# SECTION 05 12 13

# ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS)

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Requirements regarding the appearance and surface preparation of Architecturally Exposed Structural Steel (AESS). Refer to Section 05 50 00 Miscellaneous Metals for additional requirements regarding steel work not included in this section.

2. This section applies to members noted on Architectural drawings as “AESS”. The following structural steel elements and connections shall be supplied and erected per AESS 3, from six inches below Finished Grade Elevation to top of fabrication, as follows.

   a. Canopy: Entire structural steel fabrication, including built-up columns; beams; brackets; trim plates, tabs, and equipment supports.
   b. Light Poles: Entire structural steel fabrication, including built-up columns, arms, brackets and equipment supports.
   c. Windscreen Supports: Entire structural steel fabrication, including HSS tube columns, arms and supports.

### 1.2 RELATED SECTIONS

A. Section 05 12 23: Structural Steel

B. Section 05 50 00: Miscellaneous Metals

C. Section 09 90 00: Painting and Coatings

### 1.3 REFERNCES

A. American National Standards Institute (ANSI)/American Institute of Steel Construction (AISC):

1. ANSI/AISC 303-16- Code of Standard Practice for Steel Buildings and Bridges (COSP).

B. U. S. Department of Labor Occupational Health and Safety Administration (OSHA).

## 1.4 DEFINITIONS

A. Architecturally Exposed Structural Steel: Structural Steel conforming to one of the categories of Architecturally Exposed Structural Steel or AESS Refer to ANSI/AISC 303-16 “Code of Standard Practice for Steel Buildings and Bridges”.

B. AESS 3: Structural Steel designated as “AESS 3 in the contract documents and conforming to ANSI/AISC 303-16, Chapter 10 definition of AESS3. These are feature elements viewed at a distance of less than 20 feet. The art of metalworking is intended to be visible to the viewer.

## 1.5 SUBMITTALS

A. Product Data for each type of product specified. Submit “Special Coatings” under Division 9.

B. Fabrication Documents: Detailing for fabrication of AESS components.

1. Provide erection documents clearly indicating which members are AESS members and the AESS category of each part.

2. Include details that clearly identify all the requirements listed in sections 2.03 "Fabrication” and 3.03 “Erection" of this specification for each part. Provide connections for exposed AESS consistent with concepts shown on the architectural or structural drawings.

3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined herein.

4. Indicate orientation of HSS seams and mill marks (where applicable).

5. Indicate type, size, finish and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections.

6. Clearly indicate which surfaces or edges are exposed and what class of surface preparation is being used.

7. Indicate special tolerances and erection requirements as noted on the drawings or defined herein.

8. Indicate vent or drainage holes for HSS members.

C. Mock-Up: Provide mock ups of the nature and extent indicated on the contract documents.

1. Locate mockups on-site or in the fabricator’s shop as directed by Architect. Mockups shall be full size unless the Architect approves smaller models. Alternatively, when a mockup is not practical, the first piece of an element or connection can be used to determine acceptability.

2. Notify the Architect one week in advance of the dates and times when mockups will be available for review.

3. Demonstrate all applicable AESS characteristics for the specified category of AESS on the elements and joints in the mock up.

4. Build mockups using member sizes and materials indicated for final Work.

5. The mock up shall demonstrate weld quality and contouring of the welds at the aligned walls of the members.

6. The mock up shall demonstrate the specified surface preparation and finish coating.

7. HSS members shall extend at least 6" from the joint in the mock-up.

8. Obtain Architect’s written approval of mockups before starting fabrication.

9. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.

    a. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed work.

D. Samples: Provide samples of specific AESS characteristics Samples may be small size samples or components of conventional structural steel demonstrating the following specific AESS characteristics.

1. Continuous weld appearance.

2. Sharp edges ground smooth.

3. Surface preparation.

4. Fabrication mark removal.

5. Weld show-through.

E. Submit following Informational Submittals:

1. Test Reports: Indicate compliance with specified performance requirements.

2. Certifications specified in Quality Assurance article.

3. Qualification Data: Manufacturer's and applicator's qualification data.

4. Manufacturer's Instructions: Include mixing, thinning, and curing requirements; application temperature ranges; and required surface preparation.

5. Test reports for film thickness, adhesion and soluble salt.

F. Closeout Submittals:

1. Warranty: Submit specified warranty.

## 1.6 QUALITY ASSURANCE

A. Single Source Responsibility: Provide products of single manufacturer for use in each coating system. Do not mix products of different manufacturers without approval of Engineer and manufacturers involved.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum 5 years documented experience.

C. Applicator Qualifications: Company specializing in application of coatings scheduled with 3 years documented experience; licensed or approved by coating manufacturer.

D. Regulatory Requirements: Comply with CPSC 16 CFR 1303 and other applicable federal, state, and local regulations limiting lead content of coatings to be applied.

E. Certifications: Submit certification from manufacturer that materials furnished for use on this Project meet or exceed specified requirements and comply with applicable federal, state, and local requirements regarding lead and VOC content.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products in accordance manufacturer’s instructions.

B. Deliver products to site in manufacturer's sealed and labeled containers; inspect to verify compliance with specified requirements.

C. Label containers to indicate manufacturer's name, product name and type of coating, brand code or stock number, date of manufacture, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

D. Store coating materials in tightly covered containers in well ventilated area at ambient temperatures of 45 degrees F minimum and 90 degrees F maximum, unless required otherwise by manufacturer. Maintain containers in clean condition, free of harmful materials and residue with labels in legible condition.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

## 1.8 PROJECT CONDITIONS

A. Environmental Conditions: Comply with more restrictive conditions under which coatings may be applied; following requirements or manufacturer's requirements.

1. Provide continuous ventilation during application of coatings to exhaust hazardous fumes.

2. Provide heating necessary to maintain surface and ambient temperatures within specified limits.

3. Maintain temperature and humidity conditions for minimum 24 hours before, during, and 48 hours after application of finishes.

4. Do not permit wide variations in ambient temperatures which might result in condensation on freshly coated surfaces.

5. Provide illumination of not less than 80 footcandles measured mid-height at substrate surface during application of coatings.

6. Apply coatings only when ambient and surface temperatures are between 55 degrees F and 90 degrees F.

7. Do not apply coatings under following conditions:

   a. When surfaces are damp and wet.
   b. During snow, rain, fog, and mist.
   c. When relative humidity is less than 20 percent or exceeds 85 percent.
   d. When temperature is less than 5 degrees F above dew point.
   e. When dust may be generated before coatings have dried.
   f. In direct sunlight.
   g. When wind velocity is above 20 mph.

8. Application of coatings may continue during inclement weather provided work areas and surfaces to be coated are enclosed and specified environmental conditions are maintained.

## 1.9 WARRANTY

A. Warrant against defects in material and workmanship for 5 years.

B. Repair or replace defects occurring during warranty period.

C. Defects include but are not limited to holidays, wrinkling, pinholes, crazing and cracking, loss of adhesion to substrate, deficient thickness, improper materials and workmanship.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Tnemec Company, Inc., Kansas City, MO.

2. Carboline Comany, Saint Louis, MO.

3. Substantially equivalent high-performance coating system conforming to these

specifications, provided by a single manufacturer, and approved in writing by OCTA.

## 2.2 COATING MATERIALS - GENERAL

A. Coatings:

1. Furnish coatings with uniform, homogeneous mixture.

2. Provide cured coating free of streaks and sags, and yielding specified finish.

B. Paint Maximum Product Emissions Limits: Top coat and primer interior paints must meet or not exceed the VOC (Volatile Organic Compounds) limits of the current requirements of Cal-GREEN Table 5.504.4.3 and Rule 1113 as amended of the Southern California Air Quality Management District (SCAQMD) for VOC Content Limits for Architectural Coatings.

C. SCAQMD Requirements for typical high performance coatings:

1. Primers, Sealers, and Undercoaters: 100 grams per liter of product minus water

2. Industrial Maintenance Coatings: 100 grams per liter of product minus water

3. Non-flats: 50 grams per liter of product minus water.

## 2.3 HIGH-PERFORMANCE COATINGS SCHEDULE

A. Coating System - Exterior Galvanized and Non-Ferrous Metals.

1. Color and Sheen: Refer to color schedule.
2. Prime Coat: P2 Epoxy, DFT 4 mil.
3. Intermediate Coat: P2 Epoxy, DFT 4 mil.
4. Top Coat: U1 Polyurethane, DFT 5 mil.
5. Total DFT: 13 mil.

B. Coating System - Exterior Non-Galvanized Steel.

1. Color and Sheen: Refer to color schedule.
2. Prime Coat: P1 Zinc Rich Primer, DFT 3 mil.
3. Intermediate Coat: P2 Epoxy, DFT 4 mil.
4. Top Coat: U1 Polyurethane, DFT 5 mil.
5. Total DFT: 12 mil.

## 2.4 PRIMERS

A. Type P1 - Organic Zinc-Rich Primers:

1. Manufacturers and Products:

a. Tnemec Company, Inc.: 94$H_2O$ Hydro-Zinc.

b. Carboline Company, Carbozinc 859 VOC,
c. Substantially equivalent Zinc-Rich Primer approved by OCTA

2. Physical Requirements:

a. Solids content by volume: 63 percent minimum.
b. Metallic zinc content: 83 percent minimum.
c. VOC Content (Unthinned): 96 g/L.

3. Performance Requirements:

a. General: Tests are based on one coat at manufacturer's recommended DFT.
b. Adhesion: ASTM D4541, not less than 1500 psi pull, average of three trials.
c. Salt Spray (Fog): ASTM B117, no blistering, cracking, softening, or delamination of film. No more than 1 percent rust on plane and no more than 1/4 inch rust creepage at scribe and no rusting at edges after 20,000 hours exposure.

B. Type P2 - Intermediate Coating:

1. Manufacturers and Products:

a. Tnemec Company, Inc.: Series L69 Epoxoline II.
b. Carboline Company: Carboguard 890 EF.
c. Substantially equivalent Epoxy Intermediate Coating approved by OCTA

2. Physical Requirements:

a. Solids Content by Volume: 67 percent minimum.
b. VOC Content (Unthinned): 98 g/L.

3. Performance requirements:

a. General: Tests are based on one coat at manufacturer's recommended DFT.
b. Adhesion: ASTM D4541, not less than 900 psi pull, average of five trials.
c. Salt Spray (Fog): ASTM B117, no blistering, cracking, softening, or delamination of film. No more than 1/32 inch rust creepage at scribe after 1500 hours exposure.

## 2.5 POLYURETHANE COATINGS

A. Type U1 - High Build Acrylic Polyurethane Coatings:

1. Locations: Canopy column assemblies.

2. Manufacturers and Products:

a. Tnemec Company, Inc.: Series 750 UVX
b. Carboline Company: Carbothane 134 VOC, gloss.
c. Substantially equivalent High Build Acrylic Polyurethane Coating approved by OCTA

3. Physical Requirements:

    a. Solids Content by Volume: 57 percent minimum.
    b. Sheen: Semi-gloss.
    c. VOC Content (Unthinned): 99 g/L.

## 2.6 ACCESSORY MATERIALS

A. Cleaners:

1. General: Mildewcide, TSP (tri-sodium phosphate), acidic-detergent, zinc sulfate, sodium metasilicate, and solvents:

2. Commercially available.

3. Non-damaging to surface being cleaned

4. Complying with PDCA Specification Manual.

5. Acceptable to coating manufacturer.

B. Metal Conditioner: Proprietary phosphoric acid based, etching type solution; acceptable to coating manufacturer.

C. Rust Inhibitor:

1. Water containing 0.32 percent by weight of sodium nitrite and 1.28 percent by weight of secondary ammonium phosphate (dibasic).

2. Water containing 0.2 percent by weight of chromic acid, sodium chromate, sodium dichromate, or potassium dichromate.

D. Spackling compound, putty, fillers, liquid de-glosser, patching plaster, thinners, and materials not indicated but required to achieve finishes. Compatible with coating system and acceptable to coating manufacturer.

E. Do not use products of different manufacturers in combination, unless approved by each manufacturer of products involved.

## 2.7 MIXING

A. Use factory prepared colors matching approved samples. Site tinting will not be permitted.

B. Thoroughly mix and stir coating components before use to ensure homogeneous dispersion of ingredients. Prior to application, blend multiple containers of same material and color by pouring from one container to another several times to ensure uniform consistency, color, and smoothness.

C. Mix in clean pails of material recommended by manufacturer to avoid contamination.

D. Mix only enough of multi-part coatings to allow application within pot life of mixture.

E. Remove film which may form on surface of material in containers and strain material before using. Stir frequently during use to maintain pigments in suspension. Do not stir film into material.

F. Apply coatings of consistency instructed by manufacturer.

G. Thinning:

1. Provide thinners approved by coating manufacturer.

2. Add thinners within manufacturer recommended limits.

## 2.8 COLORS AND SYSTEMS

A. Colors: Custom color coating as selected by Engineer.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine conditions and proceed with Work when substrates and environmental conditions are acceptable.

