fungi, insects, etc. This is a non-residual product. It becomes completely inert after it dries. Do not use with Microcide-SQ on the same surface at the same time Retain.

B. Microcide-SQ (or equal): A broad spectrum disinfectant, cleaner and deodorizer used to sanitize hard surfaces as well as fabrics and clothing. Use to kill a wide spectrum of organisms and disease causing bacteria. Do not use with Steri-Fab on the same surface at the same time.

C. Microsan (or equal): Anti-microbial personal protection products to help prevent disease transmittal before, during and after working on and around surfaces contaminated with bird and animal wastes. Use to compliment personal protection equipment standards (PPE).

PART 3 - EXECUTION

3.1 INSPECTION

A. Visually inspect all installation surfaces. Make sure all surfaces are clean, dry and free from debris or other conditions that could impede the workflow of this section. All surfaces must be sanitized and deodorized before installation of Bird Spikes.

B. Notify architect of detrimental conditions. Do not proceed until these conditions have been corrected.
3.2 PREPARATION

A. Field Measurements: Verify the dimensions for each surface specified for Bird Spike installation. Use manufacturers Planning Guides and Estimate Worksheets to verify that sufficient quantities of bird spike strips will be installed on EACH surface specified for bird control.

B. Make sure all installation surface finishing requirements have been accomplished before installing Bird Spikes. They are to be the last items installed on each specified surface. DO NOT apply any surface coating or treatment (paint, sealer, etc.) over the installed Bird Spikes or the mounting hardware.

C. Remove or relocate all plants, foliage or foreign objects that overhang the installation surfaces. Note all conditions that could adversely affect the installation and performance of the Bird Spike installation.

3.3 SURFACE CLEANING

A. All surfaces to be clean, dry and free of obstructions before the Bird Spikes are installed.

B. If Bird Waste Is Present:

   Treat, neutralize and safely remove all bird waste from installation surfaces. Installer must follow all municipal, state and federal regulations regarding the proper removal and disposal of bird droppings and waste materials such as nests and dead birds.

C. Use surface cleaning products to neutralize any bird droppings, nests and related waste materials that may be present. Allow all surfaces to air dry completely, and then reapply to sanitize and deodorize the surface before proceeding. Strictly follow treatment instructions provided with surface cleaning products.

D. Use anti-microbial and anti-bacterial personal protection products to help prevent disease transmittal when working around surfaces contaminated with bird droppings.

3.4 INSTALLATION

A. Make sure the installation surfaces are clean, dry and free of any debris or obstructions.

B. Install specified Bird Spike Models in strict accordance with manufacturer’s spike strip spacing and installation guidelines. Protect all surfaces where pest birds can land, roost and nest.

C. Install bird spike strips so they will protect the entire surface, not just the outside edges. No gaps are allowed in the bird spike strip coverage. Cut the bird spike strips where necessary to fit the surface properly.

D. Wires of Bird Spike Models must extend over outside edges of each surface by at least 1/4” (0.6cm). The bird spike base strip must extend over the ends of each surface by at least 1/2” (1.2cm).
E. Fasten Bird Spike Models to the surface with the mounting hardware recommended by the manufacturer. Follow the hardware spacing guidelines and installation procedures supplied by manufacturer.

3.5 ADJUSTMENTS / CLEANING

A. Remove debris and waste materials from project site. Inspect finished installation. Make any adjustments needed to conform to spacing and installation guidelines.

END OF SECTION 108113
SECTION 133400–PRE-ENGINEERED METAL BUILDING

PART 1 - GENERAL

1.1 THE REQUIREMENT
A. The Contractor shall furnish and erect a pre-engineered metal building and associated accessories complete and in accordance with the requirements of the Contract Documents. Manufacturer shall be responsible for all anchor bolt designs.

