

**TREASURE ISLAND WATER RESOURCE RECOVERY FACILITY (WRRF)
PROJECT
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For Civic Design Review**

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**SECTION 07 63 00
FLASHING AND SHEET METAL**

PART 1 - GENERAL

1.1 SCOPE

- A. Provide sheet metal and appurtenant WORK, complete and in place, in accordance with the Contract Documents
- B. The principal items of sheet metal WORK include sheet metal flashings, copings, collars, pitch pockets (pans), equipment platforms, equipment (sleeper) supports at all roof penetrations which are not provided as part of the roofing system, and all other components necessary to make building weathertight
- C. Work includes:
 - 1. Design
 - 2. Coordination with DESIGN-BUILDER for standard product adjustments
 - 3. Submittals
 - 4. Installation
 - 5. Warranty

1.2 REFERENCE SPECIFICATIONS

- A. Use this Section with the Contract Documents and following other Sections to establish the total requirements
 - 1. 01 33 00 – Submittals
 - 2. 01 42 00 – Reference Standards
 - 3. 01 78 36 - Warranties

1.3 SUBMITTALS

- A. See Section 01 33 00 – Submittals
- B. Additional Submittals
 - 1. Product Data: Manufacturer's specifications, literature, and published installation instructions, and maintenance instructions for all sheet metal products

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2. Shop Drawings: Show materials, gauges, finishes, layout, jointing, sizes, profiles, fabrication of special shapes, fasteners, and method of attachment to adjacent construction
3. Samples: Color and other samples, where required for color selections and/or review by the DESIGN-BUILDER

1.4 QUALITY ASSURANCE

- A. Follow approved Quality Assurance/Quality Control Program
- B. Designate a project manager for the duration of the project to coordinate with the DESIGN-BUILDER
- C. WARRANTY

1. See 01 78 36 - Warranties

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. See 01 73 19 – Equipment Installation and Operational Testing

PART 2 - PRODUCTS

2.1 GENERAL

- A. Sheet metal of type 304 stainless steel, unless otherwise indicated. Sheet metal WORK in connection with roofing shall be in accordance with roofing manufacturer's published specifications
- B. Provide material thickness not less than thickness indicated. Where thicknesses are not indicated, provide thickness of not less than that required by referenced standards found in Architectural Sheet Metal Manual@ (ASMM)

2.2 ALUMINUM PRODUCTS

- A. Provide aluminum 0.032-inch minimum thickness conforming to ASTM B 209 - Aluminum and Aluminum Alloy Sheet and Plate, alloy 3003-H14, with clear anodized finish AA-C12-A41, unless indicated otherwise. Provide thickness of aluminum to be welded as necessary for welding method being used
- B. Provide reglets of extruded aluminum with protective coating such as manufactured by Superior Concrete Accessories, Morrison and Company Cushion-Lock, Fry Reglet, or equal.

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2.3 FERROUS METALS

- A. Provide stainless steel of 24-gauge minimum thickness conforming to ASTM A 176 - Stainless and HeatResisting Chromium Steel Plate, Sheet, and Strip, Type 304, dull No. 2D finish. Do not paint stainless sheet metal wainscots, workbench, top units, sinks, sinks and counters

2.4 FASTENERS

- A. Provide fastening devices of the same material as the sheet metal being used or corrosion-resistant metal compatible with sheet metal being used. Provide fasteners exposed to the weather with neoprene washers of 0.04-in minimum thickness. Use a rubber-type washer beneath the aluminum washer or fastener head where weathertightness is required

2.5 PLASTIC CEMENT

- A. Provide plastic cement conforming to ASTM D 2822 - Asphalt Roof Cement

2.6 SEALING MATERIALS

- A. Provide sealants in accordance with Section 079213 - Sealants and Caulking or of the silicone type. Selection of colors by the DESIGN-BUILDER from manufacturer's full range of standard colors
- B. Provide sealer tape of polyisobutylene sealer tape specifically formulated for setting flanges on bituminous roofing

2.7 COATING MATERIALS

- A. Provide primer coat for galvanized steel conforming to Federal Specification TT-P-641G(1) -Primer Coating, Zinc Dust-Zinc Oxide (For Galvanized Surfaces), Type II
- B. Provide asphaltic coating compound conforming to ASTM D 1187 – Asphalt Base Emulsions for Use as Protective Coatings for Metal

2.8 SHOP FABRICATION REQUIREMENTS

- A. Provide gutters and downspouts of sizes indicated with wire basket type strainers of 14-gauge stainless steel wire or cast bronze. Provide gutter configuration similar to that indicated
- B. Provide all aluminum welded where indicated. Provide welding conforming to Reference Standards
- C. Provide sheet metal wainscots of **aluminum**, unless otherwise indicated. Do not paint them

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- D. Provide elongated holes where necessary for material expansion and where indicated in Reference Standards
- E. Protect all WORK and finishes from scratches and abrasions
- F. Fabricate flashing, reglets and counter-flashing and associated flashing by the same manufacturer and install them as a complete flashing system. Have flashing creased longitudinally or otherwise formed with sufficient spring action to hold bottom edges firmly against base flashing or similar material
- G. Have intersecting corners of copings accurately fitted and welded. Corners may be shop-assembled, manufactured, or extruded units. Provide coping per "Architectural Sheet Metal Manual" (ASMM; 5th ed. Chantilly, VA: Sheet Metal and Air Conditioning Contractors National Association (SMACNA), 1993), Figure 3-1, except modified as indicated, with Figure 3-2, Alternate 5 seams that allow for 1/4-inch expansion per each 10-ft of length
- H. Access doors required by code or access to equipment, valves, etc., shall be provided. Size and location shall be as required by governing authorities, codes, and as indicated. Key-locked access doors shall be provided where indicated. Plumbing access doors shall conform to the requirements of Section 22 10 00 - Plumbing Piping and Specialties. Provide access doors as manufactured by Milcor Division of Inryco, Inc.; Karp Associates, Inc.; Inland Ryerson Steel Corporation; or equal, and of the types necessary to suit job conditions
- I. Fabricate dryer vent hoods at exterior walls of aluminum clear and painted to match adjacent walls or stainless steel and provided with rainhood and self closing flap, and interior and exterior escutcheon plates

2.9 FABRICATED SHEET METAL WORK

- A. Construct scuppers in walls of 0.040-inch aluminum similar to design shown on ASMM Figure 1-26 with all joints welded. Provide scuppers through top course without head similar to ASMM Figure 1-28
- B. Design stamped sheet metal vents or louver-type vents, where indicated, to provide watertight flush corners and of the size shown. Equip each vent with 1/4-inch square aluminum mesh hardware cloth insect screen. Make stamped metal items of prefinished white-coated aluminum sheet metal. Field-paint stamp vents after installation to match color of adjacent surface
- C. Design downspouts with conductor head 1/2-inch below gutter or scupper and hangers similar to design shown on ASMM Figures 1-32, 1-25, 1-35B, or 1-35D. Construct downspout and conductor head of 1/16-inch aluminum with all joints welded except joint between head outlet pipe and downspout. Provide connectors as per Figure 1-33B, details 1 and 2, with funnel, Figure E (if possible), and with joint between gutter and outlet welded

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- D. Provide metal vent screeds as plaster channel screeds PCS-V-300 as manufactured by Fry Reglet Corp., H.K. Porter Co., Inc.; or equal. Provide screeds of extruded aluminum with color as designated by ENGINEER. Do not miter corners
- E. Provide wall louvers in accordance with Section 08 91 00 - Louvers and Vents
- F. Provide roof penetration sheet metal WORK items coordinated with the roofing system. Provide the design and details conforming to the Reference Standards unless otherwise indicated
- G. Provide roof penetrations with the following flashing:
 - 1. Vent pipes: Lead collars vent pipe flashing with top of lead sleeve flashing bent into vent pipe. Reference ASMM Figures 4-14 and 4-19
 - 2. Single pipes: Sheet metal or lead collars with sheet metal or lead draw band with sealant or cap top. Reference ASMM Figures 4-14 and 4-19
 - 3. Multi-pipes: Lead collar with cap. Reference Stoneman Engineering and Mfg. Co.
 - 4. Multi-pipes w/curb: Sheet metal with sealant and draw bands. Reference ASMM Figure 4-13B or 4-14A
 - 5. Equipment support: Sheet metal. Reference ASMM Figure 4-15 and 4-16
 - 6. Sleeper covers: Sheet metal. Reference ASMM Figure 4-6D
 - 7. Pitch pockets for supports: Sheet metal with all joints welded or soldered. Reference ASMM Figure 4-16E
 - 8. Ventilators with curb (Note 1): Sheet metal. Reference ASMM Figure 8-1
 - 9. Equipment platform for Equipment: Sheet metal deck similar. Reference ASMM Figure 8-6B with prefabricated roof curbs as specified in Section entitled Roof Accessories
 - a. Provide prefabricated products, curbs, supports, and platforms which are part of mechanical equipment and skylights and are the WORK of other Sections, in compliance with those specifications

PART 3 - EXECUTION

3.1 DELIVERY

- A. See 01 73 19 – Equipment Installation and Operational Testing

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- B. Deliver materials to Site in manufacturer's original, unopened packages or bundles with labels intact and clearly identifying products
- C. Store all materials carefully in accordance with the manufacturer's instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the products

3.2 GENERAL

- A. Coordinate the flashing necessary with the different trades to make sure all items which penetrate the roof are provided with all necessary sheet metal items and WORK, such as pipes, ducts, support racks, equipment platforms or sleepers, and supports. Provide sheet metal shop manufactured curbs, equipment supports, and equipment platforms where prefabricated curbs, supports, or platforms are not required to be provided under other Sections
- B. Provide and install all WORK conforming to Reference Standards. Coordinate flashing WORK with roofing WORK. Have sheet metal and roofing provide a weather-tight and watertight assembly
- C. Have sheet metal WORK accurately formed to dimensions and shapes indicated. Fit WORK snugly, with straight, true lines with exposed faces aligned in proper plane, free from waves and buckles. Have arises and angles with true and sharp lines, and surfaces free from waves and buckles. Have exposed edges hemmed. Have holes for fasteners within sheet metal WORK exposed to temperature changes as elongated holes for material expansion and movement
- D. Furnish sheet metal WORK complete with supports, hangers, bracing, anchors, and other devices as required for reinforcement and proper attachment to adjacent construction. Have fastenings concealed wherever possible. Size and locate joints, fastenings, reinforcements, and supports as required to preclude distortion or displacement due to thermal expansion and contraction
- E. Have surfaces upon which sheet metal is to be placed dry, smooth, even, and free of any projections and hollows. Have sheet metal laid with all joints true and even and firmly attached with all fastener heads flush with the top surface
- F. Have the underlayment overlapped at least 2-inches so as to shed water and secured along the lapped edges. Use aluminum or stainless steel fasteners with aluminum sheet metal
- G. Isolate dissimilar materials with 2 coats of asphaltic paint, asphaltic coating compound, or sealer tape. Use only stainless steel fasteners to connect isolated dissimilar metals
- H. Size and space joints to permit sheet movement for thermal expansion and contraction of 1/4-inch per 10-ft length, on 100 degree F temperature difference. Have holes for fasteners or anchors elongated to provide for movement

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- I. Build roofing sheet metal items into the roofing in strict accordance with directions of roofing manufacturer

3.3 INSTALLATION

- A. Provide gutters with baffle-type expansion joint with expansion cap over 1-1/2 inch baffle flange at 40-ft centers. Allow a one-inch gap between the baffles
- B. Install flashing at vertical surfaces at intersections of roof with vertical surfaces and at projections through roof. Provide corner units factory-fabricated and mitered soldered or welded corner joints, and installed with 3-inch (min) lap joint over flashing on each side
- C. Provide gutters to indicated cross-section, complete with shop-fabricated corners, nipple (outlet) sections, joining plates, concealed hangers and downspouts with standoff brackets
- D. Provide gravel stops and copings with joints at 10-ft (max) spacing and at 2-1/2 feet from corners. Provide joints butted with 3/16-inch space centered over matching 8-inch long backing plate with sealer tape in laps. Have corner units welded or soldered units. Provide joints with cover plates
- E. Set flanges of sheet metal items on continuous sealer tape on top edge envelope ply of roofing. Have flanges nailed through sealer tape at 3-inch (max) spacing or securely fastened per Reference Standards
- F. Set stainless steel wainscots in waterproof adhesive. Have bottom of wainscot surface screwed into blocking with stainless steel countersunk flat head screws. Have top and sides concealed hemmed edge and concealed cleat fastened. Do not paint stainless steel wainscots.