B. Measure moisture content of surfaces using recently calibrated electronic moisture meter. Do not apply coatings if moisture content of surfaces exceeds lesser of percentages listed below or those required by coating manufacturer. If excess moisture content exists and cannot be reduced, obtain written approval of coating manufacturer before application of coatings.

1. Gypsum board and gypsum plaster: 17 percent.

2. Masonry, Concrete, CMU, and Portland Cement Plaster: 17 percent for solvent reduced coatings. Test concrete floors in accordance with ASTM D4263.

C. Prior to applying alkali and acid sensitive coatings, test substrate pH. Substrate pH shall not exceed pH tolerance recommended by manufacture.

## 3.2 PREPARATION

A. Protect completed construction from damage. Furnish drop cloths, shields, and protective methods to prevent spray, splatter or droppings from disfiguring other surfaces.

B. Remove surface hardware, mechanical diffusers, escutcheons, registers, electrical plates, light fixture trim, fittings, fastenings and similar items prior to preparing surfaces for finishing. Provide surface-applied protective masking for non-removable items. Carefully store removed items for reinstallation.

C. Remove mildew by scrubbing with mildewcide. Rinse thoroughly with clean water.

D. Before beginning application of coatings, ensure surfaces are clean, dry, and free of dirt, dust, rust, and rust scale, oil, grease, mold, mildew, algae, efflorescence, release agents and other harmful materials which could adversely affect coating adhesion and finished appearance.

## 3.3 SURFACE PREPARATION FOR NEW WORK

A. General:

1. Correct minor defects.

2. Remove temporary labels, wrappings, and protective coverings from surfaces to be coated.

3. Seal stains, marks, and other imperfections which may bleed through surface finishes.

B. Steel - Unprimed:

1. Remove weld spatter by chipping or grinding.

2. Clean interior and weather protected steel in accordance with SSPC SP7, "Brush-Off Blast Cleaning".

3. Clean exterior steel permanently exposed to elements in accordance with SSPC SP6 "Commercial Blast Cleaning".

4. Apply primer, or metal conditioner to bare surfaces in accordance with coating schedule, paying particular attention to abrasions, welds, bolts, and nuts. Allow to set as recommended by manufacturer.

C. Steel - Shop Prime Coated:

1. Remove loose shop primer and rust; sand to feather-edge at adjacent sound primer by cleaning in accordance with SSPC SP2 "Hand Tool Cleaning" and SP3 "Power Tool Cleaning".

2. Apply primer or metal conditioner to abrasions, welds, bolts, and nuts in accordance with coating schedule. Allow to set as instructed by manufacturer. Rinse with clean water with rust inhibitor mixed-in or applied primer or metal conditioner immediately following rinse. Allow to dry.

3. Prime coat bare areas immediately.

4. Apply specified primer to bare steel and previously primed steel surfaces scheduled to receive high performance coatings.

D. Galvanized Steel: Remove soluble and insoluble contaminants and corrosion. Sweep (Abrasive) Blasting per ASTM D6386 to achieve a uniform anchor profile (1.0 - 2.0 mils).

## 3.4 SURFACE PREPARATION OF PREVIOUSLY APPLIED COATED SURFACES

A. General:

1. Remove cracked and deteriorated sealants and calking.

2. Remove chalk deposits and loose, blistered, peeling, scaling, or crazed finish to bare base material or sound substrate by scraping and sanding.

3. Wash surfaces with solution of TSP to remove wax, oil, grease, and other harmful material; rinse, and allow to dry. Exercise caution so TSP solution does not soften existing coating.

4. Abrade glossy surfaces by sanding or wiping with liquid de-glosser.

5. Test compatibility of existing coatings by applying new coating to small, inconspicuous area in accordance with ASTM D3359. If new coatings lift or blister existing coatings, request recommendation from Engineer.

6. Apply specified primer to surfaces scheduled to receive coatings.

B. Metal:

1. Remove rust from surfaces to bare metal in accordance with SSPC SP6 "Commercial Blast Cleaning".

2. Exercise care not to remove galvanizing.

3. Complete preparation as specified for new work.

## 3.5 APPLICATION

A. General:

1. Coat surfaces specified, scheduled, illustrated, and otherwise identified unless specifically noted otherwise.

2. Apply coatings of type, color, and sheen as scheduled.

3. Apply products in accordance with manufacturer's instructions. Use application materials, equipment, and techniques as instructed by coating manufacturer and best suited for substrate and type of material being applied.

4. Do not apply finishes to surfaces that are improperly prepared.

5. Quantify of coats specified are minimum quantify acceptable.

6. Apply coating systems to achieve scheduled total dry film thickness.

7. Apply material at not less than manufacturer's instructed spreading rate.

8. Do not exceed maximum single coat thickness instructed by coating manufacturer.

9. Do not double-back with spray equipment building up film thickness of two coats in one pass.

10. Ensure that edges, corners, crevices, welds, and exposed fasteners, receive dry film thickness equivalent of flat surfaces.

11. Finish edges of coatings adjoining other materials and colors sharp and clean manner, without overlapping.

B. Prime Coats:

1. Apply initial coat to surfaces as soon as practical after preparation and before subsequent surface deterioration.

C. Intermediate and Top Coats:

1. Allow previously applied coat to dry before next coat is applied.

2. Sand and dust lightly between coats as recommended by coating manufacturer.

3. Apply each coat to achieve uniform finish, color, appearance, and coverage free of brush and roller marks, runs, misses, visible laps and shadows, hazing, bubbles, pin holes, and other defects.

4. If stains, undercoats, and other conditions show through final topcoat, correct defects and apply additional topcoats until coating film is of uniform finish, color, and appearance.

D. Mechanical and Electrical Items:

1. Refer to Division 25 - Mechanical and Division 26 - Electrical for schedule of color coding and identification banding of equipment, ductwork, piping, and conduit. Color code equipment, piping, conduit and exposed ductwork in accordance with requirements indicated.

2. Prior to finishing mechanical and electrical items; remove and finish separately louvers, grilles, covers, and access panels. Replace when dry.

3. Do not apply coatings over name plates, tags, and other equipment identification.

E. Replace trim, fittings, and other items removed for finishing.

## 3.6 FIELD QUALITY CONTROL

A. Test film thickness of each coat with wet film gage on each surface to ensure coatings are being applied to proper thickness.

B. Perform adhesion tape test for each substrate material in accordance with ASTM D3359.

C. Owner requires testing of painting for soluble salts. Coordinate requirements and test procedures with Owner.

D. Request review of each applied coat by Engineer and manufacturer's representative before application of successive coats. Only reviewed coats will be considered in determining number of coats applied.

E. Immediately prior to Substantial Completion, perform detailed inspection of coated surfaces and repair or refinish abraded, stained, and otherwise disfigured surfaces.

F. Testing: Owner reserves right to employ independent testing agency to verify acceptability of substrates and conformance of coating materials to specified requirements; and to test coating quality and dry mil thickness.

G. If test results show that material does not comply with specified requirements, remove noncomplying coatings, recoat with complying material, and pay costs of additional testing to ensure compliance.

## 3.7 CLEANING

A. Promptly remove spilled, splashed, and spattered coatings. Clean spots, oil, and other soiling from finished surfaces using cleaning agents and methods which will not damage materials.

B. If completed construction is damaged beyond normal cleaning and repair by coating operations, replace damaged items at no additional cost to Owner.

C. Maintain premises and storage areas free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

D. Collect waste, cloths, and material which may constitute fire hazards and place in closed metal containers; remove from site daily along with empty containers.

## 3.8 PROTECTION

A. Protect work of other trades against damage from coating activities. Correct damage by cleaning, repairing, replacing, and recoating as acceptable to Engineer.

B. Provide "Wet Paint" signs and other methods to protect newly coated surfaces. Remove when directed or when no longer needed.

## PART 4 MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT

A. Architecturally Exposed Structural Steel (AESS) will be measured by the unit or fraction thereof furnished and completed in accordance with the Contract Documents and as measured by the Engineer. The quantity of Structural Steel measured and paid under Section 01 12 23 Structural Steel will be used as the basis for the measurement of percent complete for AESS.

### 4.02 PAYMENT

A. Architecturally Exposed Structural Steel furnished and completed in accordance with the Contract Documents will be paid for at the Contract Unit Price, as listed on the Schedule of Quantities and Prices. Payment for AESS shall be considered full compensation for providing and constructing structural steel items conforming to the additional requirements specified for AESS under this Section. This price shall include full compensation for furnishing all labor, Materials, tools, equipment, supplies, supervision, and incidentals, and doing all work, as shown on the Plans, and as specified in these Specifications.

B. All Work of this Section not paid under 4.02.A of this section shall be considered incidental to work measured and paid under Section 05 12 23 Structural Steel and Section 09 90 00 Painting and Coating.

**END OF SECTION**

# SECTION 05 12 23

# STRUCTURAL STEEL

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Principal work in this Section:

1. Canopy, Light Poles, Point Supported Glass Wind Screen, including structural steel framing, beams embedded in concrete, columns, corrugated metal, gutter, column caps, cladding and trim complete with all shop and field connections.

2. Architecturally Exposed Structural Steel as defined in Section 05 12 13.

3. Furnish anchor bolts, loose bearing plates, wedges, guying and bracing as required for this work.

B. Related Specification Sections include but are not necessarily limited to:

1. Section 03 31 00 – Structural Concrete

2. Section 05 12 13 – Architecturally Exposed Structural Steel

3. Section 05 55 00 – Miscellaneous Metals

4. Section 09 90 00 – Painting and Coatings

### 1.02 REFERENCES

A. City of Anaheim Department of Public Works and City of Anaheim Building Division:

1. Project permits from the City of Anaheim and associated City inspection requirements

2. Current edition of the Standard Specifications for Public Works Construction (SSPWC) and associated City of Anaheim Standard Specification Supplement to the SSPWC.

B. Comply with all applicable local, State and Federal Codes Standards, Specifications and Recommended Practices, latest edition thereof and in particular:

1. AWS D1.1: Structural Welding Code

2. AWS A2.4: Symbols for Welding and Non-Destructive Testing

3. AISC Steel Construction Manual ASD – 9th Edition

4. AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings

5. AISC Code of Standard Practice for Steel Buildings and Bridges

6. Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation - Specifications for Structural Joints Using ASTM A325 Bolts.

7. ASTM A36: Specification for Structural Steel

## 1.03 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals:

1. Shop drawings: Complete shop drawings and erection diagrams for this work. Make submittals as complete as possible on their first submittal.

a) Should more than one submittal be required, later submittals shall clearly identify material added or revised subsequent to previous submittal.
b) Indicate all shop and erection details, including cuts, copes, connections, holes, threaded fasteners, rivets and welds.

2. Current qualifications and certifications for welders used for this Work.

3. Proposed welding sequence and welding qualifications to indicate the method of all welded connections. Identify all welds, both shop and field, in accordance with AWS A2.4.

B. Mill test reports for structural steel as specified.

## 1.04 QUALITY ASSURANCE

A. Fabricator's qualifications: All structural steel fabrication shall be performed in the shop of a fabricator with a current valid AISC Major Building Certificate.

B. Tests to be made and paid for by the Contractor:

1. Foreign-supplied steel or steel that cannot be identified: Make one tension and one bend test for each 50 tons or fractional part thereof, of each shape, heat or melt of stock used.

2. Tests: Take test specimens under the direction of an approved Testing Laboratory and machine to dimensions required by the applicable ASTM Specifications.

C. Tests will not be required for the following:

1. Mill order steel:

   a) Steel ordered from the mill, cut to lengths, identified by heat numbers, and accompanied by mill test reports, may be used without testing provided it conforms to these Specifications.
   b) In case of controversy, make tension and bend tests of the steel in accordance with applicable ASTM standards, either locally or at the mill, as specified hereafter for local stock.

2. Local stock steel: Local stock structural steel that can be identified by heat number and is accompanied by mill test reports may be used without testing provided it conforms to these Specifications.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Architecturally Exposes Structural Steel (AESS): Refer to Section 05 12 13

B Structural steel: ASTM A 36.

C. Steel tubing: ASTM A 500, Grade B.

D. Steel Pipe: ASTM A53, Grade B, Standard, Schedule 40

E. Fastening materials:

1. High-strength steel bolts, nuts and washers:
   a) Bolts: ASTM A 325, Slip Critical.
   b) Nuts: ASTM A563
   c) Washers: ASTM F436

2. Anchor bolts, nuts and washers: ASTM F1554.

F. Paint primer: Specified in 09900 Painting and Coatings.

G. AESS Painting and Coating System: Refer to Section 05 12 13

### 2.02 FABRICATION

A. For additional requirements for fabrication of AESS, see Section 01 12 13.

B. Fabrication shall be equal to that produced in modern structural steel shops, and shall conform to the applicable provisions contained in the AISC Code of Standard Practice, except where the drawings or these specifications differ they shall take precedence.