1.2 REFERENCES
D. ASTM A36 - Specification for Structural Steel.
E. ASTM A 53 - Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
F. ASTM A325-04b - Specification for High Strength Bolts for Structural Steel Joints.
H. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical Quality).
I. ASTM A463 - Specification for Steel Sheet Cold Rolled Aluminum Coated Type 1 and Type 2.
J. ASTM A490 - Specification for Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints.
K. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
L. ASTM A501 - Hot Formed Welded and Seamless Carbon Steel Structural Tubing.
M. ASTM A529 - Structural Steel with 50,000 psi Minimum Yield Point.
N. ASTM A570 - Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality.
O. ASTM A572 - Specification for High Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality.
P. ASTM A792 - Specification for Steel Sheet Aluminum Zinc Alloy Coated by the Hot Dip Process, General Requirements.


R. AWS A2.4-93 - Standard Welding Symbols.

S. AWS D1.1-96 - Structural Welding Code - Steel.

T. AWS D1.3-89 - Structural Welding Code - Sheet Steel.


1.3 SYSTEM DESCRIPTION

A. The building shall include all primary and secondary structural framing members, connection bolts, canopies, roof extensions, covering, doors, flashing, trim, fasteners, sealer, gutters, downspouts, and other miscellaneous items as stated in the specifications and/or shown or called for on the Drawings.

B. The Framing system shall be clear span.

C. Primary Framing: Rigid frame of rafter beams and columns, end wall columns.

D. Secondary Framing: Purlins, girts, eave struts, flange bracing, and other items detailed.

E. Lateral Bracing: Horizontal loads not resisted by main frame action may be resisted by cable, rod and/or diaphragm, portal frames, fixed base columns in the sidewall. Diaphragm and/or cable, rod, portal frame, and fixed base columns in the endwall. Cable, rod, and/or diaphragm in the roof.

F. Roof System: Preformed steel panels, insulation, and accessory components.

G. Roof Slope: As shown in drawings.

H. Dimensional Terminology:

1. The building “Width” shall be the measurement from outside face to peak of roof.
2. The building “Length” shall be the measurement from outside face to outside face of the endwall girts.
3. “Eave” to be determined as the line along the sidewall formed by the intersection of the lanes of the roof and sidewalk.
4. “Eave Height” is defined as the vertical dimensions as measured from the finished floor to the top of the eave strut.
5. The “Bay Spacing” shall be the measurement as follows:
   a. Interior Bay Spacing: The distance between the centerlines of interior frames.
   b. End Bay Spacing: The distance from the outside face of endwall girt to the centerline of the adjacent interior frame.

I. Building Type:
1. The building shall be of the single slope, rigid frame type with vertical columns (uniform depth) located at the building sidewalls and intermediate support columns as shown in the drawings.

1.4 DESIGN REQUIREMENTS

A. The buildings shall be designed in accordance to the CBC and all applicable City and State Codes.

B. All loads shall be proportioned and applied in accordance with MBMA Low Rise Building Systems Manual.

C. Deflection requirements shall be in accordance with the applicable provisions of the AISC Steel Design Guide Series 3 - Serviceability Design Considerations for Low-Rise Buildings.

D. Assembly to permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 100 degrees F.

E. Roof drainage system to withstand rainfall intensity of 2 inches per hour with 15-minute duration.

1.5 SUBMITTALS

A. Contractor shall submit building drawings and design calculations sealed by a registered professional engineer in the State of California in accordance with Section 013300 Contractor Submittals. The drawings shall provide details describing footings and foundation support including required anchoring and anchoring calculations.

B. The Engineer will verify the foundation design based on the information provided in the Submittals and make any necessary modifications.

C. No concrete for the foundations shall be installed prior to approval of the Submittals by the Engineer.

1.6 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with MBMA Low Rise Building systems Manual, and, for items not covered, AISC - Specification for Structural Steel for Buildings. Metal Building Manufacturer shall be AISC Certified Category MB.

1.7 QUALIFICATIONS

A. Manufacturer: The company manufacturing the products specified in this Section shall be a member of MBMA and shall have a minimum of 10 years’ experience in the manufacture of steel building systems.
B. Structural framing, covering and anchoring shall be the design of a California licensed Professional Engineer experienced in design of this work.