3.4 PROTECTIVE COATING

- A. Provide protective coating, per Section 09 96 00 - Protective Coatings, on all installed visible sheet metal products that are not provided with pre-finish coating system. Provide color matching the adjacent surface materials color. Obtain final color approval from the DESIGN-BUILDER prior to finish coat application. Colors may vary for each adjacent material

END OF SECTION

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**SECTION 08 63 00 –
SKYLIGHT SYSTEM****PART 1 -- GENERAL****1.1 SCOPE**

1. Section includes the skylight system as shown and specified. Provide and install:
2. Aluminum angles and box beams for attachment
3. Factory prefabricated structural insulated translucent sandwich panels
4. Aluminum installation system with exterior accessible anchor bolts

B. Work includes:

1. Design
2. Coordination with DESIGN-BUILDER for standard product adjustments
3. Submittals
4. Special tools and maintenance equipment
5. Shop fabrication and testing
6. Delivery to SFPUC Treasure Island WRRF
7. Delivery inspection
8. Installation verification
9. Warranty

1.2 REFERENCE SPECIFICATIONS

- A. Use this Section with the Contract Documents and following other Sections to establish the total requirements
 1. 01 33 00 – Submittals
 2. 01 78 36 – Warranties

1.3 APPLICABLE CODES AND STANDARDS

- A. Where reference is made to any of the below, the revision in effect at the time of bid opening applies

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B. American Architectural Manufacturer's Association (AAMA):

AAMA 1503 Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections

C. American Society for Testing and Materials (ASTM):

ASTM C297 Sandwich Construction Tensile Testing

ASTM D1002 Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading

ASTM D1037 Wood-Base Fiber and Particle Panel Strength Testing

ASTM D2244 Test Method for Calculating Color Differences

ASTM D635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position

ASTM E108 Fire Tests of Roof Coverings

ASTM E1886 Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missiles(s) and Exposed Cyclic Pressure Differentials

ASTM E661 Standard Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads

ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction

D. National Fenestration Rating Council (NFRC):

NFRC 100 Procedure for Determining Fenestration Product U-Factors

NFRC 700 Procedure for Certification of Products

E. Underwriter's Laboratories (UL):

UL 723 Standard for Test for Surface Burning Characteristics of Building Materials

UL 790 Standard for Test Methods for Fire Tests of Roof Coverings

1.4 SUBMITTALS

A. See 01 33 00 – Submittals.

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B. Additional Submittals

1. Submit manufacturer's product data. Include construction details, material descriptions, profiles, finishes of components and maintenance manuals
2. Submit shop drawings. Include plans, elevations, and details
3. Submit complete structural calculations and details in accordance with Section 01 33 17 – Structural Design, Support and Anchorage
4. Submit manufacturer's color charts showing the full range of colors available for factory finished aluminum
 - a. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected
 - 1) Sandwich panels: 14"x28" units
 - 2) Factory finished aluminum: 5" long sections
5. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
6. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.
 - 1) Reports required (if applicable) are:
 - a) International Building Code Evaluation Report (AC 177)
 - b) Flame Spread and Smoke Developed (UL 723) – Submit UL Card
 - c) Burn Extent (ASTM D635)
 - d) Color Difference (ASTM D2244)
 - e) Impact Strength (UL972)
 - f) Bond Tensile Strength (ASTM C297 after aging by ASTM D1037)
 - g) Bond Shear Strength (ASTM D1002)
 - h) Beam Bending Strength (ASTM E72)

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- i) Insulation U-Factor (NFRC 100)
- j) NFRC System U-Factor Certification (NFRC 700)
- k) Solar Heat Gain Coefficient (NFRC or Calculations)
- l) Condensation Resistance Factor (AAMA 1503) (Thermally Broken only)
- m) 1200°F Fire Resistance (SWRI)
- n) ASTM E1886/1996 or TAS 201, 202 and 203 (Optional-Windborne Debris)
- o) Fall Through Resistance (ASTM E661)
- p) Class A Roof Covering Burning Brand (ASTM E108)
- q) UL Listed Class A Roof System (UL 790) – Submit UL Card

1.5 QUALITY ASSURANCE

- A. Follow approved Quality Assurance/Quality Control Program
- B. Designate a project manager for the duration of the project to coordinate with the DESIGN-BUILDER
- C. Manufacturer's Qualifications:
 - 1. Provide material and products manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope, and location. Provide at least three of the projects in successful use for ten years or longer
 - 2. Provide panel system listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency
 - 3. Conduct quality control inspections at least once each year, including manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES
 - a. Installer's Qualifications: Provide installation of system by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope, and type

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D. WARRANTY

1. Provide manufacturer's and installer's written warranty agreeing to repair or replace skylight system work, which fails in materials or workmanship within **two years** from the date of **Substantial Completion**. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. See 01 73 19 – Equipment Installation and Operational Testing
- B. Deliver skylight system, components, and materials in manufacturer's standard protective packaging
- C. Store skylight system panels on the long edge, several inches above the ground, blocked and under cover to prevent warping in accordance with manufacturer's storage and handling instructions

PART 2 -- PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. The manufacturer shall be responsible for the configuration and fabrication of the complete skylight system, including box beams for attachment at **prefabricated curb**.
 1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Structural Loads: Provide skylight system capable of handling the loads as set forth in the Structural Drawings and Section 01 33 17, including Dead Load, Roof Live Load, Wind Load, and Seismic Loads.
 3. Deflection Limits:
 - a. Skylight Panels: Limited to L/60.
 4. Description: Skylight System
 - a. Nominal Sizes: **4'-0" x 10'-0"**
- B. Face Sheets:
 1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
 2. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.

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3. Face sheets shall not deform, deflect, or drip when subjected to fire or flame.
4. Interior face sheets:
 - a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 25 and smoke developed no greater than 250 when tested in accordance with UL 723.
 - b. Burn extent by ASTM D 635 shall be no greater than 1".
 - 1) Exterior face sheets:
 - c. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
 - d. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
 - e. Erosion Protection: Integral, embedded-glass erosion barrier.
 - 1) Appearance:
 - a) Exterior face sheet: Smooth, .070" thick and White in color.
 - b) Interior face sheet: Smooth, .045" thick and Crystal in color.
 - c) Face sheets shall not vary more than $\pm 10\%$ in thickness and be uniform in color.
 - f. Grid Core:
 - 1) Thermally broken composite I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
 - 2) I-beam Thermal break: Minimum 1", thermoset fiberglass composite.
 - g. Laminate Adhesive:
 - 1) Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".

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- 2) Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
- 3) Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
 - a) 50% Relative Humidity at 68° F: 540 PSI
 - b) 182° F: 100 PSI
 - c) Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
 - d) Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.2 PANEL CONSTRUCTION

- A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
 1. Thickness: 2-3/4"
 2. Light transmission: 20%
 3. Solar heat gain coefficient: .28
 4. Panel U-factor by NFRC certified laboratory: .23
 5. Grid pattern: Nominal size 12" x 24"; pattern Shoji
 - a. Standard panels shall deflect no more than 1.9" at 30 PSF in 10'-0" span without a supporting frame by ASTM E 72.
 - b. Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.
 - c. Thermally broken panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.
 - d. Skylight System:
 - 1) Skylight system shall pass Class A Roof Burning Brand Test by ASTM E 108.
 - 2) Roof system shall be UL listed as a Class A Roof by UL 790, which requires periodic unannounced factory inspections and retesting by Underwriters Laboratories.

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- e. Skylight system shall meet the fall through requirements of OSHA 1910.23 as demonstrated by testing in accordance with ASTM E 661, thereby not requiring supplemental screens or railings.

2.3 BATTENS AND PERIMETER CLOSURE SYSTEM

- A. Closure system: Extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
- B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
- C. Fasteners: Various series stainless steel screws for aluminum closures, excluding final fasteners to the building.
- D. Finish: Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards.

2.4 MANUFACTURER

- A. The basis for this specification is for products manufactured by Kalwall. Other manufacturers may bid this project provided they comply with all the performance requirements of this specification and submit evidence thereof. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein.
- B. Kalwall represented locally by Collier Building Specialties.

PART 3 -- EXECUTION

3.1 EXAMINATION

- A. Installer shall examine substrates, supporting structure and installation conditions.
- B. Do not proceed with structural skylight installation until unsatisfactory conditions have been corrected by the general contractor.

3.2 PREPARATION

- A. Metal Protection:
 - 1. The general contractor shall prepare foundations, curbs, footings and/or lintels isolating dissimilar materials from aluminum system, which may cause electrolysis.
 - 2. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

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3. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.
 - a. The general contractor shall install curbs designed to withstand the thrust generated by the skylight.
 - b. The general contractor shall provide temporary enclosures required.

3.3 INSTALLATION

- A. Install the skylight system in accordance with the manufacturer's installation recommendations and approved shop drawings.
 1. Anchor component parts securely in place by permanent mechanical attachment system.
 2. Accommodate thermal and mechanical movements.
- B. After other trades have completed work on adjacent material, carefully inspect translucent panel installation and make adjustments necessary to ensure proper installation.

3.4 FIELD QUALITY CONTROL

- A. Water Test: Installer to test skylights according to procedures in AAMA 501.2.
- B. Repair or replace work that does not pass testing or that is damaged by testing and retest work.

3.5 CLEANING

- A. Clean the skylight system immediately after installation.
- B. Refer to manufacturer's written recommendations.

END OF SECTION

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**SECTION 09 65 00
RESILIENT FLOORING****PART 1 - GENERAL**

1.1 SCOPE

- A. Provide resilient flooring, complete and in place, in accordance with the Contract Documents
- B. Work includes:
 - 1. Design
 - 2. Coordination with DESIGN-BUILDER for standard product adjustments
 - 3. Submittals
 - 4. Special tools and maintenance equipment
 - 5. Shop fabrication and testing
 - 6. Delivery to SFPUC Treasure Island WRRF
 - 7. Delivery inspection
 - 8. Installation verification
 - 9. Warranty

1.2 REFERENCE SPECIFICATIONS

- A. Use this Section with the Contract Documents and following other Sections to establish the total requirements
 - 1. 01 33 00 – Submittals
 - 2. 01 78 36 – Warranties

1.3 APPLICABLE CODES, AND STANDARDS

Americans with Disabilities Act (ADA)

ADAAG

Americans with Disabilities Accessibility Guidelines

ASTM International (ASTM)

ASTM E 84

Standard Test Method for Surface Burning Characteristics of Building Materials

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ASTM E 648	Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F 710	Standard Practice for Preparing Concrete Floor Slabs to Receive Resilient Flooring
ASTM F 970	Standard Test Method for Static Load Limit
ASTM F 1066	Vinyl Composition Floor Tile
ASTM F 1861	
ASTM F 1869	
ASTM F 2170	Standard Test Method for Determining Relative Humidity in Concrete Slabs using In Situ Probes

Building Code

Refer to the Drawings to determine which building code applies. The applicable building code, defined by the Drawings, is referred to herein as “the Code”.

Green Seal Standards

GS-36 - Standard for Commercial Adhesives, July 12, 2013

National Fire Protection Agency (NFPA)

NFPA 258 Standard Research Test Method for Determining Smoke Generation of Solid Materials

South Coast Air Quality Management District (SCAQMD)

SCAQMD Rule No. 1168

1.4 SUPPLIER SUBMITTALS

- A. See Section 01 33 00 – Submittals
- B. Additional Submittals

1. Product Data:

1. Manufacturer’s specifications, technical data, installation methods, and maintenance instructions, and the following:

1. Tile Manufacturer’s standard color and pattern charts for color selection by the Owner.

2. Base Manufacturer’s standard color charts for color selection by The City

3. Edging Manufacturer’s standard color charts for color selection by the City

2. Certificates:

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1. Certification by the base and tile Manufacturer that the base materials provided are suitable for, and compatible with, the required installation
 2. Certification by the base and tile Manufacturer that the products supplied are compatible with the adhesives, primers, patching and leveling compounds, fillers, and surfacers required
 3. Certification by the base Manufacturer that the products conform to ASTM F 1861, Type TP, Group 1 (solid) or Group 2 (layered)
 4. Certification from the tile Manufacturer that the polish is suitable for, and compatible with, the tile.
 5. Certification that the tile has been tested by an independent laboratory and complies with ASTM E 648/NFPA 253 and ASTM E 662/NFPA 258.
 6. Certification by the tile Manufacturer that provided the products conform to ASTM F 1066, Class II, Through Pattern.
 7. Certification by the base Manufacturer that the products conform to ASTM E 84, Class C
 8. Independent certification that the products comply with the VOC limits and VOC performance criteria indicated
 9. Certification of Manufacturer qualifications demonstrating compliance with the qualification requirements indicated. Include a list of five (5) similar completed projects with addresses of the project location, date of project completion, Manufacturer's products, and contact information of the consultant firm of record, general contractor and owner
 10. Certification of installer qualifications demonstrating compliance with the qualifications requirements indicated. Include a list of five (5) similar completed projects with addresses of the project location, date of project completion, and contact information of the consultant firm of record, general contractor and owner
 11. Certification that the required substrate tests have been performed, and that the substrates are suitable for the installation
3. Shop Drawings:
1. Complete shop drawings showing location and detail of installation
 2. Tile and base layout and control joint locations and details
 3. Base details, utilizing maximum base length dimensions as possible

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4. Samples:

1. Submit 2 samples of each of the following. Unless otherwise indicated, provide full size samples showing gauges, configuration, construction, finish, and color proposed for the various components. Clearly mark samples to show the Manufacturer's name, product identification, finish, and color. Resubmit new samples of each, as required, until approved by the DESIGN-BUILDER. Upon approval, the samples become the standard for acceptance for the project regarding color, finish, and quality of each item. Approval of samples does not relieve the SUPPLIER from compliance with the Contract Documents
2. 8-inch (203 mm) long sample of each resilient base type, and color to be provided
3. 8-in by 8-in of each vinyl composition tile type, color, and pattern to be provided.

5. Closeout Submittal

1. Warranty:

1. Submit a copy of the warranty

1.5 QUALITY ASSURANCE

- A. Follow approved Quality Assurance/Quality Control Program
- B. Designate a project manager for the duration of the project to coordinate with the DESIGN-BUILDER
- C. Single Source Responsibility:
 1. Provide resilient base by a single Manufacturer
 2. Provide tile by a single Manufacturer
 3. Provide adhesives, primers, patching and leveling compounds, fillers and surfacers by a single Manufacturer, each
- D. Qualifications:
 1. Manufacturers:
 1. Tile Manufacturer shall have a minimum of 15 years of vinyl composition tile manufacturing experience.

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2. Use a base Manufacturer with a minimum of fifteen (15) years of base manufacturing experience
 3. A minimum of five (5) similar successful projects over the most recent 10 years, employing similar products, materials, applications, and performance requirements
 4. Manufacturers without these qualifications are not accepted
2. Installers:
1. A minimum of five (5) years' experience in the successful completion of at least five (5) projects of similar size and scope, employing similar products, materials, applications, and performance requirements
 2. Use an installer that is trained, authorized, and approved by the Manufacturer to install the Manufacturer's product
 3. Installers without these qualifications are not accepted

E. WARRANTY

1. Manufacturer Warranty

1. Furnish Manufacturer's two (2) year written warranty after Substantial Completion to cover defects in materials, products, and manufacturing workmanship
2. The term of the warranty begins on the date of Substantial Completion

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. See 01 73 19 – Equipment Installation and Operational Testing

PART 2 - PRODUCTS

2.1 GENERAL

- A. Design Requirements:

1. Coordinate color samples with other Sections through the submittal process

2.2 VINYL COMPOSITION TILE

- A. Manufacturer and Product, or Equal:

1. Subject to the requirements indicated, provide products from one of the Manufacturer's listed below, or equal

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2. Armstrong; Imperial Texture, Standard Excelon.

3. Mannington; Designer Essentials.

B. Description:

1. Tile shall be composed of polyvinyl chloride resin binder, plasticizers, fillers, and pigments with colors and texture dispersed uniformly through its thickness.