C. Wire-brush structural steel before its fabrication to remove all loose mill scale and heavy rust that would prohibit primer from satisfactorily bonding to it. Straighten

structural steel members that do not conform to AISC tolerances by non-injurious methods.

D. Fabricate structural steel in accordance with the referenced AISC specifications and the following tolerances:

1. After punching or working the component parts of a member, remove twists or bends before the parts are assembled.

2. A variation of 1/32 inch will be permissible in the overall length of members with both ends finished for contact bearing, as defined in the AISC Handbook.

3. Members without ends finished for contact bearing, which are to be framed to other steel parts of the structure, may have a variation from the detailed length not more than 1/16 inch for members 30 feet or shorter, and not more than 1/8 inch for members over 30 feet long.

4. Unless otherwise specified, structural members, whether of a single rolled shape or built-up, may vary from straightness within the tolerances allowed for wide flange shapes by ASTM A 6, except that the permissible tolerance for deviation from straightness of compression members shall be 1/1000 of the axial length between points which are to be laterally supported. Sharp kinks and/or bends will be cause for material rejection.

5. Any permissible deviation of depths of girders may result in abrupt changes in depth at splices. Take up all such differences at bolted joints, within the prescribed tolerances, with fill plates. The weld profile may be adjusted at welded joints to conform to the variation in depth provided the minimum cross section of required weld is furnished, and the slope of the weld surface meets AWS requirements.

E. Make all holes by punching or drilling; burned holes will not be acceptable.

F. Prepare and prime all structural steel as follows:

G. 1. For additional requirements for preparation and prime coating of AESS, see Section 01 12 13.

2. Prepare steel in accordance with SSPC-SP10, White Metal. Paint the same day with zinc-rich primer specified applied in accordance with the primer manufacturer’s printed instructions, including minimum dry film thickness.

2. Protect painted work until paint is thoroughly dry. Do not load material for shipment until shop coat is fully dry. Touch-up damaged primer immediately after delivery to site.

## PART 3 - EXECUTION

### 3.01 INSPECTION

Inspect adjacent construction and make sure that all conditions detrimental to the proper and timely execution of this work have been corrected before proceeding.

### 3.02 ERECTION

A. Erect all structural steel in accordance with the Drawings and the referenced AISC Specifications, except provide washers on bolted connections using ASTM A 325 bolts regardless of the tightening method used. Use hardened washers with high strength bolts as required by ASTM A 325.

B. Field assembly:

1. Members and section shall be of sizes, weights, shapes and arrangements indicated, closely fitted and finished true to line and in precise position necessary to allow accurate erection and proper joining of parts in the field.

2. Drifting to enlarge unfair holes will not be allowed.

3. Rolled sections, except for minor details, shall not be heated without prior approval.

C. Contact:

1. Component parts of built-up members shall be well pinned and rigidly maintained in close contact using clamps or temporary bolting during welding.

2. Compression joints depending upon contact bearing shall have bearing surfaces accurately milled perpendicular to their axis, or as detailed.

D. Gas Cutting:

1. Use of a cutting torch is allowed where the metal being cut is not carrying stress during the operation, and provided stresses will not be transmitted through a flame-cut surface.

2. Make gas cuts smooth and regular in contour.

3. To determine the effective width of members to cut, deduct 1/8 inch from the width of the gas cut edges.

4. Make the radius of re-entrant gas cut fillets as large as practicable, but no less than 1 inch.

E. Punching, drilling and reaming:

1. Material may be punched 1/16 inch larger than the nominal diameter of the

bolt, wherever the thickness of the metal is equal to or less than the diameter of the bolt plus 1/8 inch.

2. Where the metal is thicker than the diameter of the bolt plus 1/8 inch, the holes shall be drilled or sub-punched and reamed.

3. The die for sub-punched holes, and the drill for sub-drilled holes, shall be 1/16 inch larger than the nominal diameter of the bolt to be accommodated.

4. Finished holes shall be precisely located to insure passage of bolts through assembled materials without drifting.

5. Enlargement of holes necessary to receive bolts shall be done by reaming.

6. Poor matching of holes will be sufficient cause for rejection.

F. Bolting: Use high-strength steel bolts (A 325, slip-critical, Class A) hot dipped galvanized. Conform to the latest edition of Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts as approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.

G. Structural steel shall be erected by professional riggers and shall be carefully planned and laid out.

1. Erect this work plumb, square and true to line and level, and in precise positions as indicated.

2. Provide temporary bracing and guys wherever necessary to provide for loads and stresses to which the structure may be subjected, including those due to erection equipment and its operation, and leave in place as long as it may be necessary for safeguarding all parts of the work.

H. Temporary connections:

1. As erection progresses, this work shall be securely bolted up as necessary to maintain the steel in proper position while field bolting and welding is being done, and as necessary to take care of dead loads, wind, seismic, and erection stresses.

2. No field welding or high-strength bolting shall be done until this work has been properly aligned, plumbed and leveled.

I. Set column base plates in exact position, both as to alignment, level and elevation and support on steel wedges, or equivalent, until the grout thereunder has thoroughly set.

1. The center of each base shall be true to the column center within 1/16 inch.

2. Plates shall be exactly level on both axes.

J. Sequence: The erection of structural steel shall be carried out in proper sequence with the work of other trades, and shall be framed, bedded, and anchored to related work in strict accordance with the Drawings.

## 3.03 WELDING

A. Welding and welded joints: Detail and execute welds in accordance with the requirements of the American Welding Society Standards D1.1, unless otherwise modified by the referenced AISC Specifications or as otherwise noted on the Drawings.

1. In the event of conflicts, the Drawings shall take precedence.

2. Structural welding shall be done by one of the following processes:

a) Shielded Metal Arch Welding Process
b) Gas-Metal Arc and Flux-Cored Arc Welding
c) Submerged Arc Welding

B. Operators qualifications: Thoroughly trained and experienced in arc welding of structures, capable of making uniformly reliable butt and fillet welds in flat, vertical and overhead positions, and producing neat, consistent work in actual operation.

1. Operators shall be certified in accordance with AWS requirements and shall have a valid local certification.

2. If welder's re-certification is required, it shall be the Contractor's responsibility to obtain it.

C. Storage and care of electrodes: Comply with the combined recommendations of the AWS and the electrode manufacturer's recommendations. When in conflict, comply with the more stringent requirements.

1. The coatings of low-hydrogen type electrodes shall be thoroughly dry when used. Electrodes of any classification that have been wet shall not be used under any conditions.

D. Preparation: Thoroughly clean surfaces to be welded of all paint, grease, scale and foreign matter.

1. Clean welds each time the electrode is changed and chip entire area of hand-guided and controlled flame cut edges before welds are deposited.

2. In general, surfaces made by automatic or mechanically guided and controlled equipment need not be ground or chipped before being welded.

E. Characteristics of welds: After being deposited, welds shall be wire brushed and shall exhibit uniform section, smoothness of welded metal, feather edges without undercuts of overlays and freedom from porosity and clinkers. Visual inspection at edges and ends of fillet welds shall indicate good fusion and penetration into base metal.

F. In assembling and during welding, hold components with sufficient clamps or other adequate means to keep parts straight and in close contact.

1. Take precautions when welding to minimize stress and distortion due to heat.

2. Do not weld in windy weather until adequate wind protection has been provided and set up.

3. Welds or parts of welds found defective may be removed using the air-arc process or power chisels and replaced with satisfactory welds.

G. Tack welds shall be subject to the same quality requirements as the final welds except that:

1. Pre-heat is not mandatory for single pass welds which are re-melted and incorporated into continuous submerged arc welds.

2. Defects such as undercut, unfilled craters and porosity need not be removed before the final submerged arc welding.

3. Tack welds not incorporated into the final weld shall be removed. Tack welds incorporated into the final weld shall be cleaned thoroughly and multiple pass tack welds shall have cascaded ends.

H. Peening, in accordance with AWS Article 309, is allowed at the fabricator's option.

## 3.04 ANCHOR BOLTS

A. Furnish all anchor bolts and connection material to be embedded in the concrete when and as required to maintain job progress.

B. Provide the necessary drawings and templates for the setting of such anchor bolts and connection material in the concrete forms.

C. Perform setting anchor bolts in hardened concrete, necessitated through error or oversight, and in existing concrete work, under the Engineer's direction in suitable drilled holes solidly grouted in place, or embedded in an approved structural epoxy.

## 3.05 GROUTING BEARING PLATES

A. Be responsible for maintaining bearing plates in proper location and in proper level while they are being grouted. Note that all grouting is specified to be performed by Section 03 31 00, Structural Concrete.

## 3.06 TOUCH-UP

A. Clean abraded areas of shop primer to bright metal, and touch-up with same primer used for shop priming. Extend touch-up at least 2 inches onto sound, undamaged primer.

## 3.07 FIELD QUALITY CONTROL

A. Coordinate City of Anaheim Department of Public Works and City of Anaheim Building Division inspection conforming to the requirement of Project permits with the City.

B. The registered Deputy Building Inspector employed by SCRRA will inspect field welding and high-strength bolting of structural steel framing in accordance with Building Code Requirements. Coordinate with the registered Deputy Building Inspector and afford him full and safe access to the work as required for the performance of his duties.

C. The registered Deputy Building Inspector will be required to certify in writing upon completion of this work that all welding and high-strength bolting has been performed in accordance with the Drawings, Specifications, and Building Code Requirements.

# PART 4 - MEASUREMENT AND PAYMENT

## 4.01 MEASUREMENT

A. Structural Steel will be measured by the unit or fraction thereof furnished and completed in accordance with the Contract Documents and as measured by the Engineer. The quantities as contained on the Schedule of Quantities and Prices, or approved schedule of values, as applicable, as derived from the Plans will be used as the basis for this measurement.

B. Canopy Gutter, Gutter Waterproofing, Gutter Trim, Corrugated Metal Deck and End Closure, Galvanized Steel Trim at End Closure, Columns, Column Cladding, Fabricated Column Caps, Column Steel Trim, Equipment Mounting Brackets, Concrete Canopy Column Foundations at Single Columns will be included in this Section and are considered incidental to work under this Section and will be measured by the unit or fraction thereof furnished and completed in accordance with the Contract Documents and as measured by the Engineer.

## 4.02 PAYMENT

A. Structural Steel furnished and completed in accordance with the Contract Documents will be paid for at the Contract Unit Price, as listed on the Schedule of Quantities and Prices. This price shall include full compensation for furnishing all labor, Materials, tools, equipment, supplies, supervision, and incidentals, and doing all work, as shown on the Plans, and as specified in these Specifications, and as directed by the Engineer.

B. The additional costs for supplying and constructing structural steel in compliance with the requirements for Architecturally Exposed Structural Steel (AESS) shall be measured and paid under Section 05 12 13 Architecturally Exposed Structural Steel.

**END OF SECTION**

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# SECTION 05 52 00

# HANDRAILS AND RAILING

## PART 1 - GENERAL

### 1.01 SUMMARY

A. This Section addresses the products, materials and work for the installation of metal hand railing and stainless steel hand railing and metal pedestrian channelization railing as shown on the Contract Plans and as specified in these Specifications, and as directed by the Engineer.

B. Related Specification Sections include but are not necessarily limited to:

1. Section 05 12 23 - Structural Steel

2. Section 09 90 00 - Painting and Coating

### 1.02 REFERENCES

A. AWS D1.1: Structural Welding Code-Steel

B. SSPWC: Standard specifications for Public Works Construction, 2012

C. CALTRANS: State of California Department of Transportation Standard Specifications 2010 Section 83

D. American Iron and Steel Institute: Type 302 and 304 Steel

E. American National Standards Institute (ANSI) ANSI A12.1 Safety Requirements for Floor and Wall Openings, Railings and Toeboards

F. American Society for Testing and Materials (ASTM)

1. A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

2. D4956 Standard Specifications for Retroreflective Sheeting for Traffic Control

G. State of California, Department of Industrial Relations, Division of Occupational Safety and Health (CAL/OSHA): As applicable to railing

H. Use finishes for stainless steel complying with “Metal Finishes Manual” by NAAMM.

I. The sheet Work, except as otherwise indicated or specified, shall comply with “Architectural Sheet Metal Specifications” and “Architectural Sheet Metal Manual” by SMACNA.

J. SCRRA Engineering Standards ES4005, Pedestrian Barricade and Metal Hand Railing Details. Use sleeve post detail from Pedestrian Barricade Detail for Removable Metal Hand Railing.

## 1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00, Submittal Procedures:

1. Shop Drawings: In accordance with the Contract Plans, showing the details and dimensions of all removable metal hand railing and metal hand railings, sleeve post, and posts and fences. Note dimensions which have been field verified.