1.8 FIELD MEASUREMENTS

A. Metal building contractor shall verify that field measurements are as indicated on erection drawings.

1.9 WARRANTY

A. Building manufacturer shall provide a Standard Limited Warranty of five (5) years.

B. Building manufacturer shall provide an aluminum-zinc alloy Coated Steel Panel Limited Warranty of twenty (20) years.

C. Building manufacturer shall provide a Panel Finish Limited Warranty of twenty (20) years.

D. Building manufacturer shall provide a Roof System Weathertightness Limited Warranty of twenty (20) years.

PART 2 - PRODUCTS

2.1 MATERIALS - STRUCTURAL FRAMING

A. Primary Framing Members:

1. Rigid frames, tapered beams, sidewall columns, and rafter beams shall be classified as primary structural framing.

2. Secondary structural framing shall include endwall columns, and canopy beams, purlins, girts, eave struts, headers, jambs, flange bracing, clips and other miscellaneous structural framing.

3. Primary Framing: Steel used to fabricate built up framing members shall be 50,000 PSI minimum yield point material and shall conform to the physical characteristics of one of the following:
   a. ASTM 607 Grade 50
   b. ASTM A570 Grade 50
   c. ASTM A572 Grade 50
   d. ASTM A529 Grade 50

4. Steel used for cold-formed members shall be 55,000 PSI minimum yield point material and shall conform to the physical characteristics of ASTM A570 Grade 55.

5. Steel used for interior pipe columns shall be 36,000 PSI minimum yield point material and shall conform to ASTM A53 Grade B (with Hydrostatic Test requirements excluded), ASTM A-501 straightness tolerance.

6. The building manufacturer shall have on file certified mill test reports, which verify that these requirements have been met.
Purlins and Girts: Steel used to form purlins and girts shall be hot rolled steel sheet with a guaranteed minimum yield point of 55,000 PSI and shall conform to the physical characteristics of ASTM A570 Grade 55.

Cable used for diagonal bracing shall be extra high strength Grade-7 wire Class A coating, left hand lay, galvanized steel strand, conforming to the provisions of ASTM Specification A-475.

Structural steel members shall be sheared, formed, punched, welded and painted in the plant of the manufacturer. All shop connections shall be welded in accordance with the AWS “Standard Code for Welding in Building Construction” and CWB “General Specifications for Welding of Steel Structures.”

Field connections shall be bolted with high strength bolts and nuts (ASTM A325 or SAE J429 Grade 5). Bolts and nuts shall be stainless steel 304, including anchor bolts.

Light-gauge cold-formed sections shall be manufactured by precision roll or brake forming. All dimensions shall be true, and the formed member shall be free of fluting, buckling or waviness.

Protective Coatings - All framing members shall be hot-dip galvanized in accordance with specification 098000.

B. Secondary Structural Members:

1. Purlins and girts shall be precision roll-formed “C” sections or “Z” sections of adequate size and thickness as determined by the design criteria. Purlins shall be either simple span or continuous span members.

2. Eave struts shall be precision roll-formed and/or press broke “C” sections. The upper flange shall slope with the normal roof slope, and the web shall be vertical and free to receive the sidewall covering.

3. Wind bracing shall be accomplished by diagonal cable bracing, rod bracing, portal frames, and/or diaphragm action of the roof and wall covering. All cables for diagonal bracing shall be fabricated from extra high strength strand. Adjustment shall be provided by an eyebolt assemble.

4. Flange bracing shall consist of angle or tubular bracing connected to the web of the purlin or girt and to the compression flange of the primary structural member.

5. Base support shall consist of a continuous base angle, base “C”, or panel edge to which the base of the wall covering shall be attached. The base support shall be securely fastened into the concrete by the erector.

6. All secondary members must be rolled from galvanized material or be Hot Dip Galvanized.

C. Structural Member Fabrication:

1. Framing Members: All framing members must be Hot Dip Galvanized.

2. Hot rolled members shall be fabricated in accordance with AISC Specification for pipe, tube, and rolled structural shapes.