2. Tile shall have an overall thickness of 0.125-in nominal, and shall be 12-in by 12-in nominal size.

3. Coefficient of Friction (COF) ASTM C 1028 shall be greater than or equal 0.60, per ADAAG and ATBCB.

4. Tile shall be SCS/RFCI FloorScore Certified for low VOC's.

C. Performance Standards:

ASTM E 648/NFPA 253	Greater than or equal to 0.45 watts/sq cm, Passes Class I
ASTM E 662/NFPA 258	Less than 450-passes
ASTM F 970	Static Load Limit, 125 psi
ASTM F 1066	Class II, Through pattern, asbestos-free

2.3 RESILIENT BASE

A. Manufacturer and Product

1. Subject to the requirements indicated, provide products from one of the Manufacturer's listed below, or equal

1. Armstrong; Color-Integrated Wall Base
2. Johnsonite; Traditional Rubber Wall Base
3. Roppe; 700 Series Wall Base
4. Approved Equal

B. Description:

1. Provide base Type TP thermoplastic extruded resilient, smooth and free from imperfections

2. Unless otherwise indicated, provide base as 1/8-inch (3.2 mm) thick by 4-inches (102 mm) high, matte finish

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3. Profile: Style B (Cove), unless otherwise indicated
4. Performance Standards:

ASTM E 84	Flame Spread 150, Class C
ASTM E 648/NFPA 253	Greater than or equal to 0.45 watts/sq cm, Passes Class I
ASTM E 662/NFPA 258	Less than 450 – passes
ASTM F 1861	Type TP, Group 1 or Group 2

5. Provide in rolls to be cut in required lengths
6. Provide standard inside and outside preformed corners with base system

2.4 EDGING

- A. Provide edging complying with the performance standards for resilient base as indicated above
- B. Provide edging 1-inch (25 mm) minimum width homogeneous resilient
- C. Install edging at the juncture between exposed concrete floors and any other type of flooring

2.5 COLORS AND PATTERNS

- A. Have color of base and edging selected and approved by The City from the Manufacturer's full color range

1. Tentative color selection:

1. Tile – Provide for 3 different tile colors to be selected.

2. Base – To Be Selected

3. Edging – To Be Selected

2. The City reserves the option of changing this tentative color selection during the submittal process

3. Final colors, pattern, and appearance are selected and approved by The City prior to installation

2.6 ADHESIVES, SEALANTS, AND SEALANT PRIMERS

- A. Subject to the requirements herein, provide adhesives, sealants, and sealant primers as recommended by the base Manufacturer, respectively, as applicable to the project conditions

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- B. Use adhesives, sealants, and sealant primers of low VOC per SCAQMD Rule No. 1168
 - C. Use adhesives, sealants, and sealant primers resistant to alkalis and moisture and capable of securely holding the materials in place, sealing and bonding the joints
 - D. Use aerosol adhesives complying with GS-36 VOC limits
- 2.7 PATCHING AND LEVELING COMPOUNDS, FILLERS, AND SURFACERS
- A. Provide floor surface preparation materials as recommended by the Manufacturer as applicable to the project conditions
 - B. Use floor surface preparation materials of low VOC per SCAQMD Rule No. 1168

2.8 POLISH

Floor polish shall be suitable for, and compatible with, the tile, as recommended by the tile Manufacturer.

Floor polish shall be low VOC per SCAQMD Rule No. 1168.

2.9 EXTRA MATERIALS

- A. Provide a 5 percent overage of calculated coverage for each type of tile and six 4-foot (1.2 m) lengths of resilient base being furnished for the Work for future maintenance and replacement, separately packaged, identified, and left with The City
- B. Provide extra materials from the same production run as the materials installed

PART 3 - EXECUTION

3.1 DELIVERY

- A. See 01 73 19 – Equipment Installation and Operational Testing
- B. Deliver materials to Site in Manufacturer's original, unopened packages, containers, or bundles with labels intact, which clearly identify contents
- C. Store materials carefully in accordance with the Manufacturer's written instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the products
- D. Handle materials in strict accordance with Manufacturer's written instructions

3.2 INSPECTION

- A. The SUPPLIER is totally responsible for the proper performance and completion of the Work under this Section

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- B. Inspect systems and components before installation
 - 1. Reject and mark damaged or defective items as such and remove them from the Site
 - 2. Reject exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discoloration, or other surface imperfections on the finished units
- C. Verify dimensions, tolerances, and method of attachment with adjacent Work
 - 1. Examine substrates, areas, and conditions where base, and edging is installed for compliance with requirements for installation, considering tolerances, and other conditions affecting performance of installed base, and edging
 - 1. Provide substrates for setting base, firm, sound, dimensionally stable, dry, clean, free from oil, waxy films, curing compounds, and other foreign substances, and within flatness tolerances required by the Manufacturer, or by the referenced standards, whichever is more stringent applies
 - 2. Notify the DESIGN-BUILDER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in an acceptable manner
 - 3. Commencement of the installation by the SUPPLIER indicates SUPPLIER's acceptance of the substrate, areas, and conditions

3.3 PROJECT CONDITIONS

- A. Comply with Manufacturer's written instructions for environmental conditions before, during, and after application
- B. Do not install when the building is excessively cold and damp, or hot and dry. Maintain temperature and humidity conditions closely approximating the interior conditions that will exist when the building is occupied, before, during, and after installation
 - 1. Have all windows, glazing, doors, roofing, and other waterproofing and weatherproofing cladding systems of the building shell in place and complete
- C. Do not apply flooring materials until the Work of other trades, including painting, has been completed
 - 1. Exceptions include furniture, equipment, and moveable partitions
- D. Allow base to reach room temperature or minimum temperature recommended by Manufacturer before beginning installation
- E. Protect adhesives from freezing. Follow Manufacturer's recommendations for minimum temperatures to which adhesives are exposed

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- F. Protect surrounding Work from damage that may result from operations under this Section

3.4 SURFACE PREPARATION

- A. Provide surface preparation in compliance with ASTM F 710, and with the Manufacturer's written instructions
- B. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone, that are incompatible with flooring materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush
- C. Remove protrusions, bumps, ridges, and loose substrate surface materials by sanding or grinding
- D. Trowelable leveling and patching compounds shall be used per tile Manufacturer's written instructions to fill cracks, holes, and depressions.
- E. Immediately before application of base materials, scrape surfaces to be covered free from foreign materials and brush clean
- F. Sweep substrate to remove all loose materials prior to beginning base installation

3.5 INSTALLATION

- A. Installation shall comply with the requirements of the Contract Documents, with the requirements of the Code, with ADAAG, with applicable references, and with Manufacturer's written instructions. Where a conflict occurs among these requirements, the more stringent applies as directed by the DESIGN-BUILDER
- B. Sequence installation properly with the installation and protection of other Work, so that neither is damaged by the installation of the other

C. Vinyl Composition Tile Installation:

1. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Broken, cracked, chipped, or deformed tiles will not be accepted.
2. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room is of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile adjacent to room perimeters as applicable. Lay tile in grid pattern square to room axis. Fit tile tightly to walls and doorframes getting edge of tile to back of racked joint in masonry walls.
3. Install tile wall-to-wall before the installation of furniture, equipment, and moveable partitions.

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4. Extend tile into toe spaces, door recesses, closets, and similar openings as indicated or as required.
5. Scribe, cut, and fit tile neatly around permanent fixtures, including but not limited to, columns, walls, partitions, pipes, outlets, built-in furniture and casework.

D. Resilient Base Installation:

1. Apply adhesive in a thin but thorough covering coat in accordance with the Manufacturer's instructions
2. Cut materials to proper size and press firmly into adhesive over full contact area. Fit closely at joints and abutting surfaces. At doors, stop base at outside edge of reveal in doorframe and cut at 45 degrees to corner of masonry adjoining frame
3. Apply base in long lengths with joints at corners only. Upon completion have the bottom edge in firm contact with the finished floor
4. For sealing joints between top of the wall base and irregular wall surfaces, such as masonry or similar, provide plastic filler applied according to the Manufacturer's written instructions

- E. Upon completion, have base, and appurtenances form a smooth, firm flat plane free from waves, buckles, cracks, breaks, bumps, and projecting edges

3.6 CLEANING, FINISHING, AND PROTECTION

- A. Do not use adhesive papers used for masking which become firmly bonded when exposed to heat and/or light
1. Remove masking film and temporary labels as soon as possible after installation. Film and labels left in place after installation are the responsibility of the SUPPLIER
 2. Do not leave residue on any surfaces
- B. Upon completion of the installation, clean base, and appurtenances of dirt, adhesives, and other foreign matter to the satisfaction of the DESIGN-BUILDER
1. Perform cleaning again immediately prior to acceptance of the Work, when directed by the DESIGN-BUILDER
 2. Perform cleaning in accordance with the Manufacturer's written instructions
- C. Apply polish in accordance with Manufacturer's written instructions
- D. Protect base from damage from subsequent construction operations

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1. Protect the Work at all times and arrange for the closing off of traffic and other Work when this is necessary to avoid damage to finished surfaces
- E. Remove scratches and blemishes to the satisfaction of the DESIGN-BUILDER
- F. Remove and replace damaged or defective items as determined by DESIGN-BUILDER
- G. When base Work is completed, remove unused materials, containers, and equipment, and clean the Site of base debris

END OF SECTION

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**SECTION 10 14 00
BUILDING SIGNAGE****PART 1 -- GENERAL**

1.1 SCOPE

- A. Provide building signage and appurtenant Work, complete and in place, in accordance with the Contract Documents
- B. Work includes:
 - 1. Design
 - 2. Coordination with DESIGN-BUILDER for standard product adjustments
 - 3. Submittals
 - 4. Shop fabrication
 - 5. Delivery to SFPUC Treasure Island WRRF
 - 6. Delivery inspection
 - 7. Installation verification
 - 8. Warranty

1.2 REFERENCE SPECIFICATIONS

- A. Use this Section with the Contract Documents and following other Sections to establish the total requirements
 - 1. 01 33 00 – Submittals
 - 2. 01 42 00 – Reference Standards
 - 3. 01 61 20 – Identification Systems
 - 4. 01 78 36 – Warranties

1.3 APPLICABLE CODES AND STANDARDS

- A. Americans with Disabilities Act (ADA): ADA Accessibility Guidelines (ADAAG).
- B. Building Code: Refer to the Drawings to determine which Building Code applies.
- C. National Fire Protection Association (NFPA):

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1. NFPA 704 Identification of the Hazards of Materials for Emergency Response
 - D. Occupational Safety and Health Administration (OSHA).
- 1.4 SUPPLIER SUBMITTALS
- A. See Section 01 33 00 – Submittals.
 - B. Additional Submittals
 1. Literature: Manufacturer’s specifications, technical data, installation methods, and maintenance instructions, and the following:
 - a. Manufacturer’s full range color charts, indicating custom color availability for color selection by The City.
 2. Certifications:
 - a. Certification by the building signage Manufacturer that the building signage provided is suitable for, and compatible with, the required installation.
 - b. Certification by the building signage Manufacturer that the building signage provided is suitable for, and compatible with, the substrates and surfaces indicated.
 - c. Certification of Manufacturer qualifications demonstrating compliance with the qualification requirements indicated.
 3. Samples: Submit 2 samples of each of the following. Submit full size and show gauges, configuration, construction, finish, and color proposed for the various components.
 - a. Full-size sample of each typical building signage type.
- 1.5 QUALITY ASSURANCE
- A. Follow approved Quality Assurance/Quality Control Program
 - B. Designate a project manager for the duration of the project to coordinate with the DESIGN-BUILDER
 - C. SPECIAL WARRANTY PROVISIONS
 1. Furnish Manufacturer’s written warranty to cover defects in materials, products, and manufacturing workmanship. Reference the contract for the specific warranty period.
 - a. Include coverage against chipping, fading, rusting, shattering, or peeling.

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2. Non-prorated warranty for the entire warranty period.
3. The term of the warranties begins on the date of Substantial Completion. Reference the contract for the specific warranty period.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. See 01 73 19 – Equipment Installation and Operational Testing

PART 2 -- PRODUCTS

2.1 GENERAL

- A. Provide building signage:
 1. Recommended by the Manufacturer for the installation indicated.
 2. Suitable for, and compatible with, the required installation.
 3. Suitable for, and compatible with, the substrates and surfaces indicated.

2.2 INTERIOR SIGNAGE

- A. Provide etched plaque signs for interior rooms, wayfinding and informational of signetch I series by asi-signage or approved equal.
 1. Provide signs consisting of raised braille characters and conform to ADAAG.
 2. Provide signs with 8-inch (203 mm) by 8-inch (203 mm) by 0.125-inches (3.2 mm) aluminum with brushed square edges. Finish raised surfaces with a brushed finish and paint recessed surfaces black, or color as selected by The City. Provide signs with a topcoat of urethane spray containing UV inhibitors and antioxidant compounds and rated for interior and exterior use.
 3. Lettering: Helvetica Medium in both upper and lower case, as specified and scheduled.
 4. Provide signs mounted as scheduled, as recommended in writing by the Manufacturer.

2.3 MEN'S AND WOMEN'S RESTROOM SIGNS

- A. Provide etched plaque signs for men's and women's restroom signs of SignEtch I Series by ASI-Signage or approved equal.
 1. Provide signs consisting of raised braille characters and conform to ADAAG.

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2. Provide signs with 8-inch (203 mm) by 8-inch (203 mm) by 0.125-inches (3.2 mm) aluminum with brushed square edges. Finish raised surfaces with a brushed finish and paint recessed surfaces black, or color as selected by The City. Provide signs with a topcoat of urethane spray containing UV inhibitors and antioxidant compounds and rated for interior and exterior use.
3. Lettering: Helvetica Medium in both upper and lower case, as specified and scheduled.
4. Provide signs mounted as scheduled, as recommended in writing by the Manufacturer.

2.4 RESTRICTIVE/CAUTION SIGNS

- A. Provide signs SetonUltraTuff by Seton, Branford, Connecticut, or approved equal.
- B. Provide sign constructed of a printed polyester film permanently bonded to a rigid fiberglass panel and over-laminated with Tedlar by Seton, or approved equal, and a total thickness of 0.11-inch (2.8 mm) minimum.
- C. Provide signs 14-inches (356 mm) wide by 10-inches (254 mm) tall in rounded corners. Provide color of signs and letters in accordance with OSHA standards. All other aspects of the Restrictive/Caution Signs to be in accordance with OSHA standards. If OSHA standards do not apply, use the color red with white letters, 1-inch (25 mm) high.
- D. Wall and door surface mount signs per Manufacturer standard. Mount signs as scheduled, as recommended in writing by the Manufacturer.
- E. Adjust sign sizes to suit the number of letters in each sign with a 1 1/2-inch (38.1 mm) minimum border all around. Two lines are permitted. Center-justify the letters.

2.5 HAZARD IDENTIFICATION SYSTEM

- A. Manufacture systems by Seton, Branford, Connecticut, or approved equal.
 1. Conform to NFPA 704.
 2. Use a diamond-shaped symbol divided into four smaller diamonds.
 - a. Health hazard diamond (left): blue background with a rating number in contrasting color.
 - b. Flammability hazard diamond (top): red background with a rating number in contrasting color.
 - c. Instability hazard diamond (right): yellow background with a rating number in contrasting color.