2. Welding procedures and welder qualifications and welder registration as required by the American Welding Society.

3. Manufacturer's product data for non-shrink, non-ferrous cement grout.

B. Shop Drawings showing layout, locations, Sections, elevations, details, dimensions, finishes and installation details.

C. Certified test reports, as required, for materials specified in Part 2 - Products.

D. “Buy America” Certificates of Compliance

E. Submit Shop Drawings for the fabrication and erection of stainless steel assemblies and proprietary products which are not otherwise completely shown by manufacturer’s data sheets. Include plans and elevations at not less than one-inch to one-foot scale, and include details of sections and connections at not less than three inches to one foot scale. Show anchorage and accessory items, and finishes.

## 1.04 QUALITY ASSURANCE

A. All uncoated spots or damaged coating shall be repaired by hot-dip process. Small areas as determined by the Engineer may be repaired by recoating them with “Galvicon” or “Gavalloy” or approved equivalent.

B. Perform welding in accordance with AWS D1.1.

C. Set handrails and posts true to location, alignment and grade as indicated in the Contract Plans. The railings shall present a smooth, uniform appearance in their final positions.

D. Painting of Rails: In accordance with Section 09 90 00, Painting and Coating, unless otherwise directed by the Engineer.

## PART 2 - PRODUCTS

### 2.01 STEEL PIPES

Pipe for post, sleeve post, rail and pickets shall be seamless steel pipe, conforming to ASTM A53, Type S, Grade A.

### 2.02 GENERAL

A. Metal Surfaces – For the fabrication of Work which will be exposed to view, use materials which are smooth and free of surface blemishes. Do not use materials which have stains and discolorations, including welds which do not match the materials in color and grain characteristics.

B. Surface Flatness and Edges – For exposed Work provide materials which have been cold-rolled, cold-finished, cold-drawn, extruded, stretcher leveled, machine cut or otherwise produced to the highest commercial standard for flatness with edges and corners sharp and true to angle or curvature as required.

### 2.03 STAINLESS STEEL

Use AISI Type 302 or Type 304 (at fabricator's option), except as otherwise indicated. Comply with the following general standards, with specific type, alloy, heat treatment and finish as required to produce the specific Work. Finish products to a No. 4 directional satin unless otherwise shown or specified. Protect with adhesive paper covering.

A. Sheet – ASTM A167, ASTM A480, and AISI Type 302 or 304

B. Plate – ASTM A167

C. Bar Stock – ASTM A276

D. Tubing – ASTM A269

E. Castings – ASTM A296, iron-chromium, nickel

F. Extruded Shapes – Manufacturer's standards

### 2.04 FASTENERS AND ANCHORAGE MATERIALS

A. Welding Electrodes and Filler Metal – Provide the alloy and type required for strength, workability, compatibility, and color match after grinding smooth and finishing the fabricated product.

B. Fasteners – Some basic metal or alloy as the metal fastened, and finished to match in color and texture. Comply with FS FF-S-92 for machine screws. Provide the type of fasteners indicated and provide Phillips flat-head screws for exposed fasteners.

C. Anchors and Inserts – Either furnish inserts to be set in concrete and masonry Work, or provide other anchoring devices as required for the installation of stainless steel Work. Furnish stainless steel or epoxy-coated inserts (See Concrete and Masonry Sections for installation); provide toothed stainless steel expansion bolt devices for drilled-in-place anchors.

## 2.05 FABRICATION - GENERAL

A. Fabricate from the thicknesses, sizes and shapes indicated, or if not indicated, as required to produce Work of adequate strength and durability, without objectionable deflections or “oil canning.”

B. Form exposed Work true to line and level, with flush surfaces and accurate angles. Ease exposed edges to a 1/32-inch radius, unless otherwise indicated. Miter exposed corner joints and machine fit to a hairline joint.

C. Weld corners and seams continuously, grind smooth and flush on exposed surfaces. For exposed metal finishes, use metals which will blend and match with sheet metals being joined; discolorations or stains will not be acceptable for exposed portions of natural finish metals. Comply with recommendations of AWS for welding.

D. Provide brackets, plates and straps with each assembly, as may be required for proper support and anchorage to other Work.

E. Cut, reinforce, drill and tap Work as may be required to receive finish hardware and similar items of Work.

F. Preassemble Work at shop to the greatest extent possible, so as to minimize mechanical joints, splicing and assembly of units at the site.

## 2.06 RAILINGS AND HANDRAILS

A. Comply with ANSI A12.1 and CAL OSHA requirements for railings around floor openings and exposed edges of floors, stairs, ramps, and similar locations. Install railings and supports able to withstand a horizontal force of 150 pounds per linear foot and vertical force of 100 pounds per linear foot at the top or 50 pounds per foot along the top rail, whichever is greater.

B. In tubular members, where mechanical joints are necessary, use bar stock inserts with flat-head screws located on the least visible surfaces. Where bends are shown, form members to a smooth, uniform radius without distortion of the cross-sectional shape.

C. Miter and cope members at corners and intersections. Bevel, weld and grind smooth, without fillets, to form smooth transitions and maintain sharp lines.

D. Post-mounted railings – Use base plates as indicated.

E. Provide dissimilar metals isolation pads where required.

F. Comply with ASTM D4956 Standard Specifications for Retroreflective Sheeting for Traffic Control for yellow sheeting on railing.

## PART 3 - EXECUTION

### 3.01 FABRICATION

Fabrication of metal hand railings and fencing shall be in accordance with SSPWC 2009 Sub-Section 304-2.1.2.

### 3.02 INSTALLATION

A. Set stainless steel Work accurately as measured from established building lines and levels, plumb and in true alignment with previously completed Work. Temporarily brace or anchor securely in formwork where Work is to be built into concrete, masonry or similar construction.

B. Securely anchor in place using concealed anchorage wherever possible.

C. Accurately fit mechanical joints together to form tight joints and uniform reveals and shapes for joint fillers and sealants. Restore finishes that have been damaged by shipment and installation.

D. Do not cut or abrade finishes which cannot be completely restored in the field. Return units with such finishes to the shop for required alterations, followed by complete refinishing.

E. Remove protective coverings when there is no longer danger of damage to the stainless steel Work from other Work yet to be performed. Restore protective coverings which have been removed or damaged during shipment or installation of the Work, if other Work is yet to be performed.

F. Form bends and simple and compound curves in tubing by bending members in jigs to produce uniform curvature, maintain profile of member throughout bend without buckling, twisting or otherwise deforming exposed surfaces of handrail and railing components.

G. Railing splices performed in field - Use epoxy structural adhesive or other equivalent means standard with railing manufacturer. Field welding - Not permitted. Railing splices - Butted to flush hairline joint and reinforced using manufacturer's standard concealed fittings with concealed fasteners. Lay out Work to position splices in inconspicuous locations.

H. Provide weep holes or other means for evacuation of entrapped water in hollow Sections of railing members.

I. Provide wall returns at ends of wall mounted handrails, except where otherwise indicated.

J. Close exposed ends of handrail and tubular rail members by use of plates welded and ground smooth.

K. Furnish inserts and other anchorage devices for connecting handrails and railings to concrete or masonry Work. Fabricate and space anchorage devices as indicated and as required providing adequate support. Coordinate anchorage devices with supporting structure.

L. The galvanized bolt thread for removable metal hand railing shall not be deformed after installation.

M. Removal of Existing Pavement - Remove the existing pavement by core drilling pavement to the full depth of the existing pavement thickness in clean, straight lines with neat edges. Haul all removed material off the work site daily and dispose of in a legal manner.

N. Excavation - Remove material to the width and depth required for construction of the pedestrian gate foundation. Take care not to disturb the bottom of the excavation before the concrete for the foundation is placed. Replace excavation below the required grade or more than the required width with the same class of concrete specified for the foundation, at no additional cost to the Authority.

O. Foundation and Installation of Gate Posts

1. Inspection Required Before Placing Concrete - Do not deposit concrete until the excavation, placing of the reinforcing steel, and placing of the gate posts has been inspected and approved. Provide at least one working day's advance notice that the excavation is ready for inspection and the procedure is approved for installation of the gates.

2. Concrete - Class 520-C-3250 - Portland Cement Concrete shall be used for the foundation.

## PART 4 – MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT

A. Handrails and Railing will be measured by the unit or fraction thereof furnished and completed in accordance with the Contract Documents and as measured by the Engineer. The quantities as contained on the Schedule of Quantities and Prices, or approved schedule of values, as applicable, as derived from the Plans will be used as the basis for this measurement.

### 4.02 PAYMENT

A. Handrails and Railing will be paid for at the Contract Unit Price, as listed on the Schedule of Quantities and Prices. This price shall include full compensation for furnishing all labor, Materials, tools, equipment, supplies, supervision, and incidentals, and doing all work, as shown on the Plans, and as specified in these Specifications, and as directed by the Engineer.

B. Full compensation for furnishing and placing concrete footings, base plates, anchors and inserts, welds, painting and coating, and connecting new railing to structures and existing cross railing shall be considered as included as listed on the Schedule of Quantities and Prices.

C. No separate measurement or payment shall be made for the railing on the Double Arch Concrete Headwall. This shall be considered incidental to work under other payment items.

D. No separate measurement or payment shall be made for cable railing for retaining wall. This shall be considered incidental to work under other payment items.

**END OF SECTION**

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# SECTION 05 52 10

# PEDESTRIAN SWING GATES

## PART 1 – GENERAL

### 1.01 SUMMARY

A. The work involves furnishing and installing self-closing pedestrian swing gates at the highway-rail and pedestrian-rail grade crossings. Install gates on the locations shown on the Contract Plans.

B. Related Specification Sections include but are not necessarily limited to:

1. Section 03 21 00 - Reinforcing Steel

2. Section 03 31 00 - Structural Concrete

3. Section 09 90 00 - Painting and Coating

### 1.02 REFERENCES

A. SCRRA Engineering Standards ES4002, Pedestrian Swing Gate Details.

B. SSPWC: Standard Specifications for Public Works Construction 2012, Sections 201-1, Portland Cement Concrete, and 201-3, Expansion Joint Filler and Joint Sealants.

## PART 2 - PRODUCTS

### 2.01 SWING GATES FABRICATION

Fabricate the swing gates as indicated in the Contract Plans.

A. Submittals Requirements - Submit Shop Drawings indicating bill of materials, and details for fabrication and assembly for approval prior to commencing fabrication.

B. Demonstration of Swing Gate Operation

1. Shop-assemble and test the swing gates for proper operation before installation at the worksite.

2. Assemble one gate section to demonstrate its opening and closing operation, for approval, at the shop. Provide at least five (5) working days advance notice for the gate operation demonstration before any further gate fabrication work is done and before any installation work commences. If the gate operation demonstration is not approved, make modifications to the gate section and repeat the gate operation demonstration until approval is obtained.

C. Gate Material - Fabricate the gate from steel tubing conforming to ASTM A500, Grade B. Provide gate post caps fabricated from flat steel plate conforming to ASTM A6, continuously welded in place, welded watertight, and made flush and smooth with the gate posts.

D. Gate Hinges and Stop Plates

1. Fabricate the gate hinges and stop plates, except for the hinge sleeves, from steel material conforming to ASTM A36. Neatly miter and cope all intersections, weld continuously in place as indicated in the Contract Plans, and finish so that adjoining surfaces are flush and smooth.

2. Fabricate the gravity gate hinge top and bottom sleeves, as indicated in the Contract Plans, from hardened steel conforming to ASTM A4140 heat treated and borided. Precision machine to the nearest 0.001 of an inch. Polish the rotating curved contract surfaces of the top and bottom hinge sleeves.

E. Galvanizing - After fabrication, hot-dip galvanize the swing gates including the gate posts, gate frames, hinges (except the rotating curved contact surfaces of the top and bottom hinge sleeves), and stop plates, in accordance with ASTM AI23 or ASTM A153. Provide minimum weight of the galvanizing coating of 2.0 ounces per square feet. Repair and re-coat any coating which has been shop or field cut, burned by welding, or otherwise damaged so that the base metal is exposed.

F. Gate Signs - Provide signs as indicated in the Contract Plans. Use reflective sheeting on 0.080-inch aluminum sign panel. Provide anti-graffiti coating.

G. Welding - Welding shall conform to the requirements of American Welding Society AWS D1.1, Structural Welding Code.

## PART 3 - EXECUTION

### 3.01 SWING GATE INSTALLATION

A. Existing Underground Utilities and Facilities - Identify existing underground utilities, conduits, foundations, and other facilities which could be affected by the construction, including railroad signal conduits. Hand dig to uncover these underground facilities and implement the necessary measures to protect these facilities during construction.

B. Removal of Existing Pavement - Remove the existing pavement by core drilling pavement to the full depth of the existing pavement thickness in clean, straight lines with neat edges. Haul all removed material off the work site daily and dispose of in a legal manner.

C. Excavation - Remove material to the width and depth required for construction of the pedestrian gate foundation. Take care not to disturb the bottom of the excavation before the concrete for the foundation is placed. Replace excavation below the required grade or more than the required width with the same class of concrete specified for the foundation, at no additional cost to the Authority.