2.2 MATERIALS - ROOF SYSTEM

A. Roof Panel Description:
1. Roof panel shall be standing seam-type roofs, such as those provided by CBC “SS-24” or Butler Manufacturer “MR-24.”
2. The panels shall be joined to the roof purlins per the manufacturer’s recommendations.
3. All roof panels shall be continuous from eave to ridge except where lengths become prohibitive for handling purposes. All end-laps shall be at least 6”.
4. All fasteners, screws and hardware shall be HWH 410 stainless steel.
5. Sealants: Per roof manufacturer’s recommendations.
7. Color: The interior and exterior finish chosen from the manufacturer's color charts and chips.

2.3 MATERIALS – WALL SYSTEMS

A. Wall Panels Description:
1. Wall panels shall have 1-1/4 inch trapezoidal ribs spaced 12 inches on center and two stiffener ribs. Each panel shall provide 36” net coverage in width.
2. The panels shall be attached to the girts per the manufacturer’s recommendations.
3. All wall panels shall be continuous from sill to roof line except where lengths become prohibitive for handling purposes. All end-laps shall be at least 4”.

B. Wall Panel Material: Sheet Steel Stock: Panel material shall be aluminum-zinc alloy-coated steel conforming to ASTM A792 for coating AZ50 or AZ55.
1. 24-gauge coated steel shall have a minimum yield strength of 80,000 PSI in accordance with ASTM A-792.

C. Closures: The corrugations of the roof panels shall be filled with a preformed closed cell, laminated polyethylene foam closure along the eaves and ridge for weather tightness.

D. Fasteners self-drilling, self-tapping, HWH 410 stainless steel screws with sealing washers. Size to maintain load and weather tightness requirements.

E. Sealants: Mastic for roof side-laps, end-laps and flashing shall be sealed with a mastic sealer 3/16” dia. For roof slopes of 1:12 or greater, and ½” x 1/8” tape for roof slopes of less than 1:12. The material shall be a butyl base elastic compound with a minimum solid content of 99% Chemsecos Sealum TC95 or equal. The sealer shall have good adhesion to metal and be non-staining, non-corrosive, non-shrinking, non-oxidizing, non-toxic, at temperatures from -60 degrees F to 212 degrees F (-51 degrees C to -100 degrees C). The material shall meet or surpass the requirements of Federal Specifications TT-C-1796A Type II, Class B and NAAMM SS-1C-68.

F. Finish: All panels are to receive a factory-applied Kynar 500/Hylar 5000 finish consisting of a baked-on top-coat with a manufacturer’s recommended prime coat conforming to the following:
1. Metal Preparation: All metal is to have the surfaces carefully prepared for painting on a continuous process coil coating line by alkali cleaning, hot water rinsing, application of chemical conversion coating, cold water rinsing, sealing with acid rinse, and thorough drying.
2. Prime Coating: A base coat of epoxy paint, specifically formulated to interact with the top-coat, is to be applied to the prepared surfaces by roll coating to a dry film thickness of 0.20 plus 0.05 mils. This prime coat must be oven cured prior to application of finish coat.

3. Exterior Finish Coating: Apply the finish coating over the primer by roll coating to dry film thickness of 0.80 plus 5 mils (3.80 plus 0.50 mils for Vinyl Plastisol) for a total dry film thickness of 1.00 plus 0.10 mils (4.00 plus 0.10 mils for Vinyl Plastisol). This finish coat must be oven-cured.

4. Interior Finish Coating: Match Exterior Finish Coating

5. Color: The interior and exterior finish chosen from the manufacturer's color charts and chips.

6. Physical Properties: Coating must conform to the industry and manufacturer's standard performance criteria as listed by the following certified test reports:

   a. Chalking: ASTM DEFONLINE
   b. Color Change and Conformity: ASTM D 2244
   c. Weathometer: ASTM G 152, ASTM G 153 and ASTM D 822
   d. Humidity: ASTM D 2247 and ASTM D 714
   e. Salt Spray: ASTM B117
   f. Chemical Pollution: ASTM D 1308
   g. Gloss at 60 degrees: ASTM D 523
   h. Pencil Hardness: ASTM D 3363
   i. Reverse Impact: ASTM D 2794
   j. Flexibility: ASTM D 522
   k. Abrasion: ASTM D 968
   l. Flame Spread: ASTM E 84

2.4 MATERIALS – FOUNDATION

   A. Pre-Engineered metal building supplier shall verify and submit to the Engineer all relevant structural design calculations (Stamped by a registered professional engineer in the State of California).