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- d. Special hazard diamond (bottom): white background with a rating number in contrasting color.
3. Colors used for the diamonds are to provide an adequate contrast so that the rating numbers are easily identified.
4. Provide high performances plastic signs for signs mounted on walls and doors.
5. Signs adhered to drums and containers to be vinyl.
6. Unless otherwise noted, provide exterior signs with a minimum of 15-inches (381 mm) by 15-inches (381 mm) and interior signs of minimum of 10-inches (254 mm) by 10-inches (254 mm)

2.6 BUILDING SIGNS

A. Manufacturer and Product, or Equal:

1. Subject to the requirements indicated, provide Manufacturer and product listed below, or equal.
 - a. Seton Identification Products; Fiberglass, Style No. M0027.

B. Description:

1. Provide signs with high performance fiberglass, constructed of a printed polyester film permanently bonded to a rigid fiberglass panel and over-laminated with a total thickness of 0.10-inch (2.5 mm) minimum.
2. Suitable for interior or exterior use, and resist UV light, dirt, and harsh chemicals.
3. Provide signs 14-inches (355 mm) wide by 10-inches (250 mm) tall with rounded corners. Provide colors, letters, and other aspects in accordance with OSHA standards.
4. Adjust signs to suit the number of letters in each sign with a 1 1/2- inch (38 mm) minimum border. Two lines are permitted. Left justify letters.

PART 3 -- EXECUTION

3.1 DELIVERY

- A. Confirm condition of equipment with DESIGN-BUILDER when delivered to site
- B. Repair or return any damaged goods to the satisfaction of the DESIGN-BUILDER

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3.2 LOCATIONS

- A. Install signage at the locations indicated or as otherwise required by the CODE, ADAAG, NFPA 704, and OSHA.
- B. Mount 60-inches (1520-millimeters) above the floor, unless otherwise indicated.

3.3 INSTALLATION

- A. Confirm installation is in accordance with the installation instructions
- B. Provide a written report describing observations of any installation deficiencies

3.4 RESTROOM AND INTERIOR SIGN SCHEDULE

Quantity	Sign Wording	Location
2	Men's Restroom	Admin building Area 930
2	Women's Restroom	Admin Building Area 930
1	Gender Neutral Locker and Restroom	Admin Building Area 930
2	Men's Locker Room	Admin Building Area 930
2	Women's Locker Room	Admin Building Area 930
2	Wash Station Lobby	Admin Building Area 930
1	Break Room	Admin Building Area 930
1	Laundry/ Storage	Admin Building Area 930
1	North Hallway	Admin Building Area 930
2	South Hallway	Admin Building Area 930
3	Training/ Conference	Admin Building Area 930
2	Laboratory	Admin Building Area 930
1	Mechanical Room	Admin Building Area 930
1	Electrical Room	Admin Building Area 930
1	Server Room	Admin Building Area 930
2	Control Room	Admin Building Area 930
4	Office	Admin Building Area 930
2	Lobby	Admin Building Area 930
6	Plumbing signs	Per plumbing specifications

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3.5 RESTRICTIVE/CAUTION SIGN SCHEDULE

Quantity	Sign Wording	Location
10	DANGER Equipment may start without warning	Specific location TBD
15	FIRE DOOR Keep Closed	Locate on exterior side of fire rated doors.
18	EXIT	Locate on inside of each exit door
2	CAUTION Floor Loading Capacity 200 pounds per square foot (14.4 kPa) 3,000 pounds (13.3kN) concentrated	At Maintenance Shops Area 940
2	CAUTION Vehicle Loading HS20-44	As directed by the DESIGN-BUILDER.
4	Additional Vehicle Loading signs, wording per Structural Drawings 205-S-307 and 213-S-5001	As directed by the DESIGN-BUILDER.
2	WARNING No Vehicles Beyond This Point	Along West wall of Maintenance Room in Maintenance Shops Area 940
18	EXIT DO NOT BLOCK DOOR	Exterior of each exterior door

3.6 HAZARDOUS IDENTIFICATION SYSTEM SIGN SCHEDULE – MEETING THE REQUIREMENTS OF NFPA 704

Quantity	Sign Wording	Location
3	0 3 0 SUPPLEMENTAL CARBON	Chemical Storage Area 513
3	0 3 0 COR SODIUM HYPOCHLORITE, 15%	Chemical Storage Area 513

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3	0 3 0 WR C1, COR SODIUM HYDROXIDE, 10-30%	Chemical Storage Area 513
3	0 2 0 IRR CITRIC ACID	Chemical Storage Area 513

3.7 EXTERIOR ROOM SIGN SCHEDULE

Quantity	Sign Wording	Location
1	Wash Station	Administration Building 930
1	North Hallway	Administration Building 930
1	South Hallway	Administration Building 930
1	Training/ Conference	Administration Building 930
1	Laboratory	Administration Building 930
1	Control Room	Administration Building 930
1	Lobby	Administration Building 930
2	Electrical Room	Odor Control/ Solids Electrical Structure 32
2	Electrical Room	BNR/MBR/UV Electrical Structure Area 320
2	Electrical Room	Electrical Building Area 34
2	Electrical Room	Electrical Building Area 34
1	Maintenance Room	Maintenance Shops Area 940
1	Hallway	Maintenance Shops Area 940
1	Hallway	Maintenance Shops Area 940

3.8 EXTERIOR BUILDING SIGN SCHEDULE

Quantity	Sign Wording	Location
1	stormwater Pumping Structure	Area 005

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Quantity	Sign Wording	Location
1	Influent Pumping Structure	Area 008
1	Headworks	Area 011
1	Odor Control Structure	Area 023
1	Main Electrical Structure	Area 32
1	Odor Control/ Solids Electrical Structure	Area 34
1	Biological Nutrient Removal	Area 205
1	Membrane Bioreactor	Area 213
1	UV/MBR Pumping Gallery	Area 300
1	BNR/MBR Blowers	Area 310
1	BNR/MBR/UV Electrical Structure	Area 320
1	Chemical Storage	Area 513
1	Solids Handling	Area 840
1	REW/W2/W3 Pumping Structure	Area 925
1	Administration Building	Area 930
1	Maintenance Shops	Area 940
1	Emergency Generator	Area 990

END OF SECTION

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SECTION 10 14 55 - SITE SIGNAGE

PART 1—GENERAL

1.1 SCOPE:

- A. The City & Facility Name and address
- B. Directional signage concept refined with regard to exact sign locations and clarity of content, including, but not limited to, wording, typeface and text size, text layout, and directional arrow size and placement.
- C. Interpretive signage design including development of the content using resources within and outside of City agencies, including the following themes: History, Site-Specific Ecology, Stormwater Management, Light-Transmitting Materials, and Maritime Function (such as navigation and sailing technology). Interpretive signage design including layout of text and graphics and recommending options for materials and fabrication techniques.
- D. Signage design process including three submittals and three meetings with the DESIGN-BUILDER and the SFPUC representatives to discuss signage intent, content, and materials.
- E. ISA - International Symbol of Accessibility signs
- F. Work includes:
 - 1. Coordination with DESIGN-BUILDER for standard product adjustments
 - 2. Submittals
 - 3. Special tools and maintenance equipment
 - 4. Delivery to SFPUC Treasure Island WRRF
 - 5. Delivery inspection
 - 6. Installation verification
 - 7. Warranty

1.2 REFERENCE SPECIFICATIONS

- A. Use this Section with the Contract Documents and following other Sections to establish the total requirements.
 - 1. 01 33 00 – Submittal Procedures
 - 2. 01 42 00 – Reference Standards

3. 01 73 36 – Warranties
4. 03 31 00 – Cast-in-Place Concrete
5. 05 50 00 – Miscellaneous Metalwork

1.3 SUBMITTALS

- A. In accordance with the requirements of Section 01 33 00, Submittal Procedures, submit the following samples to the SFPUC Representative for acceptance:
 1. Signs: Manufacturer's literature specifications, component detail and installation drawings, and warranties.
- B. Design Drawings: Submit drawings prepared by the environmental graphics designer in three drafts. Work on subsequent draft shall not be commenced until DESIGN-BUILDER/City's review and approval of prior draft. The final draft shall be considered part of the Shop Drawings package.
- C. Product Data: Submit manufacturers' catalog sheets, brochures, illustrations, test results and/or other standard descriptive data for the following:
 1. Primers, paints and powdercoatings, showing that coatings will withstand the marine environment.
 2. Lettering and graphics materials, showing that they will withstand the marine environment.
- D. Shop Drawings:
 1. All shop drawings shall be neat, well organized and clearly legible. Elevations and plan views from the Construction Drawings may be reproduced for the sake of expedience where appropriate.
 2. All shop drawings shall be drawn to conventional scale(s) and not subsequently reduced to fit a drawing format.
 3. Submit elevations and plan views for all sign types, including graphic layouts, complete dimensions, materials, locations of all exposed fasteners, colors and finishes. Determine the total quantity for each sign type and note it in the shop drawings.
 4. Submit comprehensive section drawings for sign types where applicable, including sections of all typical members. Show fabrication and installation details, including details for securing members to one another, to building structures, and/or to site work

Show interior construction, reinforcements, anchorages, components and finishes. Reproduction of drawings shown in the Construction Drawings shall not be acceptable.

5. Site Condition Verification: Where required by the DESIGN-BUILDER/City for specific items, inspect site to confirm installation conditions, then submit shop drawings and/or written documentation for approval indicating proposed mounting devices.

E. Samples:

- a. Color and Finish: Submit 3 each, 6 inch x 6 inch samples of all paint colors, screen colors, vinyl colors, porcelain colors and material finishes. All paint and screen colors shall be applied to the appropriate substrate.

- 1) Design-Builder to submit verification of paint manufacturer used for submittal.
- 2) Prior to submittal, verify that all colors submitted as samples match accurately the samples or specifications provided by DESIGN-BUILDER/City.

2. Typeface(s): Submit complete typeface font(s), including upper and lower case letters, numbers and punctuation, for all typeface(s) specified. Also submit samples of letter and word spacing for each cap height specified.

3. Prototypes: Submit one full-size complete prototype for the interpretive signs.

4. Patterns: Submit one representative full size pattern each for all Sign Types for which a prototype is not required. All patterns shall be black vinyl graphics on a single carrier sheet and shall include the perimeter of the sign panel.

5. Quality Control: Samples, mock-ups and prototypes will be retained by the DESIGN-BUILDER/City for record and quality control until substantial completion unless otherwise indicated.

6. Adherence to Schedule:

- a. Provide fabrication and installation schedule to DESIGN-BUILDER/City for review and approval.

1.4 QUALITY ASSURANCE

- A. Follow approved Quality Assurance/Quality Control Program
- B. Designate a project manager for the duration of the project to coordinate with the DESIGN-BUILDER

- C. Workmanship and materials: Provide all workmanship and materials within this Section conforming strictly to the manufacturer's specifications, installation instructions and guarantees.
- D. DESIGN-BUILDER will verify and be responsible for all dimensions and conditions shown by the Drawings and shall visit the site to inspect and verify field conditions prior to fabrication and installation. Notify the City in writing, of all discrepancies on Drawings, in field dimensions or conditions, and of changes required in construction details.
- E. Provide each type of sign as a complete unit produced by a single manufacturer, including all required mounting accessories, fittings and fastenings.
- F. Have completed work structurally sound, and free from scratches, distortions, chips, breaks, blisters, holes, splits or other disfigurements considered as imperfections for the specific material.
- G. WARRANTY
 - 1. Warrant work against failure because of faulty materials, workmanship, and structural design for a period of one year from date of substantial completion. Warranty to include specific date on which warranty begins, date of expiration, and name, address, and telephone number of contact person during warranty period.
 - 2. Fading, cracking, warping, peeling, delaminating, rusting, corroding, and/or structural failure, including distortion by whatever cause, construed to mean failure because of faulty materials and workmanship.
 - 3. Repair or replace failures during warranty period to the satisfaction of, and at no cost to, the City.
 - 4. Guarantee unit pricing for all items for a period of one year, with an allowable cap of 10%

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. See 01 73 19 – Equipment Installation and Startup Testing
- B. Do not deliver materials to jobsite until installation areas are ready to receive them. Delivery shall be responsibility of Design-Builder, and materials shall be insured for the total value of the contents. Freight damage claims and replacement items are the responsibility of Design-Builder.
- C. Wrap, package, transport, deliver, handle and store materials and equipment at jobsite in such a manner as required to prevent any and all damage, including damage resulting from the intrusion of foreign matter or moisture from any source.
- D. Delivery to SFPUC Treasure Island WRRF
- E. Store signs above ground on level platforms, which allow air circulation under stacked units.

F. Protection

1. Protect and prevent damage to adjacent properties and improvements that may be caused by the Contractors operations.
2. Protect and prevent damage or danger to on-site improvements.