D. Foundation and Installation of Gate Posts

1. Inspection Required Before Placing Concrete - Do not deposit concrete until the excavation, placing of the reinforcing steel, and placing of the gate posts has been inspected and approved. Provide at least one working day's advance notice that the excavation is ready for inspection and the procedure is approved for installation of the gates.

2. Concrete - Class 560-C-3250 - Portland Cement Concrete shall be used for the foundation.

E. Swing Gates Installation - Install swing gates on gate posts. Adjust gate operation, as necessary, to ensure proper operation.

F. Replacement of Portland Cement Concrete Pavement - Use four inches of Class 520-A-2500 Portland Cement Concrete pavement, placed over at least four inches of crushed aggregate base material compacted to 95 percent relative compaction, to replace removed Portland cement concrete pavement. Install paving tiles which match the size and color of the existing paving tiles on the concrete. Submit a sample paving tile for approval at least two (2) weeks before installation of paving tiles commences. Carefully cut paving tiles in clean, straight lines with neatly sawed edges to match existing tiles.

G. Pedestrian Traffic Control During Construction - Maintain pedestrian traffic flow at all times during construction.

H. Submittal Requirements - Submit a pedestrian traffic control plan for approval before commencing construction work at the pedestrian crossing. Describe in detail how pedestrian traffic will be maintained during construction, including temporary pedestrian crossing requirements, measures to be implemented for pedestrian safety in the vicinity of open excavation and other work areas during construction.

## PART 4 – MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT

A. Pedestrian Swing Gates will be measured by the unit or fraction thereof furnished and completed in accordance with the Contract Documents and as measured by the Engineer. The quantities as contained on the Schedule of Quantities and Prices, or approved schedule of values, as applicable, as derived from the Plans will be used as the basis for this measurement.

### 4.02 PAYMENT

A. Pedestrian Swing Gates furnished and completed in accordance with the Contract Documents will be paid for at the Contract Unit Price, as listed on the Schedule of Quantities and Prices. This price shall include full compensation for furnishing all

labor, Materials, tools, equipment, supplies, supervision, and incidentals, and doing all work, as shown on the Plans, and as specified in these Specifications.

B. Full compensation for furnishing and placing concrete footings, connecting to structures and existing railing, and painting and coating shall be considered as included as listed on the Schedule of Quantities and Prices.

**END OF SECTION**

# SECTION 05 55 00
# MISCELLANEOUS METALS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section includes:

1. Pull irons, inserts, channels and other items required by utility companies.

2. Miscellaneous metal angles, plates, bars, rods, studs, etc. shown or required to complete the work.

3. Coated Woven wire mesh (metal mesh)

4. Shop-primed finish for all miscellaneous metal fabrications not receiving galvanized finish, except for gratings.

B. Coordinate work of this Section with all other Sections of this Specification.

### 1.02 REFERENCES

A. Comply with all applicable local, State and Federal codes, specifications, standards and recommend practices, and in particular:

1. AISC - American Institute of Steel Construction: “Design, Fabrication and Erection of Structural Steel for Buildings”.

2. AISI - American Institute of Steel and Iron: “Specifications for the Design of Cold-Formed Steel Structural Members”.

B. AWS - American Welding Society: D-1.1, “Code for Welding in Construction”

C. ASTM

### 1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00, Submittal Procedures

1. Shop Drawings: Large scale, clearly indicating all methods of fabrication and assembly, applicable field measurements, dimensions, weights, materials, finishes and all other pertinent data.

### 1.04 QUALITY ASSURANCE

A. All steel fabrications shall be done by a licensed fabrication shop with a minimum of five (5) years experience in this type of work.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Steel plates, bars and studs (including ship's ladder):

1. Rolled shapes and plates: ASTM A36

2. Bars: ASTM A36

3. Studs: ASTM A1044 / A1044M

B. Steel tubing:

1. Cold-drawn tubing: ASTM A512, sunk drawn, butt welded, cold-finished and stress relieved

2. Hot-formed tubing: ASTM A501, butt welded, cold-finished and stress relieved

C. Iron castings:

1. Gray iron castings: ASTM A48, Class 30B

2. Malleable iron castings: ASTM A47

D. Polyvinyl chloride coated and zinc coated woven steel wire with 11 GA core, 8GA finish with custom color to be selected by Authority.

1. ASTM F668 2A

2. AASHTO M181

3. Type IV Class

E. Anchors: Expansion anchors by Hilti, Rawlplug Company, Inc., or equal. Provide anchors of the types shown and required for the various conditions of use, installed in accordance with manufacturer's printed instructions.

F. Fasteners: Galvanized steel fasteners of the type, grade and class required for the installation of miscellaneous metal items.

G. Welding electrodes: Low hydrogen type conforming to AWS D1.4, E70 XX Series.

H. Shop primer: Fabricator's standard thermosetting or air-drying shop primer compatible with alkyd enamel finish paint specified in Section 09 90 00, Painting and Coatings, applied in a uniform dry film not less than 1-1/2 mils thick.

## 2.02 FABRICATION

A. Metal Work Exposed to View - Use materials that are smooth and free of surface blemishes including pitting, seam marks, and roller and grinding marks, before cleaning, treating and applying finishes including zinc coatings.

B. Use materials of size and thicknesses indicated or, if not indicated, of required size and thickness to produce adequate strength and durability in finished product for intended use. Work to dimensions shown on reviewed and accepted Shop Drawings, using proven details of fabrication and support. Use types of materials indicated for various components of Work.

C. Form exposed Work true to line and level, with accurate angles and surfaces and straight, sharp edges. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing Work.

D. Verify dimensions by accurate field measurement before fabrication where Work of this Section adjoins preceding Work. Do not delay job progress; allow for trimming and fitting metalwork where taking field measurements before fabrication might delay the Work. Note on Shop Drawings dimensions verified by field measurement.

E. Form exposed connections with hairline joints flush and smooth, using concealed fasteners wherever possible. Exposed fasteners - f type indicated or, if not indicated, use Phillips flat-head countersunk screws or bolts.

F. Pre-drill bolt and screw holes as indicated and required for attachment of metalwork and adjacent materials.

G. Furnish inserts and anchoring devices to be set in concrete for installation of metalwork. Coordinate delivery with other Work to avoid delay

H. Provide anchorage of type indicated. Fabricate and space anchoring devices as indicated and required to provide adequate support for intended use of Work.

I. Cut, reinforce, drill and tap metalwork as required to receive finish hardware and similar items of Work.

J. Use hot-rolled steel bar for Work fabricated from bar stock, unless Work is indicated to be fabricated from cold-finished or cold-rolled stock.

K. Pre-assemble Work in shop to greatest extent practicable; minimize field splicing and assembly of units at Worksite. Disassemble units to extent necessary to comply with shipping and handling limitations. Clearly mark units for reassembly and proper installation.

L. Where indicated as galvanized, complete shop fabrication before applying coating. Remove mill scale and rust, clean and pickle units as required for

coating. Apply hot-dip zinc coating, two ounces per square foot, in accordance with ASTM A123.

M. Fabricate complete with anchors, inserts and hardware.

N. Form and finish to shape and size with sharp angles and lines.

O. Countersink metalwork to receive required hardware and to provide bevels and clearances.

P. Weld on hardware mounting plates. Drill or punch holes for bolts and screws. Conceal fastenings wherever possible.

Q. Grind exposed edges smooth. Construct joints exposed to weather to exclude water and provide weep holes indicated.

R. Brackets, lugs and similar accessories required for installation - Include as part of fabrication.

S. Welding:

1. Weld all shop and field connections continuously in accordance with the referenced AWS specifications, unless bolted connections are specifically shown.

2. Grind all exposed welds flush and smooth with parent metal surfaces.

3. All welders shall be qualified in accordance with AWS requirements.

T. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.

U. Bend pipe without collapsing or deforming the walls, to produce a smooth, uniform curved sections and maintain uniform sectional shape.

V. Fabricate items in the largest sections practical to minimize field jointing.

## 2.03 FINISHING

A. Galvanizing: Galvanize plates and angles, after fabrication, to obtain a minimum zinc coating of 1.25 ounces per square foot when tested in accordance with ASTM A123.

B. Shop priming: After galvanizing shop prime steel surfaces as follows.

1. Clean steel surfaces of all oil and other foreign substances that would interfere with paint bond in accordance with applicable SSPWC specifications.

2. Apply pretreatment to cleaned steel surfaces using solution recommended by SSPWC.

3. Apply the shop primer within the time limits recommended for the pretreatment system used. The shop primer shall be a smooth and even coating with a dry film thickness of not less than 1-1/2 mils.

## PART 3 - EXECUTION

### 3.01 INSPECTION

A. Inspect adjacent construction and make sure that all conditions detrimental to the timely and proper execution of this work have been corrected before proceeding.

### 3.02 INSTALLATION

A. Perform all cutting, drilling and fitting required for the installation of this work. Install all items accurately in their proper location, alignment and elevations, plumb and level, free of rack as measured from established lines and levels. Provide temporary bracing or anchors for items that are to be built into concrete, masonry or similar construction.

B. Fit exposed connections accurately to form tight hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and flush with parent metal and touch-up shop paint coat.

C. Comply with AWS recommendations for welding procedures, appearance and quality of welds made, and methods used to correct faulty welds.

### 3.03 TOUCH-UP OF DAMAGED SHOP PRIMER

A. Clean the damaged shop primer, sand smooth, re-clean and spot-prime with the same paint used for shop priming.

### 3.04 PROTECTION AND REPLACEMENT

A. Protect fabrications from construction damage.

B. Promptly replace work damaged beyond satisfactory field repair before its acceptance, with new materials at no additional cost to Authority.

## PART 4 – MEASUREMENT AND PAYMENT

A. Work of this Section is considered incidental to work under other payment items and no separate measurement and payment will be made to the Contractor for Work of this Section. Work of this section shall include furnishing all labor, materials, tools, equipment, supplies, supervision, and incidentals, and doing all work, as shown on the Plans, and as specified in these Specifications.

**END OF SECTION**

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# SECTION 07 13 26

# SELF-ADHERING SHEET WATERPROOFING

## PART 1 - GENERAL

### 1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.02 SUMMARY

A. Section Includes:

1. Modified bituminous sheet waterproofing.

### 1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.

2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Samples: For each exposed product and for each color and texture specified, including the following products:

1. 8-by-8-inch square of waterproofing and flashing sheet.

### 1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

### 1.05 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

## 1.06 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

## 1.07 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.01 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer.

## 2.02 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil-thick, polyethylene-film reinforcement, and with release liner on adhesive side.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Hydrotech, Inc.

b. Carlisle Coatings & Waterproofing Inc.

c. Grace Construction Products; W.R. Grace & Co. -- Conn.

d. Henry Company.

e. Or approved equal.

2. Physical Properties:

a. Tensile Strength, Membrane: 250 psi minimum; ASTM D 412, Die C, modified.

b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.

c. Low-Temperature Flexibility: Pass at minus 20 deg F ; ASTM D 1970.

d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.

e. Puncture Resistance: 40 lbf minimum; ASTM E 154.

f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F ; ASTM D 570.

g. Water Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.

h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.

3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

## 2.03 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.

1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.

2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

F. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.

G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

## 3.03 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

E. Seal edges of sheet-waterproofing terminations with mastic.

F. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

G. Immediately install protection course with butted joints over waterproofing membrane.

## 3.04 FIELD QUALITY CONTROL

A. Owner will engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish daily reports to Architect.

B. Prepare test and inspection reports.

## 3.05 PROTECTION, REPAIR, AND CLEANING

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

## PART 4 - MEASUREMENT AND PAYMENT

A. Work of this Section is considered incidental to work under other payment items and no separate measurement and payment will be made to the Contractor for Work of this Section. Work of this section shall include furnishing all labor, materials, tools, equipment, supplies, supervision, and incidentals, and doing all work, as shown on the Plans, and as specified in these Specifications.

**END OF SECTION**

# SECTION 07 62 00

# SHEET METAL FLASHING AND TRIM

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

1. Formed roof-drainage sheet metal fabrications.

2. Formed low-slope roof sheet metal fabrications.

### 1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Sample Warranty: For special warranty.

### 1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

### 1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

## 1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: Smooth, flat.

2. Exposed Coil-Coated Finish:

a. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.

3. Color: As selected by Architect from manufacturer's full range.

4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

## 2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

## 2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.

b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:

1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

## 2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

## 2.6 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines

indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

## 2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-to-Wall Transition Expansion-Joint Cover: Fabricate from the following materials: Shop fabricate interior and exterior corners.

1. Aluminum-Zinc Alloy-Coated Steel: 0.034 inch (0.86 mm) thick.

B. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.