2.5 MATERIALS - TRIM

   A. Exterior gutters shall be 24-gauge, G90 galvanized or aluminum-zinc alloy coated steel with the same finish as the wall panels. Color to be chosen by Owner from manufacturer provided color charts.

   B. Downspouts shall be 28-gauge galvanized or aluminum-zinc alloy coated steel with a color coordinated, pre-painted finish. Color to be chosen by Owner from manufacturer provided color charts.

   C. Standard rake trim shall be 26-gauge, G90 galvanized or aluminum-zinc alloy coated steel with the same finish as the wall panels. Color to be chosen by Owner from manufacturer provided color charts. If the roof is a Standing Seam or Loc-Seam system, the rake shall be attached to the endwall material with t slip joint, allowing the rake to expand and contract with the roof system.
D. Wall trim shall be 26-gauge, G90 galvanized or aluminum-zinc alloy coated steel with the same finish as the wall panels. Color to be chosen by Owner from manufacturer provided color charts.

E. All gutter and downspout joints, rake flashing laps, ridge flashing laps doors, windows and louvers shall be sealed with Sika Sikaflex 201 caulk or equal. The caulk shall meet or exceed the requirements of Federal Specification TT-S-00230C, Type II, Class A.

2.6 MATERIALS – BIRD FLASH CLOSURE

A. All pre-engineered metal buildings shall be supplied with a bird flash closure system, consisting of bent cover flashing over beams, soffit panels on the underside of the roofing system, and soffit panel end caps, to eliminate bird nesting locations. All flashing, panels and end caps shall match the roof panel in finish and material.

PART 3 - EXECUTION

3.1 RECEIVING, STORAGE AND HANDLING OF MATERIALS ON JOBSITE

A. All materials shall be unloaded, handled, hauled and delivered to storage by competent workmen in a manner, which will prevent bends, dents, scratches and other damage. Damaged materials shall be rejected and promptly replaced. All materials shall be properly stored and protected from weather damage by the Contractor. All shipments will be thoroughly checked by the project Contractor.

B. Primed Materials: Upon receipt, all bundles of primed material shall be stored on blocking at an angle sufficient to allow any trapped water to drain and should be protected from the weather by covers allowing air circulation. Water, ice and snow should not be allowed to collect and remain thereon.

C. Roof and Wall Panels: Bundles of panels shall be inspected for moisture upon receipt. If moisture is present, dry the panels and, if possible, store them in a warm, dry place. The panel bundles shall be elevated and sloped in a manner to allow moisture to drain. Cover all bundles with a tarp or plastic, leaving airspaces for adequate air circulation.

3.2 ERECTION – GENERAL

A. The erection of the metal building and the installation of accessories will be performed in accordance with the Building Manufacturer’s erection drawings and erection manuals by a qualified erector using proper tools, equipment and safety practices.

3.3 ERECTION – FRAMING

B. The erector shall furnish temporary guys and bracing where needed for squaring, plumbing, and securing the structural framing against loads, such as wind loads acting on the exposed framing and seismic forces, as well as loads due to erection equipment and erection operation, but not including loads resulting from the performance of work by others. Bracing furnished by the manufacturer for the metal building system cannot be assumed to be adequate during erection. The temporary guides, braces, falseworks and cribbing are the property of the erector, and the erector shall remove them immediately upon completion of erection.

C. Do not field cut or alter structural members without approval of the metal building manufacturer. After erection, prime, weld abrasions, and surfaces not shop primed.

3.4 ERECTION - ROOFING SYSTEMS

A. Install in accordance with manufacturer’s instructions

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

3.5 TOLERANCES

A. All work shall be performed in a workmanlike manner.


END OF SECTION 133400
SECTION 141190 – GANTRY CRANE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. This section covers supply, delivery, supervision of installation and commissioning of the portable gantry crane and related accessories.