- G. Have any damage to the finished pavement surface from subsequent construction repaired to a clean, smooth, true, and uniform surface. Have existing or new paving which has been damaged due to the Contractors operations, and which cannot be repaired to the satisfaction of the SFPUC Representative, removed and replaced at the Contractors own expense before final payment is made.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum:

1. Extruded Shapes: Provide alloy 6063; size as required, or as specified by DESIGN-BUILDER
2. Flat Sheet: Provide alloy 3003; mill finish as specified, for all Work which will receive a painted finish

B. Porcelain Enamel:

1. Provide porcelain enamel on steel, bonded by fusion
2. Steel: Provide special purpose vitreous or enameling iron steel as defined by ASTM A424 Type 1; tensioned, leveled and specifically manufactured for the purpose of porcelain enameling. Total additions of copper and aluminum shall not exceed .002. Gauge of base metal shall be as required to meet tolerances specified
3. Frits / Glazes / Oxides: Provide only specially formulated porcelain enamel frits, glazes and oxides as supplied by Ferro, Chivit, APEC, Pemco or Degussa. These materials, when combined and processed in final form, shall be acid resistant as required to achieve an A or AA acid resistant rating
4. Laminates and Installation Substrates: Provide permanent adhesive(s) recommended by manufacturer

C. Fasteners, Hardware and Devices: Stock proprietary fastening devices of approved standard manufacture such as cadmium plated screws, bolts and washers, and stainless steel hinges

1. Conceal all fasteners except where noted or shown otherwise
2. Finish on all exposed devices to match overall sign finish, unless otherwise noted

3. Provide vandal-resistant fasteners at all exposed locations unless otherwise noted
 4. Use fasteners fabricated from metals that are noncorrosive to either the sign material(s) or the mounting surface.
- D. Very High Bond Tape: Provide #4905/.020"/clear and/or #4950/.045"/white closed cell acrylic foam carrier with VHB adhesive, very high solvent resistance and very high shear and peel adhesion, as manufactured by 3M Scotch or approved equal.
- E. Acrylic Polyurethane Paint:
1. Provide acrylic polyurethane with ultraviolet inhibitors and lightfast, weather, abrasion and graffiti resistant additives as manufactured by Matthews Paint Company, (800) 323-6593. Prime and finish coats shall be mixed and applied in accordance with manufacturer's specifications. Paint finish shall be smooth, free of scratches, gouges, drops, bubbles, thickness variations, foreign matter, or other imperfections.
 - a. Provide a semigloss finish for all exterior applications.
 2. Colored Coatings for Cast Acrylic Sheet: Use paints for background color which are recommended by acrylic manufacturer for optimum adherence to acrylic surfaces and are non-fading for application intended.
 3. Design-Builder shall provide verification of paint manufacturer used for all paint work.
- F. Screen Media:
1. Screened graphics shall be produced with silkscreen ink or silkscreen paint compatible with substrate, using mesh of 390 or finer to produce clean, sharp edges. Media are to be opaque, with full even coverage, and free from hickeys, dust, bubbles and/or other blemishes or foreign matter.
- G. Vinyl Film: Provide opaque reflective or non-reflective vinyl film as indicated, 0.0355" minimum thickness, with pressure sensitive permanent adhesive backing; 3M Scotchcal or approved equal. All colors shall be integral and not surface applied except where custom color(s) are specified in the Drawings. All custom colors shall be flood coated on white vinyl.

PART 3 - —EXECUTION

3.1 INSPECTION

- A. Examine the substrate under which the signs or sign posts are to be installed. Notify City Representative, in writing, of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected
- B. Conditions of Surfaces: Inspect foundations to assure surfaces are as follows:

1. To proper grades and elevations
2. Free of all dirt and other deleterious material
3. All surfaces not properly prepared have been satisfactorily corrected.

3.2 FABRICATION

A. Intent of Specifications: Provide all finished work of the highest quality in order to pass eye-level examination and scrutiny by City.

1. Have all Work free from burrs, dents, raw edges and sharp corners.
2. Finish all welds on exposed surfaces as required so they are not visible in the finished Work.
3. Finish all surfaces smooth unless otherwise indicated or specified.
4. Have surfaces which are intended to be flat free from bulges, oilcanning, gaps or other physical deformities. Fabricate such surfaces to remain flat under installed conditions.
5. Have surfaces which are intended to be curved smoothly free-flowing to the required shape(s)
6. Fabricate all cabinets, panels, and components with smooth, mechanically finished edges. Have all edges true, and all corners square. Where edges are specified to be painted, fill and sand smooth as required prior to painting.
7. Cut routed letterforms and/or graphics clean and true to match adjacent surface-applied letterforms and/or graphics.
8. Fabricate all internally illuminated sign cabinets as required to provide a weathertight housing for all lighting and electrical components.
9. Exercise care to protect all polished and/or plated surfaces so that they remain unblemished in the finished Work.
10. Isolate dissimilar materials. Exercise particular care to isolate nonferrous metals from ferrous metals as required to prevent corrosion.
11. Have all surfaces flat to a tolerance of plus or minus 1/16' when measured at any point with a ten foot straight edge.
12. Provide all visible sign surfaces of the same type with the same finish. Provide color and/or finish consistent across the entire surface of a sign.
13. Provide all reveals of uniform width; all butt joints tight and closed along the entire length; all access panels with a nominal, uniform gap all around.

14. Have all expansion joints, when required, positioned so as not to interfere with the look or finish of any sign message or the overall appearance of the sign face.
 15. Have all gaps between milled components, when assembled, not exceeding a tolerance of .005"
- B. Provide colors and/or finish textures as specified or indicated in the Drawings or, where not specified or indicated, as selected by City.
- C. Graphics: Provide all text, arrows and symbols in the sizes, colors, typefaces and spacing specified in the Drawings. Have all text true, clean, digitally or photomechanically accurate reproduction of the typeface(s) specified, with letter spacing and directional arrows as shown in the Drawings.
- D. Sign Schedule: Copy shown in the Drawings is for layout purposes only. Provide a Sign Schedule for DESIGN-BUILDER/City's review and approval, indicating all final copy, quantities, and references for all signs. Clarify any perceived irregularities in the Sign Schedule with the City prior to fabrication.
- E. Porcelain Enamel:
1. Metal Fabrication: Provide all work machine fabricated in accordance with the approved shop drawings, in a shop certified and qualified in porcelain enamel fabrication.
 2. Flatness: Provide panels of three feet or more in any dimension flat within 3/16" over all directions across the convex surface. Provide panels flat within 1/16" over the concave surface in all directions. Measure flatness with an accurate steel tape and straight edge.
 3. Squareness: Provide panels not be more than 1/16" out of square when measured over the diagonal for panels with a total surface area of nine square feet or more, and less than 1/16" measured over the diagonal for panels with an area less than nine square feet.
 4. Welding: Provide all welds clean, sound, and solid; free from defects and gas bubbles; and ground and sanded smooth.
 5. Holes and Cutouts: Provide all necessary holds and/or cutouts drilled or punched and welded in advance of enameling.
 6. Forming: Have all forming mechanical and done in advance of enameling.
 7. Degreasing: Degrease all panels by immersion in an approved degreasing fluid. Then rinse the panels in a heated water bath.
 8. Acid Etching: After the first rinse, have the panels etched with sulfuric acid such that weight loss shall not be less than 35-40 GG/M2. Have surfaces then rinsed again.
 9. Neutralizing: After the third rinse, neutralize the chemical action in a soda ash solution, and the panels dried rapidly.

10. Porcelain Enameling: Apply a porcelain enamel ground coat to all areas of each unit, including backside and flanges, using spray methods recognized by PEI. Apply at least one additional separately fired cover-coating to the face side and flanges of each unit. For corrosion protection and flatness, apply one additional coating to the backside of each panel, to be fired simultaneously with the finish coat for panels over three feet square.
11. Finish / Continuity of Coating: Ensure visual inspection of each unit reveals no visible breaks, gas bubbles, scumming, hairlines, stress lines or surface defects on the surface area. Exposed metal is unacceptable.
12. Finish and Background Color Control: Provide the color(s) and finish matching sample(s) previously submitted by the Manufacturer and approved by the City Representative.

3.3 INSTALLATION OF SIGNS

- A. Pre-installation Walkthrough / Field-Staking: Attend a pre-installation walkthrough at the job site to confirm all typical installation conditions and determine installation locations for nontypical conditions. The exact locations for all exterior signs will be determined and field-staked at this time. Do not begin excavation for the footing for any exterior sign until the field-staked location has been approved by the DESIGN-BUILDER/City and/or City's representative.
- B. Provide reinforced concrete footings where required, with plan dimensions as shown and depth as specified by DESIGN-BUILDER/City. Use sonotube type formwork for post and panel signs at all landscape locations; core drill and set post(s) in epoxy grout at all hardscape locations.
- C. Where a concrete footing is level with finished grade to serve as a mow strip, slope the top of the footing away from the sign cabinet or post(s) minimally as required for drainage and to prevent puddling.
- D. Securely attach all signs to footings or site work in accordance with DESIGN-BUILDER's specifications.

3.4 CLEANING AND PROTECTION

- A. At completion of installation, clean all sign surfaces in accordance with manufacturer's instructions.
- B. Protect all signs from damage until acceptance by DESIGN-BUILDER/City; repair or replace damaged units as required.

3.5 SITE CLEANUP

- A. Final cleanup:
 1. Clean and/or repair all evidence of installation work or damage to site work or other adjacent surfaces prior to completion of work.

2. Clean up work area after all installation has been completed. Restore all disturbed ground cover.
3. Remove all protective materials and dispose of properly off site.

3.6 CONTRACT CLOSE-OUT ITEMS

- A. Provide the City with two quarts of paint for each paint color specified.
- B. Provide the City with written instructions for proper cleaning of the signs. Note any solvents that should not be used.

END OF SECTION

SECTION 32 31 19 - DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 SCOPE

- A. Provide the following in accordance with the Contract Documents:
 - 1. Decorative powder coated aluminum fences.
 - 2. Galvanized Steel Wire Mesh.
 - 3. Sliding vehicular gates.
 - 4. Swing pedestrian gates.
- B. Work includes:
 - 1. Design
 - 2. Coordination with DESIGN-BUILDER for standard product adjustments
 - 3. Submittals
 - 4. Special tools and maintenance equipment
 - 5. Delivery to SFPUC Treasure Island WRRF
 - 6. Delivery inspection
 - 7. Installation verification
 - 8. Warranty

1.2 REFERENCE SPECIFICATIONS

- A. Use this Section with the Contract Documents and following other Sections to establish the total requirements
 - 1. 01 33 00 – Submittal Procedures
 - 2. 01 78 36 – Warranties
 - 3. 03 30 00 - Cast-in-Place Concrete.
 - 4. 08 71 00 - Door Hardware
 - 5. 26 05 26 – Grounding
 - 6. 26 29 00 – Low Voltage Motor Control Systems

1.3 SUPPLIER SUBMITTALS

- A. See Section 01 33 00 – Submittal Procedures
- B. Samples: For each fence material and for each color specified.
 - 1. Provide Samples 12 inches (300 mm) in length for linear materials.

1.4 QUALITY ASSURANCE

- A. Follow approved Quality Assurance/Quality Control Program

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. See 01 93 13 – Equipment Installation and Operational Testing

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Wind Loading:
 - 1. Fence Height: As indicated on the drawings.

2.2 DECORATIVE POWDER COATED ALUMINUM FENCE

- A. Fence Panel Configuration: As indicated.
- B. Fence Panel Height: Match drawings.
- C. Steel Frames and Bracing: Fabricate members from steel plates and shapes.
- D. Decorative Mesh Panel: As shown on drawings.
- E. Frame Corner Construction: Welded or assembled with corner fittings and 5/16-inch (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.
- F. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.
- G. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- H. Fence Manufacturer: Clear Vu/Cochane USA, 3551 Lee Hill Dr, Fredricksburg, VA 22408. (202) 853-3227; (202) 368-3335 (m) Contact: Jonathan Mishoe.

2.3 SLIDING GATES

- A. Gate Configuration: As shown on drawings.

- B. Gate Frame Height: As shown on drawings.
- C. Gate Opening Width: As shown on drawings.
- D. Steel Frames and Bracing: Fabricate members from steel plates and shapes.
- E. Frame Corner Construction: Welded or assembled with corner fittings and 5/16-inch (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.
- F. Hardware: As shown on Drawings.
- G. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.
- H. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- I. Gate Manufacturer: Clear Vu/Cochane USA, 3551 Lee Hill Dr, Fredricksburg, VA 22408. (202) 853-3227; (202) 368-3335 (m) Contact: Jonathan Mishoe.

2.4 SWING GATES

- A. Gate Configuration: As shown on drawings.
- B. Gate Frame Height: As shown on drawings.
- C. Gate Opening Width: As shown on drawings.
- D. Steel Frames and Bracing: Fabricate members from steel plates and shapes.
- E. Frame Corner Construction: Welded or assembled with corner fittings and 5/16-inch (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.
- F. Hardware: Refer to Hardware Schedule on Drawings
- G. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.
- H. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- I. Gate Manufacturer: Clear Vu/Cochane USA, 3551 Lee Hill Dr, Fredricksburg, VA 22408. (202) 853-3227; (202) 368-3335 (m) Contact: Jonathan Mishoe.

2.5 MISCELLANEOUS MATERIALS

- A. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 033000 "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi (20 MPa), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum

aggregate size or dry, packaged, normal-weight concrete mix complying with ASTM C 387/C 387M mixed with potable water according to manufacturer's written instructions.

- B. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M and specifically recommended by manufacturer for exterior applications.
- C. Wood Posts: Pressure treated hem-fir or Douglas Fir, meeting AWPA Standards.

2.6 BRACKETS AND FASTENERS

- A. Standard "L" and "T" brackets and/or "universal" from panel manufacture as required and will be specified in shop drawings.
- B. All brackets and fasteners must coordinate with the applicable structural frame assembly.
- C. Lag screws and bolts: Galvanized, with washers, size and type to suit application.

2.7 POWDER COATING

- A. Coating shall comply with the American Architectural Manufacturing Associations (AAMA) specification 2604.
- B. TIGER Drylac Series 38, TIGER Drylac USA, Ontario, CA (800) 243-8148 or approved equal.
- C. TIGER Shield 2 coat system or approved equal shall be used.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 DECORATIVE FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.

- B. Post Setting: Set posts in concrete at indicated spacing.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches (51 mm) above grade. Finish and slope top surface to drain water away from post.
 - 3. Posts Set in Concrete: Extend post to within 6 inches (150 mm) of specified excavation depth, but not closer than 3 inches (75 mm) to bottom of concrete.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

END OF SECTION

**SECTION 32 92 00
HYDROSEED**

PART 1 – GENERAL

1.1 SCOPE

- A. Section includes: furnishing transportation, labor, materials, and equipment to perform hydroseeding work. **Section includes hydroseeding activity and seed mixes.**
- B. Related Sections:
 - 1. Section 32 84 00 – Landscape Irrigation
 - 2. Section 32 91 13 – Soil Preparation.
 - 3. Section 32 93 00 – Trees, Shrubs, Ornamental Grasses, and Ground Cover
 - 4. Section 33 47 27 – Bioretention.

1.2 REFERENCES:

- A. Nomenclature shall comply with the latest editions of:
- B. Standardized Plant Names of the American Joint Committee on Horticulture Nomenclature.
- C. Hortus Third, Bailey Hortorium, Cornell Owner (1976).
- D. Checklist of Woody Ornamental Plants of California.
- E. Sunset Western Garden Book.
- F. Guideline Specifications for Nursery Tree Quality; Western Arborist; by Brian Kempf, Winter 2009.
- G. Sizing and grading shall comply with:
 - 1. State of California Grading Code of Nursery Stock.