C. Flashing Receivers: Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.

D. Roof-Penetration Flashing: Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.

E. Roof-Drain Flashing: Fabricate from the following materials:

1. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch (0.38 mm) thick.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 days.

D. Apply slip sheet, wrinkle free, directly on substrate before installing sheet metal flashing and trim.

### 3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.

5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel sheet.

2. Do not use torches for soldering.

3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

5. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.

6. Copper-Clad Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for copper-clad stainless steel.

## 3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm). Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.

D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

## 3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

## 3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

## PART 4 - MEASUREMENT AND PAYMENT

A. Work of this Section is considered incidental to work under other payment items and no separate measurement and payment will be made to the Contractor for Work of this Section. Work of this section shall include furnishing all labor, materials, tools, equipment, supplies, supervision, and incidentals, and doing all work, as shown on the Plans, and as specified in these Specifications.

**END OF SECTION**

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# SECTION 07 92 00

# JOINT SEALANTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.

B. Related Requirements:

### 1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.

2. Joint-sealant manufacturer and product name.

3. Joint-sealant formulation.

4. Joint-sealant color.

### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.

2. Manufacturer and product name.

3. Type of substrate material.

4. Proposed test.

5. Number of samples required.

D. Field-Adhesion-Test Reports: For each sealant application tested.

E. Sample Warranties: For special warranties.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

## 1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## 1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.

2. Disintegration of joint substrates from causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:

1. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.

2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

### 2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. GE Construction Sealants; Momentive Performance Materials Inc.
   b. Sika Corporation.

### 2.3 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BASF Corporation-Construction Systems.
   b. Construction Foam Products; a division of Nomaco, Inc.

## 2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

   a. Metal.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

## 3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.

2. Do not stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.

## 3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

a. Whether sealants filled joint cavities and are free of voids.

b. Whether sealant dimensions and configurations comply with specified requirements.

c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

## 3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

## 3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair

damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

## 3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations: Joints between bent metal plate at canopy.
2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: White to match bent metal plate at canopy

## PART 4 - MEASUREMENT AND PAYMENT

A. Work of this Section is considered incidental to work under other payment items and no separate measurement and payment will be made to the Contractor for Work of this Section. Work of this section shall include furnishing all labor, materials, tools, equipment, supplies, supervision, and incidentals, and doing all work, as shown on the Plans, and as specified in these Specifications.

**END OF SECTION**

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# SECTION 08 44 20

# POINT SUPPORTED STRUCTURAL GLASS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes: Custom fabrication, and site erection including: glass, glazing, connections and accessories required for point supported vertical glazing at windscreens, in accordance with the Contract Documents.

### 1.2 RELATED SECTIONS

A. Section 05 55 00: Miscellaneous Metals

B. Section 07 92 00 Joint Sealants

C. Section 08 80 00 Glazing

D. Section 09 90 00: Painting and Coatings

### 1.3 REFERNCES

A. American National Standards Institute (ANSI):

1. ANSI Z97.1-2009 - Safety Glazing Materials Used in Buildings.

B. ASTM International (ASTM):

1. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

2. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

3. ASTM A276 - Stainless and Heat-Resisting Steel Bars and Shapes.

4. ASTM A653A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

5. ASTM C864 - Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

6. ASTM C920 - Elastomeric Joint Sealants.

7. ASTM C1036 - Flat Glass.

8. ASTM C1048 - Heat Treated Flat Glass, Kind HS, Kind FT, Coated and Uncoated.
9. ASTM C1115 - Dense Elastomeric Silicone Rubber Gaskets and Accessories.
10. ASTM C1172 - Laminated Architectural Flat Glass.
11. ASTM C1281 - Preformed Tape Sealants for Glazing Applications.
12. ASTM E283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under specified Pressure Difference Across Specimen.
13. ASTM E546 - Frost Point of Sealed Insulating Glass Units.
14. ASTM E576 - Frost Point of Sealed Insulating Glass Units in Vertical Position.
15. ASTM E773 - Accelerated Weathering of Sealed Insulating Glass Units
16. ASTM E774 - Classification of the Durability of Sealed Insulating Glass Units.
17. ASTM E1300 - Determining Load Resistance of Glass in Buildings.

C. Glass Association of North America (GANA):

1. GANA Glazing Manual.
2. GANA Sealant Manual.
3. GANA Laminated Glazing Reference Manual.
4. Bulletin 01-0300 - Proper Procedures for Cleaning Architectural Glass Products.

D. Consumer Product Safety Commission (CPSC): 16CFR 1201 - Architectural Glazing Standards and Related Material.

## 1.4 SUBMITTALS

A. Product Certification: Manufacturer's certifications that products comply with specified requirements and governing codes including product data, laboratory test reports and research reports showing compliance with specified standards.

B. Product Data: Manufacturer's product data for proposed components, materials, products, and accessories.

1. For each type glass, as indicated in Section 08 80 00 – Glazing.

C. Shop Drawings:

1. Plans, elevations, and sections illustrating shape, configuration, and dimensions.
2. Illustrate method of assembly, installation, and glazing.

3. Indicate frit pattern dimensions and extent.

4. Details for support points, reinforcement, connections, joints, anchors, and other fabrication and installation conditions.

5. Indicate required tolerances and coordination with adjacent elements and work of other trades.

D. Calculations: Show compliance with performance criteria and applicable loads with stamp and signature of Licensed Professional Engineer registered in the State of California.

E. Samples: Provide the following:

1. Glass: In accordance with Section 08 80 00 – Glazing.

2. Glass fittings, one of each type.

3. 6 inches minimum length for structural silicone sealant.

4. 6-inch minimum length of silicone extrusions, compression seals and gaskets.

5. Metal finishes.

F. Manufacturer's installation and maintenance instructions. Certificates or test reports demonstrating components and methods have been successfully tested by an independent laboratory in the United States certifying that the proposed system has been tested and as defined by Paragraph 1.5.

G. Data showing compliance with manufacturer's and installer's qualifications.

H. Copies of warranties required.

I. Product Data:

1. Manufacturer's product data, specifications and installation instructions for each type of component specified and for attachment hardware.

2. Include manufacturer's recommendations for cleaning glass and hardware, and precautions against materials and methods which may be detrimental to finishes.

J. Design calculations for the point supported glass system as indicated in the contract drawings, signed and sealed by registered professional engineer licensed in State of California.

K. Closeout Submittals:

1. Warranty: Submit specified warranty.

## 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum 5 years documented experience, with record of successful in-service performance.

B. Applicator Qualifications: Engage applicator/installer with minimum 5 years of experience in installation of materials/products similar in material, design, and to extent indicated for this Project.

1. The installer of the structural glass windscreen wall system shall be responsible for supplying and erecting the complete structural glazing system, coordinating and maintaining tolerances between structure and glazing system with individual suppliers and manufacturers, and installation of glazing system.

    a. Installer Certification: Obtain written certification from manufacturer, certifying that installer is approved by, licensed, or certified by manufacturer for installation of specified materials/products or systems.
    b. Provide list of minimum 5 projects similar in nature and size to that of this Project, where specified materials/products have been successfully installed/used.
    c. Provide list of minimum 5 projects similar in nature and size to that of this Project, where specified materials/products have been successfully installed/used.

C. Coordinate Work of this Section with construction including Architecturally Exposed Structural Steel (AESS), to ensure panel fabrication matches steel framing lines and levels as constructed.

D. Mock-up:

1. Vertical Glass at Windscreens: Construct sample panel at Worksite location convenient for observation by OCTA or its designee in accordance with the following:

    a. Construct one full size vertical mock-up consisting of a minimum of one full size glass unit.
    b. Locate on structural Work already in place.
    c. Do not continue with the Work of this Section until Mock-up has been approved.

2. Accepted Mock-up: If otherwise acceptable, mockup may be used as part of final Work.

E. Safety Glazing: Comply with Consumer Product Safety Commission 16 CFR 1201, ANSI Z97.1, and other applicable safety requirements. Each piece of safety glazing shall be permanently labeled with appropriate marking.

F. Design structural components and develop shop drawings under direct supervision of professional engineer experienced in design of glass structures and licensed by the State of California. Calculations and shop drawings shall bear engineer's seal.

## 1.6 SYSTEM DESCRIPTION

A. Point supported glass windscreens shall be shall be custom designed, engineered, detailed, factory fabricated, and site assembled and erected.

B. Basic configuration: Flat laminated architectural glass at windscreens to provide architectural appearance and configuration shown on Drawings.

C. Dimensions: Glass windscreens shall be nominal dimensions shown on Drawings. Minor variations to accommodate manufacturer's design and components are acceptable, provided overall concept is maintained.

D. Fittings: external flush mounted countersunk bolts.

1. The design of fittings is the sole responsibility of the manufacturer. All fitting sizes must be in accordance with profiles and sizes shown on drawings. Size of fittings is critical to the design of the glass assembly.

## 1.7 DESIGN AND PERFORMANCE CRITERIA

A. Design, size components, and install canopies in accordance with ASTM E1300.

1. Elements shall withstand the following loads without breakage, loss, failure of seals, product deterioration, or other defects:
   a. Dead and live loads: Determined by ASCE 7 and calculated in accordance with applicable codes.
   b. Design Wind Load: Velocity pressure (qh) = 15.4 and gust factor (g) 0.89 for use in determining design pressure (p) for component and cladding elements.
   c. Design Seismic Loads: System shall be designed and installed to comply with applicable seismic requirements for Project location and as defined by California Building Code and ASCE 7. Parameters are Occupancy Category III with remaining parameters as indicated on Drawings.
   d. Canopy live loads: 20 lbs./sq.ft. uniform or 100 lbs. concentrated, wind uplift pressure of 51 lbs./sq.ft.
2. Elements shall be installed on a supporting structure with the following characteristics:
   a. Dead load determined by material properties.
   b. Live load deflection of L/360 for simply supported beams and columns and 2L/360 for cantilever beams and columns.
   c. Vertical and lateral movement under wind and seismic loading shall be designed such that elements may move 1/2 inch relative to one another in any direction.

B. Spring plate members:

1. Design spring plate members to prevent high stress concentration at the hole positions and must cope with:
   a. Negative and positive wind loading.
   b. Seismic loads.
   c. Thermal movement.

d. Construction tolerances.
e. Live load and dead load movements.

2. Movement diaphragms of stainless steel and durable flexible discs must be incorporated in connections to accommodate oversize holes in spring plate members which allow for thermal movement and glass manufacturing tolerances.

C. Effects of applicable wind load acting inward and outward normal to plane of wall in accordance with ASTM E330.

D. Thermal loads and movement:

1. Ambient temperature range: Range typical to Anaheim, CA.

E. Provide and install exterior gaskets, sealants, extruded silicone gaskets, and other glazing accessories to resist water penetration.

F. Provide and install exterior silicone compression seal extrusions as indicated.

1. Extruded in continuous lengths sufficient to provide seals in lengths indicated without splices.

## 1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products in accordance manufacturer’s instructions

B. Protect glass and other components during delivery, storage, and handling in accordance with manufacturer's instructions. Prevent edging chipping and other damage.

C. Do not store glass panels on site for extended time.

## 1.9 WARRANTY

A. Manufacturer Warranty: Provide twelve-year warranty for the design integrity, weatherability and durability of the Point Supported Glass System.

1. Glass warranties:
a. 5 years’ warranty to cover replacement of laminated glass units in event of delamination, edge separation, and blemishes.
b. Requirements defined in Section 08 80 00 – Glazing.

B. Installer's 5 years warranty to cover installation against defects and failure to perform and remain weathertight. Warranty to provide for required repairs. Installer Warranty: Warrant the installation for a period of five years for installation and repairs of failures. Provide written requirements for notification of installer and terms for maintaining warranty provisions. Do not contradict the requirements of the Contract Documents.

C. The Warranties submitted under this Section shall not deprive OCTA of other rights or remedies that OCTA may have under other provisions of the Contract Documents and the laws of governing jurisdictions and is in addition to and runs concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

### 1.10 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference at site prior to commencing work of this Section.

B. Require attendance of entities directly concerned with canopies including manufacturer's field representative.

C. Review at meeting:

1. Construction of Architecturally Exposed Structural Steel (AESS) to receive Point Supported Structural Glass System.

2. Schedule, sequence, and method for installing Point Supported Structural Glass System and coordination with other work.

3. Safety procedures.

4. Availability of system materials.

5. Chemical compatibility of metal framing, glass panels, sealants, and other glazing materials.

6. Protection of adjacent items and finishes.

7. Measure of acceptance.

8. Other items related to successful execution of Work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include, but are not limited to, following:

1. Innovative Structural Glass, Inc.

2. Pilkington Planar.

3. Manufacturer of a substantially equivalent point supported structural glass system that conforms to the Contract Documents and has been submitted by the Contractor approved in writing by OCTA.

## 2.2 GLASS PRODUCTS

A. Glass type and minimum thickness shall be in accordance with Section 08 80 00 – Glazing, or thicker as determined by manufacturer.