1.2 OPERATING CONDITIONS

A. The following site operating and water quality conditions must be assumed for all design calculations:

1. 40°C maximum/5°C minimum ambient air temperature
2. 95% maximum relative humidity
3. Fully enclosed facility

B. Refer to the Contract Drawings for further details

1.4 REFERENCE STANDARDS

B. Specifications for Overhead and Gantry Cranes – ANSI B30.17-2003
C. Construction and Test of Electric Cranes and Hoists – CSA C22.2 No. 33M1984
D. Canadian Electrical Code – CSA 22.1
E. Certification of Companies for Fusion Welding of Aluminum – CSA W47.2-M1987
F. Ontario Hydro Electrical Safety Code
G. Ontario Occupational Health and Safety Act and Regulations

1.5.1 SHOP DRAWINGS

A. Submit the Shop Drawings in accordance with Section 01330 – Contractor Submittals
B. The shop drawing submission shall include, but not limited to, the following:

1. Submission details covered in Section 01330 – Contractor Submittals
2. Provide sufficient detail to show the general construction pertinent to the proper review of the equipment. Description of the materials of construction of the major components including:
   a.) Details of vertical, diagonal and horizontal members
   b.) Details of electrical motors where specified. Supply technical details from the Manufacturer.

3. General assembly drawings of beam trolleys, hoists and other major components
4. A precise list of all electrical requirements for the equipment including all controls, monitoring equipment and instrumentation shall be given including all power characteristics and materials of construction.
5. The Supplier shall indicate a list of spare parts which he/she would recommend be purchased and individual prices for each item.
6. All ancillary equipment to be provided by the Supplier shall be listed.
7. Special accessories or tools for the adjustment or removal of parts required for any piece of equipment shall be listed and furnished as part of the supply.

1.6 MAINTENANCE DATA

   A. Refer to section 017700 – Closeout Procedures

PART 2 – PRODUCTS

2.1 GENERAL

   A. Refer to the Contract Drawings for further details.
   B. All lifting systems shall be capable of overcoming the initial dislodging force, overcoming friction including pump and lifting chain weight (the sum of all of these weights is referred to as the minimum weight).

2.2 GANTRY CRANE

   A. Provide one (1) adjustable gantry crane to the following specifications:
      1. Minimum 2,000 lb. lifting capacity
      2. Minimum span and clearance height as shown in the drawings
      3. The gantry crane shall be supplied complete with a beam trolley.
      4. The gantry crane shall be supplied with lockable V-casters and rails. The rails length shall be as noted in the drawings.

2.3 CHAIN HOIST

   A. Provide a 1.0 ton (2,000 lbs) electrically (1PH, 230V) operated stainless steel chain hoist with minimum lifting height of 15 feet fully compatible with the gantry crane.
   B. Manufacturers:
      a. Harrington,
      b. Yale,
      c. Or equal.

2.4 WARRANTY

   A. The Manufacturer shall provide a minimum one (1) year warranty on all components against defects in workmanship and materials from the date of start-up. All components shall be fully tested prior to shipping. Hoist warranty shall be 2 years from startup.

2.5 ACCEPTABLE MANUFACTURERS

   A. Equipment must be supplied from acceptable Manufacturer:
      1. Spanco, Inc.
      2. Or Equal

PART 3 – EXECUTION
3.1 Gantry Crane/Hoist system shall be void of any conflict with any existing or newly installed equipment and shall ensure the safe transport of UV modules.

END OF SECTION 141190
SECTION 151100 – OWNER SELECTED EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. The Owner has pre-selected various pieces of equipment to be purchased and installed by the Contractor under this contract.

B. The list of Owner selected equipment, along with the terms and conditions of purchase, and all relevant equipment details and vendor contact information are included in this section.

C. The Contractor is responsible for purchase of Owner selected equipment. The Contractor shall be responsible for all taxes and any additional fees associated with the purchase of Owner selected equipment. Unless noted otherwise, Owner has already released payment for equipment submittals (to facilitate design). However, no submittals have been returned or approved, and no equipment has been released for production at this time. Contractor shall coordinate submittal review with Engineer, Owner, and the Supplier and shall be responsible for coordinating the production and delivery schedules.