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2. "American Standards for Nursery Stock," 2014, American Horticulture Industry Association.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

- A. Perform work in accordance with all applicable laws, codes and regulations required by authorities having jurisdiction over such work and provide for all inspections and permits required by Federal, State and local authorities in furnishing, transporting and installing materials.
- B. Certificates of inspection required by law for transportation shall accompany the invoice for each shipment of seed or sod. Inspection by Federal or State Governments at place of growth does not preclude rejection of materials at project site.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Affidavit and test report for seed mixture.
- C. All plants to be ordered and samples submitted for approval within 10 calendar days after signed Notice to Proceed.
- D. Mulch Samples: Provide 2 samples of each of mulch materials in quart size plastic bags 30 Calendar Days prior to installation.
- E. Executed contract between Contractor and Seed Supplier for procurement and initial stock shifting, seasonally appropriate growing and transporting of contract-grown trees as indicated on the plant list on the Drawings. Contract to be executed between Pacific Coast Seed, S&S Seed or approved equal.

1.5 QUALITY ASSURANCE

- A. The Contractor shall be responsible for furnishing seeds inspected by appropriate State or Federal authorities and certified to be free from disease, insect infestations, or other deleterious conditions at the growing site.
- B. Inspection and/or certification at the growing site does not preclude the SFPUC Representative's right to reject the seed mix.

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1.6 SITE CONDITIONS

- A. Perform actual planting during those periods when weather and soil conditions are suitable in accordance with locally accepted horticultural practice.
- B. Hydroseeding shall be performed in late fall or winter, ideally a few days ahead of a rain event.

1.7 EXISTING UTILITIES AND PLANT MATERIALS

- A. Repair or replace existing improvements which are not designated for removal which are damaged or removed as a result of Contractor's operations.
- B. Protect existing trees and their roots, lawns, and shrubbery that are not to be removed from damage or injury.
- C. Tree roots larger than 2 inches in diameter shall be inspected by a Consulting Arborist before cutting.

1.8 WARRANTIES AND GUARANTEES

- A. The contractor shall warrant the work for one (1) year following seeding. Any bare areas shall be reestablished by the Contractor at the Contractor's expense.

PART 2 – PRODUCTS

2.1 SEED MIX

- A. Seeds shall be as specified in the plant list on the plans, and shall be healthy, vigorous stock, free of insects and disease in compliance with American Standards of Nursery Stock. Use only plant materials that are first class representations of the species and cultivars specified and that conform to all state and local laws governing the sale, transportation and inspection of plant materials. Substitutions or plant material, species and/or varieties must be approved by the Ecologist and/or Landscape Architect.
- B. Seeding rates in PLS/acre as shown in the drawings.
- C. Seed collection shall be at the appropriate time for each targeted species, in general, collections shall be made between April and November.

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- D. Contractor to confirm availability of all seed mixes within 60 days after award of the contract with seed supplier.

2.2 FIBER

- A. Wood fiber must be a long-strand, whole wood fiber that is thermomechanically processed from clean whole wood chips. Wood fiber is manufactured from wood or wood waste from lumber mills or urban sources. It is applied at a total rate of 600 to 2,000 pounds/acre, either in a single or two-step application. Contractor to submit product data from preferred supplier.
- B. Cellulose fiber is of shorter length than wood fiber mulches and must be made from natural or recycled pulp fiber, such as wood chips, sawdust, newsprint, chipboard, corrugated cardboard, or a combination of these materials. Cellulose mulch has shorter fiber lengths than wood fiber mulches because they are produced from fiber initially manufactured to create smooth surfaces for paper products and other non-mulch uses. When applied, the shorter fibers of cellulose products may clump rather than interlock. Cellulose fiber is typically applied at the rate of 2,000 to 4,000 pounds/acre. Contractor to submit product data from preferred supplier.

2.3 TACKIFIER

- A. Tackifier shall be Psyllium. Psyllium is composed of the finely ground muciloid coating of plantago ovata seeds that is applied as a dry powder or in a wet slurry to the surface of the soil. It dries to form a firm but rewettable membrane that binds soil particles together but permits germination and growth of seed. Psyllium requires 12 to 18 hours drying time. Application rates as described below in pounds per acre, with enough water in solution to allow for a uniform slurry flow. Contractor to submit product data from preferred supplier.

2.4 PESTICIDES AND PRE-EMERGENT HERBICIDES

- A. Selected from the broad spectrum of commercial brands listed and certified organic by OMRI only. Subject to approval by the SFPUC Representative and not in conflict with regulations governing their use.

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PART 3 – EXECUTION

3.1 PREPARATION

- A. Before applying hydroseed, verify that finish grades comply with specifications for grade compaction and elevation
- B. Remove and dispose of all trash, debris and weeds in the areas to receive hydroseeding.
- C. Remove and dispose of loose rocks larger than 2 inches in maximum dimension unless otherwise authorized.:
- D. Protect the traveled way, sidewalks, lined drainage channels, wetlands, and any existing vegetation from overspray or hydraulically-applied material.

3.2 INSTALLATION

- A. Apply hydroseed with hydraulic spray equipment that mixes fiber, tackifier, fertilizer and seed at the minimum rates shown, unless otherwise coordinated with the hydroseeder:

Material		Application Rate
Description	Type	
Seed	Per Plans	Per Plans
Fiber	Wood or Cellulose	As Required
Tackifier	Psyllium	200 lbs/acre

- 1.
2. After application, do not allow pedestrians or equipment on the treated areas.

3.3 FINAL INSPECTION AND ACCEPTANCE

- A. Upon completion of all hydroseeding work under this Contract, and before the beginning of the formal 90-Day Maintenance Period, the Pre-maintenance inspection shall be performed.
- B. Conditions of acceptance of work at the end of Maintenance period. Any bare areas shall be reestablished by the Contractor at the Contractor's expense

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- C. Final acceptance: Upon final acceptance, SFPUC will assume responsibility for the maintenance of the work.

END OF SECTION

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**SECTION 32 93 00
TREES, SHRUBS, ORNAMENTAL GRASSES, AND GROUND COVER**

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish transportation, labor, materials, and equipment to perform planting and landscaping work. Provide tree contract growing; tree, shrub, ornamental grass, groundcover plant installation; and top dressing (mulch).
- B. Work includes:
 - 1. Design
 - 2. Coordination with DESIGN-BUILDER for standard product adjustments
 - 3. Submittals
 - 4. Special tools and maintenance equipment
 - 5. Delivery to SFPUC Treasure Island WRRF
 - 6. Delivery inspection
 - 7. Installation verification
 - 8. Training
 - 9. Warranty

1.2 REFERENCE SPECIFICATIONS

- A. Use this Section with the Contract Documents and following other Sections to establish the total requirements
 - 1. 01 33 00 – Submittal Procedures
 - 2. 01 78 36 – Warranties
 - 3. 32 84 00 – Landscape Irrigation
 - 4. 32 91 13 – Soil Preparation.
 - 5. 33 47 27 – Bioretention.

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1.3 APPLICABLE CODES AND STANDARDS

- A. Nomenclature shall comply with the latest editions of:
1. Standardized Plant Names of the American Joint Committee on Horticulture Nomenclature.
 2. Hortus Third, Bailey Hortorium, Cornell Owner (1976).
 3. Checklist of Woody Ornamental Plants of California.
 4. Sunset Western Garden Book.
 5. Guideline Specifications for Nursery Tree Quality; Western Arborist; by Brian Kempf, Winter 2009.
 6. The Organic Materials Review Institute (OMRI)
- A. Sizing and grading shall comply with:
7. State of California Grading Code of Nursery Stock.
 8. "American Standards for Nursery Stock," 2014, American Horticulture Industry Association.
- B. Existing tree value appraisal shall comply with Council of Tree and Landscape Appraisers:
1. Manual for Plant Appraisers Handbook.
 2. Guide for Establishing Values of Trees and Other Plants.
- C. Pruning standards: ANSI Z1333.1 – 1972, Safety Requirements for Tree Pruning, Trimming, Repairing or Removal.
- D. Perform work in accordance with all applicable laws, codes and regulations required by authorities having jurisdiction over such work and provide for all inspections and permits required by Federal, State and local authorities in furnishing, transporting and installing materials.
- E. Certificates of inspection required by law for transportation shall accompany invoice for each shipment of seed or sod. Inspection by Federal or State Governments at place of growth does not preclude rejection of materials at project site.

1.4 SUPPLIER SUBMITTALS

- A. 01 33 00 – Submittal Procedures

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- B. All plants to be ordered and samples submitted for approval within 10 calendar days after signed Notice to Proceed.
- C. Mulch Samples: Provide 2 samples of each of mulch materials in 0.25 cubic foot clear plastic bags 30 Calendar Days prior to installation.
- D. Executed contract between Contractor and Tree Nursery or Native Plant Nursery for procurement and initial stock shifting, seasonally appropriate growing and transporting of contract-grown trees and plants as indicated on the plant list on the Drawings.
- E. Executed contract between Contractor and Seed Supplier for procurement and initial stock shifting, seasonally appropriate collecting and transporting of seeds as indicated on the seed mix list on the Drawings. Contract to be executed with Hedgerow Farms, Pacific Coast Seed, or approved equal.

1.5 QUALITY ASSURANCE

- A. Follow approved Quality Assurance/Quality Control Program.
- B. Plants are to be sourced from a Nursery that implements Phytophthora base management practices (BMPs) and whose collection and propagation practices minimize the potential for the spread of plant pathogens.
- C. Project site procedures shall follow quality assurance procedures outlined in ATTACHMENT A.
- D. A qualified ecologist shall supervise all wetlands planting on the project site. No shorter than 21 days will be given in advance of planting.
- E. Designate a project manager for the duration of the project to coordinate with the DESIGN-BUILDER.

1.6 SITE CONDITIONS

- A. Perform actual planting during those periods when weather and soil conditions are suitable in accordance with locally accepted horticultural practice.
- B. Wetlands Planting shall be performed during the cooler, wetter months between November 15 and April 15.
- C. Perform planting only during the period when moisture is below field capacity.

1.7 EXISTING UTILITIES AND PLANT MATERIALS

- A. Repair or replace existing improvements which are not designated for removal which are damaged or removed as a result of Contractor's operations.

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- B. Protect existing trees and their roots, lawns, and shrubbery that are not to be removed from damage or injury.
- C. Tree roots larger than 2 inches in diameter shall be inspected by a Consulting Arborist before cutting.

1.8 INSPECTIONS

A. Preselected Trees and Plants at the Nursery:

1. Allow for one inspection of shifting sock, one inspection per season during the nursery growing period and one inspection at the nursery prior to tree shipment. Growing season is equivalent to one calendar year.
2. In case the specimen trees inspected are found to be defective, SFPUC and their representatives reserve the right to reject the entire lot or lots of trees represented by the defective specimen(s). Any plants determined to be unsuitable for planting because of this inspection will be rejected and not paid for.
3. Cost of inspections by the SFPUC representative including the SFPUC's Arborist shall be paid for by the Contractor.

B. All Remaining Nursery Stock:

1. Allow for one inspection of shifting stock, one inspection per season during the nursery growing period and one inspection at the nursery prior to tree shipment. Growing season is equivalent to one calendar year.
2. The Owner reserves the right to reject the entire lot or lots of plant material. Any plants determined to be unsuitable for planting because of this inspection will be rejected and not paid for. Contractor to find appropriate replacements and coordinate an inspection for this material for final approval.
3. Cost of inspections by the SFPUC Representative including the SFPUC's Arborist shall be paid for by the Contractor.

C. Plant material shall be tested for the presence of Phytophthora prior to shipment. Tests are to be performed in accordance with recommended procedures outlined by Phytosphere Research (http://phytosphere.com/BMPsnursery/test3_4bench.htm).

D. All plant material upon delivery to the jobsite:

1. Notify the SFPUC Representative and Ecologist at least 21 Calendar Days prior to time of the following required inspections:
 - a. Plant material at time of delivery to the job site.

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- b. Landscape plants and construction items prior to start of maintenance period.
- c. Landscape plants and construction items at the end of the maintenance period.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. See 01 73 19 – Equipment Installation and Operational Testing
- B. Planting stock shall be protected from potential contamination from the point it leaves the production Nursery, during storage and staging, until planting. For transportation and storage protocols, see ATTACHMENT A, “Guidance to Minimize Phytophthora Contamination in Restoration Project” (Working Group for Phytophthora in Native Habitats, 2016).
- C. Nursery plants shall be transported on or in vehicles or equipment that have been cleaned before loading the stock. Truck beds, racks, or other surfaces need to be swept, blown with compressed air and/or power washed as needed so they are visibly free of soil and plant detritus.
- D. At the job site, plants shall be handled to prevent contamination until delivered to each planting site. Nursery stock shall not be placed on the soil or other potentially contaminated surfaces until they are placed at their specific planting sites.
- E. If it is necessary to offload plants at the job site, plants may be placed on clean waterproof plastic tarps or other clean, sanitized surfaces. If tarps are used for holding plants, one surface needs to be dedicated for contact with nursery stock and will be cleaned and sanitized to maintain phytosanitary conditions.
- F. If plants are to be stored for longer than two days, then they are to be watered at regular intervals to prevent desiccation of root systems. Do not allow plants to dry out. Washing, soaking, or irrigation of plant material shall be conducted using clean water sources.
- G. Delivered nursery plants that will be held before planting shall be transferred to clean and sanitized storage surfaces and maintained as described in ATTACHMENT A.

1.10 WARRANTY

- A. Warranty with Nursery:
 - 1. Warrant that all plant materials are true to the species and variety agreed upon.
 - 2. Warrant that all wetlands plants under contract will be healthy and are in flourishing condition of active growth one year from date of final acceptance. Plants shall be free of dead or dying plant tips or branches, with foliage of normal density, size, and color. Replace all dead plants and all plants not in a vigorous, thriving condition.

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- B. Exclusions: Contractor and nursery shall not be held responsible for failures due to neglect by the owner, vandalism, and acts of nature during the warranty period. Such conditions must be reported.
- C. Provide 12 months guarantee for Work of this Section in accordance with provisions of Division 01.
- D. Provide supplemental guarantee, on Contractor's letterhead:
 - 1. Plant material: Warrant that all plant material under this Contract will be vigorous, healthy, free of dead or dying branches and branch tips, bearing foliage of normal density and color, and will otherwise comply with these Specifications for a period of 18 months from date of Substantial Completion.
 - 2. Replacements: Without cost to Owner, in a timely manner and as directed by the Owner's Representative, replace all plants not meeting the requirements above during and at the end of the Warranty Period. Replace plants which are identified, within 3 years, as not being true to name as specified, with the specified plant. Replacements shall closely match adjacent specimens of the same species in size at the time of replacement and shall comply with all requirements of this Specification.