## 2.3 FITTINGS

A. Provide structurally engineered and independently tested fittings for connecting glass panels together and for attachment to supporting substrates.

B. Material: Stainless steel complying with ASTM A276, Type 316 with brushed satin finish.

C. Configuration, number of points, size, and spacing shall be determined by manufacturer and scheduled on shop drawings to accommodate project design and meet performance criteria specified in Paragraph 1.7. Ensure that fitting-induced stresses do not exceed glass strength.

D. Providing fittings with countersunk stainless steel bolts, Delrin bushings, and resilient gaskets.

E. Spring plates shall provide a tolerance capability which will cope with the full range of movements shown below:

1. Thermal movements occurring as a result of differential coefficients of thermal expansion within the range specified. The components used within the system shall withstand noiselessly all thermal movements without any buckling, distortion, cracking, failure of joint seals or undue stress on the glass or fixing assemblies.

2. Deflection of columns due to loading applied after erection of the cladding to magnitude specified.

3. Maximum side sway of structure due to wind load to the magnitude specified or seismic movement to the degree specified.

4. Deflection due to self weight.

5. Inward and outward movements due to the design wind loads specified.

F. Countersunk bolts will be bright machine finished, socket head bolt diameter 1-1/8" with hexagonal shank, stainless steel Type 303.

G. Bushings will be Nylatron Polyamide.

H. Gaskets will be fully vulcanized fiber, neoprene or precured silicone.

I. Provide Fittings by one of the following manufacturers.

1. CR Laurence Company, Inc., RB Series Glass Fitting Brackets.

2. Innovative Structural Glass, Inc., 200 series Glass Fitting Brackets.

3. Pilkington Planar, 905J series Glass Fitting Brackets.

4. Approved Equivalent.

## 2.4 ACCESSORIES

A. Provide glazing accessories, anchors, and fasteners of type recommended by glass facade manufacturer and as required for complete, functional, weathertight installation

B. Anchorage devices: Clips, anchors, fasteners, and shims required for secure installation of glass facade. Type, size, and spacing as recommended by glass facade manufacturer.

C. Cleaners and primers: Recommended by manufacturer to be compatible with substrate and glazing materials.

D. Glazing sealant: Chemically curing type complying with ASTM C920, compatible with materials and conditions, and capable of anticipated joint movement without watertight seal failure.

E. Compression Seals: Extruded silicone type of profile indicated. Extruded from thermo-cured silicone meeting ASTM D2000, UV stabilized and do not propagate flame

1. Color: Light Gray unless otherwise.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Prior to delivery of glass panels to site, verify that wall openings, support framing, and substrates are ready to receive glass facade. Verify alignment, support dimensions, and tolerances are correct. Follow the recommendations of the FGMA as to inspection procedures. Do not begin work until unsatisfactory conditions have been corrected. Installation of work shall constitute acceptance of the related construction.

B. Report unacceptable conditions and deficiencies. Do not proceed with installation until corrective action has been performed.

C. Inspect glass panels for chipped edges, scratches, abrasions, and other damage. Remove damaged panels from site and replace.

## 3.2 PREPARATION

A. Pre-Installation Meeting: Meet at the project site with the representatives of the glass and glazing materials manufacturers, architectural exposed structural steel fabricator and erector, sealant manufacturer, the glazing installer, Architect's representative and Owner's representative. Review the glazing procedure and schedule, including the method of delivering and handling glass, and installing glazing materials. The chemical compatibility of all glazing materials and framing sealants with each other and with like materials used in glass fabrication shall be established.

## 3.3 COORDINATION

A. Coordinate provision of glass facades and canopies with casting of concrete floors, platforms and plaza slabs and structural walls. Ensure that sleeves, inserts, anchor bolts, and other embedded items are provided in sufficient time for embedment in cast concrete. Ensure that blockouts and pockets for glass facade and canopy components are provided, accurately placed, and properly sized.

B. Coordinate provision of glass facades and canopies with structural steel framing. Ensure that provision is made for attachments and transfer of calculated loads

C. Coordinate requirements for lighting, and signage to ensure proper power source, conduit, wiring, and boxes.

## 3.4 INSTALLATION

A. Site assemble and erect glass facade in accordance with approved shop drawings, manufacturer's installation instructions, and GANA Glazing Manual and the shop drawings Metal.

B. Employ only experienced glaziers who have had previous experience with the materials and systems being applied. Use tools and equipment recommended by the glass manufacturer.

C. Plate to plate joints of glass are sealed with silicone sealant. Joint dimensions shall be designed to be compatible with sealant properties and live load movement of the structure.

D. Bolt Torque: Torque bolts to torques specified on shop drawings using calibrated tool. Lock torqued bolts into position to prevent backoff. Reset calibrations regularly to ensure accurate torqueing.

E. Maintain a minimum temperature of 40 degrees F. during glazing unless the manufacturer of the glazing material specifically agrees to application of this material at lower temperature. If job progresses or other conditions require glazing work when temperature is below 40 degrees F. (or below the minimum temperature recommended by the manufacturer), consult the manufacturer and establish the minimum provisions required to ensure satisfactory work.

F. Clean glazing connectors receiving glazing materials of deleterious substances which might impair the work. Remove protective coatings which might fail in adhesion or interfere with bond of sealants. Comply with manufacturer's instructions for final wiping of surfaces immediately before application of primer and glazing sealants. Wipe metal surfaces with xylol or toluol.

G. Inspect each unit of glass immediately before installation. Glass which has significant impact damage at edges, scratches or abrasion of faces, or any other evidence of damage shall not be installed.

H. Sealants: Prime surfaces to receive glazing sealants where required, in accordance with manufacturer's recommendations, using recommended primers.

I. Locate setting blocks, if required by the drawings, at the quarter points of sill, but no closer than 6 inches to corners of glass. Use blocks of proper sizes to support the glass in accordance with manufacturer's recommendations.

J. Provide spacers to separate glass from spring plates.

K. Set glass in a manner which produces greatest possible degree of uniformity in appearance. Face all glass, which has dissimilar faces, with matching faces in the same direction. Set art fritted glass in manner to conform with design layout and direction indicated.

L. Use masking tape or other suitable protection to limit coverage of glazing materials to the surfaces intended for sealants.

M. Tool exposed surfaces of glazing materials.

N. Clean excess sealant from glass and support members immediately after application, using solvents or cleaners recommended by manufacturers.

O. Allow for settling, expanding, and contracting to occur without breaking glass.

P. Do not field cut or alter structural glass panels.

## 3.5 GLAZING

A. Mechanically install glass panels with stainless steel fittings as designed by manufacturer, as indicated on approved shop drawings and in accordance with Section 08 80 00 – Glazing.

B. Glazing methods: as determined by manufacturer and indicated on approved shop drawings.

1. Glass panels shall be mechanically attached directly to supporting substrate with fittings and anchors.

2. Secure glass panels to fittings with bolts. Torque bolt to amount specified on approved shop drawings using calibrated tool. Lock torqued bolt into position to prevent backoff. Reset calibrations regularly to ensure accurate torqueing

### 3.6 CURING, PROTECTING AND CLEANING

A. Intermediate and Top Coats.

B. Cure sealants in accordance with the manufacturer's instructions to attain maximum durability and adhesion to glass.

C. Clean excess sealant from glass and other surfaces immediately after application. Use solvents or other cleaners recommended by manufacturer.

## PART 4 – MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT

A. Point Supported Structural Glass will be measured by the unit or fraction thereof furnished and completed in accordance with the Contract Documents and as measured by the Engineer. The quantities as contained on the Schedule of Quantities and Prices, or approved schedule of values, as applicable, as derived from the Plans will be used as the basis for this measurement.

### 4.02 PAYMENT

A. Point Supported Structural Glass will be paid for at the Contract Unit Price, as listed on the Schedule of Quantities and Prices. This price shall include full compensation for furnishing all labor, Materials, tools, equipment, supplies, supervision, fittings, accessories, glazing, structural steel posts including (fittings, base plates and anchorage), and incidentals, and doing all work, as shown on the Plans, and as specified in these Specifications.

B. Full compensation for furnishing and placing concrete footings and coordinating installation with elements of the platform and canopy shall be considered as included as listed on the Schedule of Quantities and Prices.

**END OF SECTION**

# SECTION 08 80 00
# GLAZING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes: The requirements for providing glazing.

### 1.2 RELATED SECTIONS

A. Section 05 50 00: Miscellaneous Metals

B. Section 07 92 00 Joint Sealants

C. Section 08 44 20: Point Supported Structural Glass

### 1.3 REFERNCES

A. ASTM International (ASTM):

1. D 256 - Test Method for Impact Resistance of Plastic and Electrical Insulating Materials.

2. D 638 - Test Method for Impact Resistance of Plastic and Electrical Insulating Materials.

B. Flat Glass Marketing Association (FGMA):

1. Glazing Manual.

C. Federal Specifications and Standards (FS):

1. DD-G-451 - Glass, Plate, Sheet, Figured (Float, Flat, for Glazing, Corrugated, Mirror and other Uses).

2. DD-G-1403: - Glass, Plate (Float), Sheet, Figured and Spandrel (Heat Strengthened and Fully Tempered).

3. Sealing Compound: Silicone Rubber Base (for Caulking, Sealing and Glazing in Buildings and other Structures).

D. UBC: Uniform Building Code:

1. Tables 54-A, 54-B and 54-C.

## 1.4 SUBMITTALS

A. Product Data.
   1. Complete material specifications and installation instructions for each required type of glass and Lexan plastic.

B. Certificates.
   1. Certificates stating products comply with specified requirements.

C. Samples.
   1. Samples 6 in. by 6 in. for each required type of glass and Lexan plastic.

## 1.5 PRODUCT HANDLING

A. Materials shall be delivered with manufacturer's labels affixed to each pane.

B. Labels shall not be removed prior to installation, inspection and final acceptance.

C. Materials shall be handled in such a manner to prevent chipping, breakage, and surface damage.

## 1.6 JOB CONDITIONS

A. Glazing materials shall not be installed using sealants when the ambient temperature is 40 F or lower.

B. Glazing work shall be performed only on dry, clean surfaces.

# PART 2 - PRODUCTS

## 2.1 GLASS MATERIALS

A. Glass shall be of the type and thickness indicated.

B. Plate or Float Glass, Clear, Tempered: FS DD-G-1403, Kind FT, Condition A, Type I, Class 1, Quality q3, thickness as indicated.

C. Laminated Safety Glass, Clear: FS DD-G-451, Type I, Class 1, Quality q3. Glass shall be fabricated of 2 panes of glass laminated together with a 0.060 in. thick vinyl inter-layer, total thickness as indicated

# PART 3 - EXECUTION

## 3.1 INSPECTION

A. Openings and glazing channels shall be examined to ensure they are free of projections, burrs, irregularities and debris that will affect the glazing operation.

B. Materials shall be examined for edge damage or surface imperfections. Edge damage and surface imperfections will be cause for rejection.

C. Do not proceed with the Work until unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Openings to receive glazing shall be measured before glass and plastic are cut.

B. Protective coatings shall be removed from surfaces to be glazed.

C. Materials shall be wiped clean to remove dust, oil and contaminants. Manufacturer's labels shall not be removed.

## 3.3 INSTALLATION

A. General.

1. Glazing shall be installed in accordance with the FGMA Glazing Manual and the manufacturer's instructions, where and as indicated.

2. Glazing shall be accurately sized and cut for each glazing condition.

3. Tempered glass shall not be cut, nipped or abraded.

4. Panes exhibiting directional orientation shall be installed with directional orientation consistent in all panes.

## 3.4 CLEANING

A. Excess glazing compound shall be removed from installed panes.

B. Both faces of glazing shall be washed and polished prior to final acceptance of the Work. Use cleaning materials and methods indicated by the manufacturer's cleaning instructions

C. Labels shall be removed from glazing surfaces after final acceptance.

## 3.5 PROTECTION

A. Installed glazing shall be protected against breakage, damage from sandblasting, welding spatter or other degrading sources.

B. Broken, damaged or defective glazing materials shall be replaced at no cost to OCTA.

## PART 4 - MEASUREMENT AND PAYMENT

### 4.01 MEASUREMENT AND PAYMENT

A. Glazing shall be considered incidental work items measured and paid under Section 08 44 20 Point Supported Structural Glass. No separate measurement or payment will be made for Glazing.

**END OF SECTION**

## SECTION 09 61 50

## DETECTABLE WARNING PANELS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. This Section includes specifications for Detectable Warning Panels for pedestrian grade crossings, curb ramps, and platforms in Metrolink stations.