D. The Contractor shall issue Purchase Orders to release equipment for production on all Owner Selected equipment within seven (7) calendar days of receiving final approved submittals from Engineer and Owner. The contract price listed for each item in the Bid Schedule represents the approved and agreed upon price for the equipment package, including submittals.

E. The Contractor is required to maintain a record for each piece of equipment.

F. The equipment representative and primary contact for each manufacturer is included below. An overview of the scope for each piece of equipment is included in the attachment to this section. For a complete scope of supply, equipment assembly requirements, as well as warranties, payment terms and other necessary information the Contractor shall contact the equipment vendors.

G. While every effort has been made to coordinate the design drawings with each supplier’s submittal and equipment package, Contractor shall ensure that final installation accommodates the final dimensions and requirements as required by the manufacturer. Contractor shall furnish a complete and fully functional system as indicated in the design drawings.

1.2 RECEIVING, STORAGE AND HANDLING

A. The Contractor shall be responsible for receiving, storage and handling of Owner selected equipment. The Contractor shall unload and uncrate equipment and visually inspect for defects and/or damage. Contractor shall report immediately to the Owner and Engineer any such conditions found. The Contractor shall follow all requirements as outlined in Section 016100 of these specifications.

B. Owner has already issued payment for submittal packages for each piece of Owner Selected Equipment. Accordingly, the costs listed in the Bid Schedule in Volume 2 represent the remaining contract amount to be assigned to the Contractor. No submittals have been approved and no
equipment has been released for production at this time. Contractor shall coordinate with Engineer and Owner to finalize submittal comments, return approved submittals, and release each equipment package for fabrication per the terms in the assigned contract.

C. Contractor shall store and protect all Owner Selected equipment and associated items per the supplier’s recommendations and confirm proper storage and protection before delivery.

1.3 OWNER SELECTED EQUIPMENT

A. HYBRID FFAS BY H2O Innovation USA (BID ITEM #3)

1. Contact: Naomi Jones  
   Phone: (760) 519-7701 (work)  
   Email: Naomi.Jones@h2oinnovation.com

2. Contact: Jim Zaiser (Goble Sampson Associates, H2O Rep.)  
   Phone: (916) 933-5500  
   Email: jimzaiser@jbiwater.com

3. Scope of Supply: **AS SHOWN IN APPENDIX A OF VOLUME 3A from the H2O Innovation USA proposal:** Contact equipment manufacturer for clarifications.

B. TRICKLING FILTER DISTRIBUTOR BY ENVIRODYNE (BID ITEM #4)

1. Contact: Robert E. Sheker  
   Phone: (717)-763-0500  
   Email: res@envirodynesystems.com

2. Contact: Jim Billings (G3 Engineering)  
   Phone: (925)-462-2703  
   Email: jim@g3engineering.com

3. Scope of Supply: **AS SHOWN IN APPENDIX A OF VOLUME 3A from the Envirodyne proposal:** Contact equipment manufacturer for clarifications.

C. TRICKLING FILTER MEDIA BY BRENTWOOD INDUSTRIES (BID ITEM #5)

1. Contact: Larry Li  
   Phone: (610) 347-8816  
   Email: larry.li@brentwwodindustries.com

2. Contact: David C Frost or Brian Villacorta (Coombs-Hopkins Company)  
   Phone: (925)-947-6733  
   Email: dcf@chcwater.com

3. Scope of Supply: **AS SHOWN IN APPENDIX A OF VOLUME 3A from the Brentwood proposal:** Contact equipment manufacturer for clarifications.
D. EDUCTOR TUBE MIXERS BY JDV EQUIPMENT CORPORATION (BID ITEM #6)

1. Contact: Joe Barringer  
   Phone: (973)-366-6556 x112  
   Email: joe@jdvequipment.com

2. Contact: Dave Ritter (Goble Sampson Associates)  
   Phone: (801)550-1613  
   Email: driter@goblesampson.com


E. SECONDARY CLARIFIER MECHANISMS BY OVIVO USA, LLC. (BID ITEM #7)

1. Contact: Robert R Palmer  
   Phone: (801) 931-3000  
   Email: bob.palmer@ovivowater.com

2. Contact: Mike Brown (Coombs-Hopkins Company)  
   Phone: (801) 652-2632  
   Email: mike@chcwater.com

3. Scope of Supply: AS SHOWN IN APPENDIX A OF VOLUME 3A from the OVIVO USA, LLC proposal: Contact equipment manufacturer for clarifications. Includes cost for two (2) clarifier mechanism equipment packages.