PART 2 - PRODUCTS

2.1 CONTAINER PLANT MATERIAL

- A. Plants shall be as specified in the plant list on the plans, and shall be healthy, vigorous stock, free of insects and disease in compliance with American Standards for Nursery Stock. Use only plants materials that are first class representations of the species and cultivars specified and that conform to all state and local laws governing the sale, transportation, and inspection of plant materials. Substitutions or plant material, species, and/or varieties must be approved by Ecologist.
- B. Only healthy plants of suitable size and uniformity and species/variety indicated and only plants with a normal plant and root structure will be acceptable. Plants shall be guaranteed to arrive on the jobsite free of pests and diseases.
- C. All plants shall be nursery grown in accordance with good horticultural and phytosanitary practices and shall be grown under climatic conditions similar to those in the locality of the project for at least one year unless otherwise approved SFPUC Representative.
- D. The Contractor is responsible for supplying plant material that has been properly acclimated and conditioned, in accordance with good horticultural practices, for the exposure, wind and humidity levels, soil conditions, etc. encountered at the project site and in the proposed plant locations.

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- E. Plants shall be superior in form, compactness and symmetry; sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of pests and insects, insect eggs or larvae, diseases, sunscald injuries, abrasions or disfigurements, and free from physical damage of adverse conditions that would prevent thinning growth. They shall have healthy, well-developed root systems to outside of each container without being root bound in their containers. Specimens shall not demonstrate any damage due to containerization or staking. Tree tappers and calipers shall reflect appropriate staking methods.
- F. Size:
1. Plants shall conform to the measurements specified. Measure plants when branches are in their normal position. Height and spread dimensions specified refer to the main body of plant and not branch tip to tip. Take caliper measurements at a point on the trunk 6 inches above natural ground line for trees up to 4 inches in caliper and at a point 12 inches above the natural ground line for trees over 4 inches in caliper.
 2. If a range of size is given, no plant shall be less than the minimum size and not less than 40% of the plants shall be as large as the maximum size specified.
 3. The measurements specified are the measurements after pruning, where pruning is required. Plants that meet the measurements specified, but do not possess a normal balance between height, spread and caliper, shall be rejected.
 4. Plants larger than specified may be used if approved by the SFPUC Representative and if provided at no additional cost to the Owner. If larger plants are approved, the root ball shall be increased in proportion to the size of the plant; irrigation system shall also be adjusted as required to accommodate larger plants.
- G. Species: All plant material shall be pre-selected and identified by tagging as specified herein prior to delivery to the site. Any plants not so identified will be subject to rejection by the SFPUC Representative. Replace all plant materials, determined by the SFPUC Representative within one year following the final acceptance of the project, to be untrue to the species, clone, and/or variety specified, to the equal condition of adjacent plants at the time of replacement, at no additional cost to the Owner.
- H. Trunks and Branches: Do not prune plants before delivery. All trunks are to be straight and of uniform taper, larger at the bottom unless otherwise specified. Plants with damaged or crooked leaders, or multiple leaders, unless specified, will be rejected. Plants with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 3/4 inch, which have not completely calloused, will be rejected. Any plant unable to stand upright without support will be rejected. Specimen shall not demonstrate any damage due to containerization or staking.
- F. Root ball:

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1. Do not supply any bare root or ball and burlapped stock unless approved by the SFPUC Representative.
 2. Sizes: As specified on the plans. Where no root ball dimensions have been specified, supply material in container sizes specified.
 3. Material: Root ball shall consist of a soil or soil mix that is compatible with the soil or soil mix into which the plant will be planted, and that provides for thorough drainage, aeration, and adequate moisture and nutrient retention. The root ball must be firm and well-rooted. It shall have sufficient density and firmness that when planted, the plant will stand upright and stable without the need for additional support.
 4. Containers: All plant material shall have been grown in the containers in which delivered for at least one year, but not over two years. Containers for trees shall be constructed to the specified dimensions in such a manner that the resultant root ball will approximate the slopes into which the individual tree(s) is to be planted.
 5. Root Pruning: Where root pruning is required to provide material of the specified size or for planting in the confined planters, the pruning is to be done under the direction of a Certified Arborist. No root pruning is to be done within one year of installation unless approved by the SFPUC Representative.
- I. Plant material that has been reviewed and selected at place of growth by the SFPUC Representative does not constitute waiver of the requirements of this Section, nor does it waive the Contractor's warranty responsibilities. The Contractor does not have the option to substitute for selected material unless selected material is rejected by the SFPUC Representative during the course of the work.
 - J. Contractor to confirm availability of all plant materials within 60 days after award of contract.
 - K. Flatted plants shall be grown and remain in the flat until transplanted at the job-site. The soil and spacing of the plants in the flat shall ensure the minimum disturbance of the root system at time of transplanting. Maximum plants per flat shall be between 64 to 100 plants or as indicated on Drawings.

2.2 SEED MIX

- A. Seeds shall be as specified in the plant list on the plans, and shall be healthy, vigorous stock, free of insects and disease in compliance with American Standards for Nursery Stock. Use only plants materials that are first class representations of the species and cultivars specified and that conform to all state and local laws governing the sale, transportation, and inspection of plant materials. Substitutions or plant material, species, and/or varieties must be approved by Ecologist.
- B. Seeding rates in PLS lb/acre for hydroseeding application per drawings.

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- C. Seed collection shall be from nearby sites and made at the appropriate time for each targeted species (general, collections shall be made between April and November).
- D. Contractor to confirm availability of all plant materials within 60 days after award of contract with seed supplier.

2.3 MULCH AND ACCESSORIES

- A. Organic Recycled: 3-inch deep layer of composted bark mulch to be supplied at all planting areas. Color: Dark Brown. Available: Premium Arbor Mulch from Lyngso Garden Supply, San Carlos, CA (650) 364-1730 or approved SB 1383 compliant equal.
- B. Staking and guying materials:
 - 1. Wooden stakes: Lodge pole pine, 10-foot length, 3-inch diameter, with 10-inch tapered driving point and chamfered top; treated with wood preservative to heartwood; green color; as available from SiteOne Landscape Supply or accepted equal.
 - 2. Ties: Rubber strap, 32-inch minimum length without sharp edges adjacent to trunk, V.I.T. cinch-tie, or accepted equal

2.4 ANTI-DESICCANT

- A. Shall not be used.

2.5 PESTICIDES AND PRE-EMERGENT HERBICIDES

- A. Selected from the broad spectrum of commercial brands listed and certified organic by OMRI only. Subject to approval by the SFPUC Representative and not in conflict with regulations governing their use.

PART 3 - EXECUTION

3.1 PLANTING CONTAINER PLANTS

- A. Plant materials, including contract grown trees and plants previously approved at the nursery, shall be inspected prior to planting. Contractor shall be responsible for the condition of plants, planted or otherwise, until final acceptance by the SFPUC Representative:
 - 1. Perform planting with materials and equipment in conformance to procedure favorable to the optimum growth of the plant. Do not plant during windy, frost or exceptionally muddy conditions.
 - 2. Except as noted for specimen planting, start planting operations following the completion and approval of the irrigation system. For Emergent Wetland and

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Wetland Transition areas. Irrigation must be run for two weeks prior to the start of planting operations.

- B. Keep plant materials delivered to the site in healthy condition for planting.
- C. All workers working near plantings are to be trained on phytophthora base management practices by qualified Ecologist, or qualified expert, and follow the procedures outlined in ATTACHMENT A. This includes vehicle operators, field workers, and anyone accessing planting areas or coming into contact with materials designated for planting areas.
- D. Layout and Plant Locations:
1. Plant locations indicated on Drawings are approximate.
 2. Plants may be re-spotted prior to planting as directed by the SFPUC Representative, without additional compensation to Contractor.
 3. Make a detailed layout of plants, in the planting areas and obtain approval of the SFPUC Representative prior to planting operations.
 4. Locate the first row of plants in areas designated for on-center spacing at 1/2 the designated spacing from the edge of the area.
- E. Plants in boxes (24 inches or larger) shall be planted before installation of lateral irrigation lines. Re-route irrigation lines in conflict with specimen plant locations to clear the root ball.
- F. Shrub Planting:
1. Protect plants at all times from sun or drying winds. Plants that cannot be planted immediately on delivery shall be kept in the shade, well protected, and shall be kept well-watered.
 2. Container stock shall be opened and removed in such a manner that the plant roots are not injured. A spade may not be used to cut cans. Plants shall be handled by earth ball only. Handling the plant itself may cause injury to the material. Special precaution should be taken to not break earth ball of all plants.
 3. Plants shall be set vertical on undisturbed sub grade and the crown shall be held above grade to the extent indicated on the Drawings to discourage root-rot or other soil-borne diseases caused by having the crown at an inadequate elevation.
 4. Use amended topsoil as backfill mix.

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5. Thoroughly mix Osmocote controlled release fertilizer at the rate of 8.5 pounds per cubic foot into the backfill mix prior to backfilling.
6. A slight saucer indentation around plants shall be formed around each shrub or ornamental grass plant at the time of planting to hold water.
7. Immediately after placing in pit, backfill shall be watered then firmly tamped to insure planting soil in and about all roots. No air pockets shall be left around roots of any plants. Thoroughly water after planting taking care not to cover crowns of plants with wet soil.

G. Ground Cover Planting:

1. The ecologist shall supervise all Wetlands plantings.
2. Complete soil preparation, amending and fine grading prior to planting of ground cover materials.
3. Plant ground covers in moist soil, spaced as indicated on Drawings.
4. Plant each plant with its proportionate amount of flat soil to minimize root disturbance. Plants are to be handled carefully when removing from container. Plants are not to be damaged and the root ball shall be intact upon installation.
5. The degree of soil moisture in the flat shall be such that the soil does not crumble when removing plant.
6. Container plants are to be installed at adequate depth (the root crown is flush with soil surface) and sufficiently tamped down so that there are no air pockets around the roots.
7. Following planting of ground cover, restore finish grade to ensure surface drainage.

H. Seed Mix Dispersal:

1. Upon completion of planting activities in the Emergent Wetland and Wetland areas, designated Seed Mixes are to be spread by hand across the site.
2. Plan seeding activities to take place in advance of predicted rain. If planting is complete, and no rain within 1 month of completion, then it is acceptable to apply the seed to the site.
3. Complete seeding using the following steps for each zone:
 - a. Emergent Wetlands:

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1. Divide Emergent Wetlands Seed Mix into $\frac{1}{3}$ and $\frac{2}{3}$ proportions. $\frac{1}{3}$ of total mix will be spread in Cell 1 Emergent Wetlands, $\frac{2}{3}$ of total mix will be spread in Cell 2 Emergent Wetlands.
2. Divide Cell 1 Emergent Wetlands area into quadrants and portion the $\frac{1}{3}$ seed mix (from Step 1) into 4 equal parts. Distribute by hand.
3. Divide Cell 2 Emergent Wetlands area into 8 subdivisions and portion $\frac{2}{3}$ seed mix (from step 1) into 8 equal parts. Distribute by hand.
- 4.
5. Wetlands Transition:
6. Divide Wetlands Transition Seed Mix into $\frac{1}{3}$ and $\frac{2}{3}$ proportions. $\frac{1}{3}$ of total mix will be spread in Cell 1 WT, $\frac{2}{3}$ of total mix will be spread in Cell 2 Wetlands Transition.
7. Divide Cell 1 Wetlands Transition area into quadrants and portion $\frac{1}{3}$ seed mix (from Step 4) into 4 equal parts. Distribute by hand.
8. Divide Cell 2 Wetlands Transition into 8 subdivisions and portion $\frac{2}{3}$ seed mix into 8 equal parts. Distribute by hand.

3.2 MULCHING

- A. Apply mulch to lines, levels and depths indicated on the Drawings.

3.3 APPLICATION OF PRE-EMERGENT HERBICIDES

- A. Immediately after planting, treat non-seeded planting areas with a pre-emergent weed and grass seed control agent; spray or spread on in conformance with the manufacturer's written recommendations. Only products listed and certified organic by ORMI shall be used.
- B. Check manufacturer's list of ornamental to determine toxicity with regard to selection of type of material used.

3.4 WATERING

- A. Water plants immediately after planting.
- B. After the first watering, water shall be applied to all plants as conditions may require keeping the plants in a healthy and vigorous growing condition until completion of the Contract, without causing erosion detrimental to the planting area.

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- C. Use soil probes to insure the rootball, especially of boxed trees, and backfill are neither too wet or too dry.
- D. Emergent Wetlands shall have temporary drip lines that will emit 1 gallon per hour at each emitter for the 9-12 month growing period. Each zone will run for two hours, twice a day, for a total of 4 gallons per day per emitter.
- E. Wetlands Transition Areas shall have temporary drip lines that will emit 0.5 gallons per hour at each emitter for the 9-12 month growing period. Each zone will run for two hours, once a day, for a total of 1 gallon per day per emitter.

3.5 FERTILIZING

- A. Lawn, grasses and groundcovers (excluding Wetlands areas): At 30- day intervals after planting lawn or ground cover areas, apply certified organic an all-purpose 16-6-8 commercial fertilizer at the rate of 5 pounds per 1,000 square feet of planted area. Water the area after applying fertilizer. Fertilizer shall be listed and certified by OMRI. Fertilizer applications shall be done under the inspection of the SFPUC Representative.

3.6 MAINTENANCE OF PLANTING

- A. From the time any plants are planted until Final Acceptance of the Landscape Installation, the Contractor shall ensure that all plants be watered and fertilized, trash and debris kept removed, weeds controlled, erosion damage repaired, and plant replacements made.
- B. Immediately treat or replace plants which become damaged or injured as a result of Contractor's operations or negligence .
- C. Replacement plants shall match species, size, condition, variety and quantity of plants replaced.
- D. From the time plants are accepted at the site until Final Acceptance of the Landscape Installation, logs shall be kept of the Wetlands plants that include information such as acceptance records, plant establishment and maintenance records, irrigation schedules and records, rates of plant establishment versus loss, and also include final planting plans, final soils plans, and irrigations as-builts. Maintenance records will be provided to the Ecologist and SFPUC.
- E. An Integrated Pest Management program shall be implemented to reduce the use of pesticides.

3.7 FINAL INSPECTION AND ACCEPTANCE

- A. Upon completion of all landscape, planting and irrigation work under this Contract, and before the beginning of the formal 90-Day Maintenance Period, the Pre-maintenance inspection shall be performed.

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- B. Conditions of acceptance of work at the end of Maintenance period: Each plant shall be alive and thriving, showing signs of growth and no signs of stress, disease or any other weakness. Contractor shall be responsible for replacing all plants not meeting these conditions. An additional Warranty period equal in length to the original shall be commenced for all such plants.
- C. Final acceptance: Upon final acceptance, SFPUC will assume responsibility for the maintenance of the work.

END OF SECTION

ATTACHMENT A

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SECTION 32 93 00 - 14

TREES, SHRUBS,
ORNAMENTAL GRASSES,
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SECTION 32 93 00 - 15

TREES, SHRUBS,
ORNAMENTAL GRASSES,
AND GROUND COVER

Working Group for *Phytophthoras* in Native Habitats

October 2016

Guidelines to Minimize *Phytophthora* Contamination in Restoration Projects

These guidelines aim to avoid contamination of restoration sites with exotic pathogenic *Phytophthora* species or other plant pathogens during planting and related activities.

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Definitions:

- ∨ **Holding facility or nursery:** A facility where nursery stock is maintained for a short to extended period of time prior to planting. Plant maintenance activities may include irrigation, fertilization or light pruning, as necessary. Nurseries involved in most other activities, including propagation or repotting are considered production nurseries.
- ∨ **Job site:** The job site includes areas for planting, soil stockpiling, parking, and access roads within and leading to the site.
- ∨ **Nursery stock:** All types of nursery grown plants.
- ∨ **Planting area:** Area being planted for habitat restoration, erosion control, or other purposes.
- ∨ **Planting site:** An individual planting basin or other spot, typically no larger than one square yard, where an individual plant or several grouped plants will be installed.
- ∨ **Sanitize:** Clean and treat with a sanitizing agent or via a lethal heat exposure to kill plant pathogens present as external contamination.
- ∨ **Sanitizing agent:** Materials such as bleach (sodium hypochlorite solutions), alcohol, quaternary ammonium compounds, and peroxides that can directly kill exposed propagules of *Phytophthora* or other plant pathogens when used properly. Most sanitizing agents can also kill a wide variety of bacteria and deactivate many viruses. Note that most materials referred to as fungicides are applied to plants to suppress disease but may not kill the pathogens and are not sanitizing agents.

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I. Construction projects

In an effort to minimize the spread of plant pathogens the exterior and interior of all equipment and tools must be clean and free of debris, soil and mud (including tires, treads, wheel wells and undercarriage) prior to arrival at a new job site.

General guidance – suggested standard operating procedures:

- a. Vehicles need to stay on established roads unless infeasible.
- b. In general, vehicles and equipment need to be maintained clean – interior and exterior free of mud, debris and soil especially during the wet season.
- c. In general, work shoes need to be kept clean- inspect shoe soles and knock mud, debris and soil off treads before moving to a new job site.
- d. To minimize the potential for spreading potentially contaminated soil and time required for decontamination, if possible, avoid vehicle traffic and field work when soils are wet enough to stick readily to shoes, tools, equipment and tires.

II. Planting at Field Sites

Overview: Three general routes for the spread of *Phytophthora* and other soilborne plant pathogens are addressed in these guidelines. These routes are (1) contamination of planting material, including clean nursery stock, and other materials installed at the site, (2) inadvertent introduction of pathogens to a job site from other outside sources (e.g., via contaminated equipment), and (3) potential movement of undetected contamination within the planting area.

These guidelines assume that all nursery stock was originally grown under phytosanitary conditions and tested as remaining free from disease in the nursery (refer to nursery guidelines). These guidelines address how to protect the planting area from subsequent contamination during the delivery, storage onsite, and installation of planting stock and materials.

1. Prevent contamination of clean nursery stock or other clean plant materials

Planting stock shall be protected from potential contamination from the point that it leaves the production nursery or collection site until planting. Note that nursery stock has a high risk of infection by *Phytophthora* species if exposed to these pathogens. Excluding these pathogens provides the only viable option for maintaining outplanted nursery stock free of *Phytophthora*.

1.1. Maintaining nursery stock in a holding facility

When holding stock for an extended period (after delivery from production nursery and before planting), the following practices need to be followed to prevent contamination of the nursery stock with *Phytophthora*.

- 1.1.1. Delivered nursery plants that will be held before planting shall be transferred to cleaned and sanitized raised benches and maintained as described in "Guidelines to Minimize *Phytophthora* Pathogens for holding (non-production) nurseries at restoration sites, Section 3."

1.2. Handling and transporting nursery plants at the job site

- 1.2.1. Nursery plants shall be transported on or in vehicles or equipment that have been cleaned before loading the stock. Truck beds, racks, or other surfaces need to be swept, blown with compressed air and/or power washed as needed so they are visibly free of soil and plant detritus. More information on sanitizing surfaces are described in the Appendix.
- 1.2.2. Keep plants in sanitized vehicles or on sanitized carts, trailers, etc. until delivered to their planting sites. (More information may be found in sections 1.3.3. and 1.3.4.)
- 1.2.3. At the job site, plants shall be handled to prevent contamination until delivered to each planting site. Nursery stock shall not be placed on the soil or other potentially contaminated surfaces until they are placed at their specific planting sites.
- 1.2.4. If it is necessary to offload plants at the job site, plants may be placed on clean waterproof plastic tarps or other clean, sanitized surfaces. If tarps are used for holding plants, one surface needs to be dedicated for contact with nursery stock and will be cleaned and sanitized to maintain phytosanitary conditions.

1.3. Other planting site inputs

- 1.3.1. Washing, soaking, or irrigation of plant material shall be conducted using clean water sources as specified in the Appendix below. Untreated surface waters should not be used for these purposes.
- 1.3.2. On-site or off-site collection of plant materials, including seed and cuttings for direct planting, shall be conducted in a phytosanitary manner (see guidelines for collection practices at www.calphytos.org).
- 1.3.3. Prior to delivery to the planting areas, mulch, compost, soil amendments, inoculants, and other organic products need to be examined and determined to be low-risk for pathogen introduction. Acceptable materials are those that are free of contamination by plant pathogens based on their composition or manufacturing conditions, or that have been exposed to an effective heat treatment to eliminate pathogens. Such materials must be handled and stored in a manner that prevents contamination. At the job site, delivered materials shall be handled to prevent contamination until delivered to each planting site in the same manner specified for nursery stock in section 1.2 above.
- 1.3.4. All other materials to be installed at the site shall be of new or sanitized material that has not been stored in contact with soil, untreated surface waters, or other potentially contaminated materials. This includes irrigation supplies (such as pipe, fittings, valves, drip line, emitters, etc.), erosion control fabrics, fencing, stakes, posts, and other planting site inputs.

2. Cleaning and sanitation required before entering planting area to prevent introducing contamination from other locations

Phytophthora contamination can be present in agricultural and landscaped areas, in commercial nursery stock, and in some infested native or restored habitat areas. Contamination can be spread via soil, plant material and debris, and water from infested areas. Arriving at the site with clean vehicles, equipment, tools, footwear, and clothing helps prevent unintentional contamination of the planting site from outside sources.

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2.1. Vehicles, equipment, and tools

- 2.1.1. Equipment, vehicles and large tools must be free of soil and debris on tires, wheel wells, vehicle undercarriages, and other surfaces before arriving at the planting area. A high pressure washer and/or compressed air may be used to ensure that soil and debris are completely removed. Vehicles that only travel and park on paved roads do not require external cleaning.
- 2.1.2. The interior of equipment (cabs, etc.) should be free of mud, soil, gravel and other potentially contaminated material. Interiors should be vacuumed, washed, and/or treated with sanitizing agents as needed to eliminate pathogen propagules that could be transferred to the planting area.
- 2.1.3. Small tools and other small equipment (including hoses, quick couplers, hose nozzles, and irrigation wands) need to be washed to be free of soil or other contamination and sanitized (see Appendix).
- 2.1.4. Hoses shall be new or previously used only for clean water sources (see Appendix).

2.2. Footwear and clothing

- 2.2.1. Soles and uppers of footwear need to be visibly free of debris and soil before arriving at the planting area. (See the Appendix for more details.)
- 2.2.2. At the start of work at each new job site, worker clothing shall be free of all mud, soil or detritus. If clothing is not freshly laundered, all debris and adhered soil should be removed by brushing with a stiff brush.
- 2.2.3. Gloves and non-porous knee pads must be new (if disposable) or laundered/sanitized at the start of each work day, and/or clean coveralls must be worn. Non-disposable gloves should be made of or coated with material, such as nitrile, that can be sanitized.

3. Prevent potential spread of contamination within planting areas

Phytophthora can also be spread within plantings areas if some portions of the site are contaminated. However, it is not possible to identify every portion of a planting area that may contain *Phytophthora*. Because *Phytophthora* contamination is not visible, working practices should minimize the movement of soil within the planting area to reduce the likelihood of pathogen spread.

Note that areas with higher risk of *Phytophthora* infestation include areas adjacent to planted landscaping, areas previously planted with *Phytophthora*-infected stock, areas with existing or recently removed woody vegetation, disturbed wetlands, and areas directly along watercourses. Areas with low risk of contamination typically include upland sites with only grassy vegetation or sites where surface soils have been removed.

3.1. Worker training and site access

- 3.1.1. Before entering the job site, field workers need to receive training that includes information on *Phytophthora* pathogens and how to prevent the spread of these and other soilborne organisms by following approved phytosanitary procedures. Workers should also be informed about any site-specific phytosanitary practices before work commences.

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- 3.1.2. Do not bring more vehicles into the planting area than necessary and keep vehicles on surfaced or graveled roads whenever possible to minimize potential for soil movement.
- 3.1.3. Travel off roads or on unsurfaced roads should be avoided when soil and road surfaces are wet enough that soil will stick to vehicle tires and undercarriages.
- 3.1.4. To allow for adequate decontamination of equipment, tools, gloves, and shoes, avoid planting under overly wet conditions or when soil is saturated.

3.2. Minimize unnecessary movement of soil and plant material within the planting area, especially from higher to lower risk areas

- 3.2.1. Brush off soil from tools and gloves when moving between successive planting sites to prevent repeated collection and deposition of soil across multiple sites.
- 3.2.2. Avoid contaminating clothing with soil during planting operations. Brush off soil accumulations before moving from one planting site to the next. Use nonporous knee pads that are cleaned between planting sites if kneeling is necessary.
- 3.2.3. When possible, plant nursery stock from a given block in the same local area rather than spreading it widely. If a problem is associated with a given block of plants, it will be easier to detect and deal with it if the plants are spatially grouped.
- 3.2.4. Phase work to minimize movement between areas with high and low risk of contamination. Where possible, complete work in low risk areas before moving to higher risk areas. Alternatively, assign personnel to working in either high or low risk areas exclusively to reduce the need for decontamination.
- 3.2.5. Clean soil and plant debris from large equipment and sanitize hand tools, buckets, gloves, and footwear when moving from higher risk to lower risk areas or when moving between widely separated portions of the planting area.
- 3.2.6. All non-plant materials to be installed at the site (irrigation equipment, erosion control fabric, fencing, etc.) shall be handled to prevent movement of soil within the site, especially movement from higher risk to lower risk areas. Materials should be kept free of soil contamination by maintaining them in clean vehicles or carts, trailers, etc., or stockpiling in elevated dry areas on clean tarps until used.

4. Clean water specifications

Objective: use only uncontaminated, appropriately-treated water for irrigation.

- 4.1.1. Water used for irrigating plants needs to be uncontaminated. See Appendix for specifications.

Appendix

A. Procedures for sanitizing tools, surfaces, and footwear

Surfaces and tools should be clean and sanitized before use. Tools and working surfaces (e.g., plant carts) should be smooth and nonporous to facilitate cleaning and sanitation. Wood handles on tools should be sealed with a waterproof coating to make them easier to sanitize.

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Before sanitizing items, remove all soil and organic material (roots, sap, etc.) from their surfaces. If necessary, use a detergent solution and brush to scrub off surface contaminants. The sanitizing agent may also be used as a cleaning solution. Screwdrivers or similar implements may be needed to clean soil out of crevices or shoe treads. Brushes and other implements used to help remove soil must be visibly clean and sanitized after use.

After surface soil and contamination are removed, treat the surface with one of the following sanitizing agents, allowing the appropriate contact time before rinsing. If surfaces are clean and dry, wet surfaces thoroughly and allow for the appropriate contact time listed. If the sanitizer has been used to help clean the surface, use fresh sanitizer to rinse off any dirty solution and then allow the required contact time. If treated surfaces are wetted with water, the sanitizing solution will become diluted. Apply enough sanitizer to completely displace the water film and then allow the required contact time. Sanitizing agents may be applied with spray bottles to thoroughly wet the surface. Observe all appropriate safety precautions to prevent contact with eyes or skin when using these solutions.

- 70-90% ethyl or isopropyl alcohol - spray to thoroughly wet the surface and allow to air dry before use
- freshly diluted bleach solution (0.525% sodium hypochlorite, Table 1) for a minimum of 1 minute (due to corrosivity, not advised for steel or other materials damaged by bleach)
- quaternary ammonium disinfectant - use according to manufacturer recommendations, making sure that the label indicates that the product is suitable for your use situation and has activity against *Phytophthora* when used as directed. Solution should be freshly made or tested to ensure target concentration.

Table 1. Dilutions of commonly available bleach products needed to obtain approximately 0.525% sodium hypochlorite concentrations (5000 ppm available chlorine).

Percent sodium hypochlorite in bleach	Parts bleach	Parts water	Diluted bleach percent sodium hypochlorite
5.25%	1	9	0.525%
6.0%	1	10.4	0.526%
8.25%	1	14.6	0.529%
8.3%	1	14.8	0.525%

For example, adding 100 ml of 5.25% bleach to 900 ml of water will make 1000 ml of 0.525% NaOCl solution. If using 8.3% bleach, add 100 ml of bleach to 1480 ml of water to make 1580 ml of 0.525% NaOCl.

B. Clean water specifications

Surface waters, including untreated water from streams or ponds and nursery runoff, can be sources of *Phytophthora* contamination. Only uncontaminated water or water that has been effectively treated to remove or kill *Phytophthora* should be used for rinsing or irrigating plant material.

5.1. Water used for irrigation shall be from treated municipal water supplies or wells and delivered through intact pipes with backflow prevention devices. Tertiary-treated municipal recycled water is acceptable.

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- 5.2. If well water is used, wellheads shall be protected from contamination by surface water sources.
- 5.3. Untreated surface waters and recycled nursery runoff shall not be used, and plants shall not be held where potential contamination from such sources is possible via splash, runoff, or inundation.
- 5.4. Irrigation equipment must be kept free of contamination that could be transferred to irrigation water or plants. All hoses, wands, and nozzles, and hand irrigation equipment must either be new or sanitized before use. Drip irrigation and other sprinkler parts should be new or sanitized. Hose ends, wands, or nozzles that become contaminated with soil or mud during use should be cleaned and sanitized before being used further.