4. Cost for an optional third clarifier mechanism is also included in the proposal and constitutes the additional equipment cost associated with Alternative Bid Item #A.2.

F. UV DISINFECTION SYSTEM BY SUEZ TREATMENT SOLUTION, INC. (BID ITEM #8)

1. Contact: George Vrachimis  
   Phone: (201) 676-2227  
   Email: George.vrachimis@suez-na.com

2. Contact: Peter Ruszel (Burlingame Engineers, Inc)  
   Phone: (925) 943-5200  
   Email: peter@burlingameengineers.com

3. Scope of Supply: AS SHOWN IN APPENDIX A OF VOLUME 3A from the SUEZ proposal: Contact equipment manufacturer for clarifications.

G. RWTF PRESSURE MEMBRANE FILTER EXPANSION PACKAGE BY GE, (BID ITEM #9)

1. Contact: Timothy Fisher-Kane  
   Phone: (760) 305-0145  
   Email: Timothy.Kane@ge.com

2. Contact: Mike Brown (Coombs-Hopkins Company)
3. **Scope of Supply:** **AS SHOWN IN APPENDIX A OF VOLUME 3A from the GE proposal:** Contact equipment manufacturer for clarifications.

**H. ODOR CONTROL SYSTEM BY ECOVERDE, LLC. (ALTERNATE BID ITEM #A.4)**

1. **Contact:** Luis Uribe  
   Phone: (480)282-7488  
   Email: lul@ecoverdetechnologies.com

2. **Contact:** Pacific Water Resources  
   Phone: (650)259-0302  
   Email: alan@pacificwaterresources.com

3. **Scope of Supply:** **AS SHOWN IN APPENDIX A OF VOLUME 3A from the EcoVerde proposal:** Contact equipment manufacturer for clarifications.

**I. DISSOLVED AIR FLOATATION THICKENER SYSTEMS BY WESTECH, INC. (ALTERNATE BID ITEM #A.5)**

1. **Contact:** Adrian Williams  
   Phone: (801) 265-1000  
   Email: awilliams@westech-inc.com

2. **Contact:** Mark Humberstone (MISCO Water)  
   Phone: (925) 225-1900  
   Email: mhumberstone@miscowater.com

3. **Scope of Supply:** **AS SHOWN IN APPENDIX A OF VOLUME 3A from the Westech proposal:** Contact equipment manufacturer for clarifications.

**1.4 ASSEMBLY OF OWNER SELECTED COMPONENT**

**A.** Assembly of some Owner selected components are required to make complete and functional installations. The contractor shall follow manufacturer's instructions.

**1.5 PRESTART-UP INSPECTION AND LUBRICATION**

**A.** Contractor shall check all Owner selected equipment and make adjustments to the equipment which will allow for proper/functional operation of the equipment, then start-up the equipment. Pertinent items include but not necessarily limited to the following:

1. Removal of shipping stops.  
2. Vibration isolators properly aligned and adjusted.  
3. Flexible connections are properly aligned.  
4. Safety controls, safety valves and high or low limits are in operation.
B. Provide initial lubrication to all Owner selected equipment. Follow manufacturer's requirements.

1.6 START-UP

A. The Contractor will inform the Owner when each piece of equipment is ready for start-up. The Contractor will then have an authorized representative of that piece of equipment come and perform the start-up.

B. Any problems in start-up which are found to be as a result of improper installation shall be corrected by the Contractor at no cost to the Owner.

C. The Owner will schedule the training of each piece of equipment by each manufacturer’s representative at the Owner’s convenience.

END OF SECTION 151100
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