### 1.02 REFERENCES

A. ASTM International:

1. B117 Practice for Operating Salt Spray (Fog) Apparatus
2. C501 Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
3. C1028 Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method
4. D570 Test Method for Water Absorption of Plastics
5. D638 Test Method for Tensile Properties of Plastics
6. D695 Test Method for Compressive Properties of Rigid Plastics
7. D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
8. D1308 Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
9. D5420 Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)
10. G155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

B. Americans with Disabilities Act (ADA) Standards issued by U.S. Department of Transportation

C. California Building Code

### 1.03 SUBMITTALS

A. Shop Drawings

1. Submit Shop Drawings showing fabrication details; panel surface profile; fastener locations; plans of panel placement including joints, and material to be used as well as outlining installation materials and procedure. Include procedures for containment and disposal of milling and saw cutting waste water.

2. The Shop Drawings do not need to feature a full dimensional layout of the platform edges.

B. Product Data

1. Submit manufacturer's literature describing products and installation procedures. Include product data for adhesives and sealants.

C. Samples

1. Submit the following samples:

a. Samples of panels measuring at least 12 inches x 12 inches. Panel sample shall include longitudinal edge with integral flange and transverse ship-lap edges.

b. Samples of panels and sealant for verification of color match.

D. Samples for Verification Purposes

1. Submit panels of the kind proposed for use.

E. Maintenance Instructions

1. Submit manufacturer's specified maintenance practices for each type of panel and accessory as required.

F. Quality Assurance Submittals

1. Material Test Reports: Submit test reports from qualified independent testing laboratory indicating that materials proposed for use are in compliance with requirements and meet the properties indicated in this Section. Tests which indicate performance for the panels shall have been performed within three (3) years of the Invitation to Bid.

2. Submit list of projects in California that successfully demonstrate the proposed products' durability and weatherability.

## 1.04 QUALITY ASSURANCE

A. Panels and accessories, including panel adhesive, fasteners, and sealants, shall be from a single source. Products shall have been in successful service for a period of five (5) years.

B. Installer's Qualifications

1. Engage an experienced Installer certified in writing by panel manufacturer as qualified for installation, who has successfully completed panel installations similar in material, design, and extent to that indicated for Project. Only persons who are thoroughly trained and experience in the installation of the panels shall perform the work.

## 1.05 DELIVERY, STORAGE AND HANDLING

A. Panel type shall be identified by part number on packages.

## 1.06 SITE CONDITIONS

A. Environmental Conditions and Protection

1. Conduct field operations only when environmental conditions fall within those recommended by manufacturers of the products.

## 1.07 WARRANTY

A. Panels shall be covered by a written warranty for a period of five (5) years from date of final completion. The warranty includes defective work, breakage, deformation, delamination, fading and chalking of finishes, and loosening of panels. Warranty shall include furnishing new materials, removal of existing panels, and installation of new panels.

## 1.08 SPARES

A. Furnish a minimum of five (5) percent additional panels of the total amount installed of each panel and corresponding fasteners. Deliver spares to location (within 50 mile radius of work site) designated by the Engineer. Furnish spare materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identification.

# PART 2 - PRODUCTS

## 2.01 PANELS

A. Subject to conformance with the requirements of this Section, use products fabricated by the following manufacturers or substantially equivalent tactile warning tile approved in writing by the Authority:

1. Armor-Tile by Engineered Plastics, Inc. of Williamsville, NY

2. ADA Solutions, Inc. of North Billerica, MA

3. Access Products of Buffalo, NY

B. Panels shall be manufactured from a fiber reinforced polymer composite.

C. Panel color shall be Federal Yellow conforming to Federal Color No. 33538. Color shall be homogeneous throughout the panel.

D. Truncated Dome Geometry

1. Truncated dome surface shall comply with Americans with Disabilities Act (ADA) Standards and California Building Code.

2. Truncated Dome Description:

a. Pedestrian Grade Crossings and Curb Ramps:

1) Square grid (in-line) pattern of raised truncated domes of 0.2-inch nominal height, base diameter of 0.9-inch and top diameter of 0.45-inch.

2) Truncated domes shall have a center-to-center (horizontally and vertically) spacing of 2.35-inch as measured side by side in-line.

b. Platforms:

1) Staggered pattern of raised truncated domes of 0.2-inch nominal height, base diameter of 0.9-inch and top diameter of 0.45-inch.

2) Truncated domes shall have a center-to-center spacing of 1.67-inch diagonally, and center-to-center (horizontally and vertically) spacing of 2.35-inch as measured side by side in-line.

c. In order to ensure a uniform appearance of the detectable warning surface throughout the transit system, equivalent facilitation findings or alternate patterns will not be acceptable.

3. Truncated dome pattern shall align properly from panel to panel.

E. Panel Configuration

1. Panel Thickness

a. At a minimum, the thickness of the body of Detectable Warning Panel shall measure 3/16-inch (0.1875-inch) nominal.

2. Panel Size

a. Pedestrian Grade Crossings and Curb Ramps (In-Line Pattern):

1) Nominal 36-inch x 48-inch or longer (unless otherwise dimensioned on the Contract Drawings) with a 7/16-inch thick deep flange along both long sides.

b. Platforms (Staggered Pattern):

1) Nominal 24-inch x 48-inch with a 7/16-inch thick deep flange along both long sides.

3. Butt Joints

a. The detectable warning panel shall feature a butt joint detail from panel to panel. Alternatively a ship lap detail may also be furnished.

F. Fastener Holes in Panel

1. Holes for fasteners shall be formed in the factory. Holes for fasteners, whether made in the factory or in the field, shall be located only at the centers of the truncated domes.

G. Performance

1. Panels shall comply with the following performance characteristics:

| Property | ASTM Test Method | Nominal Value |
|---|---|---|
| Salt Spray (200 Hours) | B117 | No Change |
| Wear Resistance | C501 | 500 (Min.) |
| Slip Resistance | C1028 | 0.80 (Min.) |
| Water Absorption | D570 | 0.05% (Max.) |
| Tensile Strength | D638 | 19,000 psi (Min.) |
| Compressive Strength | D695 | 28,000 psi (Min.) |
| Flexural Strength | D790 | 25,000 psi (Min.) |
| Chemical Resistance | D1308 | No Stain or Discoloration |
| Gardner Impact Test | D5420 | 550 in. lbf/in (Min.) |
| Accelerated Weathering (3000 Hours) | G155 | Delta E: 4.5 (Max.) |

## 2.02 ACCESSORIES

A. Fasteners for Concrete

1. Color matched nylon expansion sleeves with 1/4 inch diameter by 1-1/2 inches long stainless steel drive pins, or as recommended by panel manufacturer for specific job conditions and accepted by the Engineer.

B. Adhesive

1. Type approved by panel manufacturer.

C. Sealant

1. Urethane sealant of type approved by panel manufacturer.

D. Backer Rod

1. Acceptable to sealant manufacturer. Where required, such as, at platform expansion joints.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. Apply adhesives, sealants and mechanical fasteners in strict accordance with the guidelines set by their respective manufacturers.

B. Utilize manufacturer-provided template to lay out area to receive panels.

C. Form recess for panels by either milling with diamond blade head or casting recess in place (at new paving) so that installed panel will still flush relative to adjacent surface. Grind or form to the depth and width required by the approved shop drawings and manufacturer's instructions. Finish cast-in-place recess with equivalent of a light broom finish. When milled, substrate shall have a light ribbed finish.

D. Contain and remove slurry resulting from concrete milling and saw cutting. Do not wash slurry into track bed area.

E. For Panels with Recessed Flanges:

1. Utilize diamond bladed double headed wet saw to achieve parallel grooves to receive panels. Both saw cuts shall be made simultaneously from the same machine. Saw cut parallel to platform edge.

2. After saw cutting, vacuum and power wash surface with clean clear water, free from all dirt and debris. Visually inspect surface for obtrusions or foreign matter. If obtrusions are present, remove by grinding. Remove foreign matter by grinding or further washing, as appropriate.

3. Immediately prior to application of the setting adhesive, inspect surfaces to receive panel to ensure that they are clean, dry, free of voids, curing compounds, projections, loose material, dust, oils, grease, sealers, and other contaminants. Verify that surfaces are structurally sound and that concrete has cured a minimum of 30 days. Obtain panel manufacturer's representatives and Engineer's approval of surface preparation before installing panels.

F. Set panels and install fasteners in accordance with panel manufacturer's instructions and as follows:

1. Wherever possible, install full size (uncut) panels. Do not install panel sections measuring less than 24 inches in length. Only cut panels where absolutely necessary.

2. Maintain gap between panels for expansion and contraction in accordance with manufacturer's instructions.

3. At platform expansion joints, cut panels on their short sides, finish cut edges smoothly, and lay panels with cut edges aligned with the edges of the substrate along the joints. Install fasteners on either side of the expansion joint at the time of initial installation. After a minimum of 4 hours, make a saw cut measuring 5/16 inch wide across the composite detectable warning panel and fill with sealant. Make saw cut in the zone between truncated domes.

   a. Where there is platform curvature, composite detectable warning panels shall be treated in a similar manner so that the joints remain uniform across the width of the joint between successive panels. However, in areas of platform curvature, the joint shall take on somewhat of a triangular configuration.

4. Cutting through panel domes shall be kept to a minimum. Where less than half of the truncated dome remains, grind off balance of dome; where over half of the truncated dome remains, feather dome so as not to present a tripping hazard.

G. Install sealant in accordance with manufacturer recommendations.

## 3.02 CLEANING AND PROTECTING

A. After the area has been fully paneled and sealant system applied, clean panel surface, following the manufacturer recommended maintenance and cleaning procedures.

B. Protect sealant and panels against damage during construction period. Comply with panel and sealant manufacturers' recommendations.

C. Protect panels against damage from rolling loads following installation by covering with plywood or hardwood.

D. Clean panel by method specified by manufacturer.

# PART 4 - MEASUREMENT AND PAYMENT

## 4.01 MEASUREMENT

A. Detectable Warning Panels will be measured by the unit or fraction thereof furnished and completed in accordance with the Contract Documents and as measured by the Engineer. The quantities as contained on the Schedule of Quantities and Prices, or approved schedule of values, as applicable, as derived from the Plans will be used as the basis for this measurement.

B. Measurement shall include only installed portion of Detectable Warning Tiles. Material waste quantity due to trimming the panel length or cutting angled ends on the panels in order to conform to the dimensions as shown on the Contract Drawings shall not be included in the Quantity measured for payment.

## 4.02 PAYMENT

A. Detectable Warning Panels furnished and completed in accordance with the Contract Documents will be paid for at the Contract Unit Price, as listed on the Schedule of Quantities and Prices. This price shall include full compensation for furnishing all labor, materials, tools, equipment, supplies, supervision, and incidentals, and doing all work, as shown on the Plans, and as specified in these Specifications.

**END OF SECTION**

# SECTION 09 90 00

# PAINTING AND COATINGS

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. Furnish all labor, materials, tools and equipment necessary and incidental to the painting, and finishing the surfaces as indicated on the Contract Drawings, as specified herein and as directed by the Engineer.

B. Painting shall include shop coat and field finish painting of all metal surfaces, including the complete canopy, railings, handrails, base plates, covers, connecting hardware, mounting brackets; field painting of railings and guardrails, fences, flashings, pipe bollards, and exposed mechanical or electrical equipment including housing; and the finish painting over shop coated exposed equipment.

C. Related Specification Sections include but are not necessarily limited to:

1. Section 03 21 00 - Reinforcing Steel

2. Section 05 52 00 - Handrails and Railings

3. Division 05 - Metals

4. Division 26 - Electrical

### 1.02 REFERENCES

A. Comply with all applicable local, State and Federal Codes, regulations, specifications, standards and recommended practices, and in particular:

1. ASTM - American Society for Testing and Materials

2. Federal Specification

3. SSPWC: Standard Specifications for Public Works Construction 2012

### 1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00, Submittal Procedures:

1. List of products: A complete list of products proposed for use on the project; include manufacturers' product descriptions of all materials; obtain approval before proceeding. Use the same manufacturers' products for all coats of each individual finish unless otherwise approved in writing by the Engineer.

2. Product data: Alternate manufacturers' published literature for specified products and accessories as applicable, including manufacturers'

specifications, physical characteristics and performance data. Submit as a supplement, manufacturers' instructions and directions for application if not included in the manufacturers' published literature.

3. Samples: Of all paints and finishes proposed for use on the project, minimum size 8-1/2 inches by 11 inches.

## 1.04 QUALITY ASSURANCE

A. Application: Shall be by an experienced painter or a painting firm employing experienced personnel.

B. Conform to manufacturers' specifications, directions and recommendations for best results in the use of each of their products for each condition. If results are at variance with Specifications, report the discrepancy to the Engineer for decision.

## 1.05 DELIVERY, HANDLING AND STORAGE

A. Delivery and storage: Deliver paint materials in unbroken, unopened containers bearing the manufacturers' labels; do not open containers or remove labels until the Engineer inspects and approves. Store materials in a dry location where the indicated ambient temperature of storage is not less than 50 degrees Fahrenheit.

B. Precautions: Take extraordinary care to prevent fire; open containers or inflammable materials only as needed; keep rubbing cloths and oily rags in tightly closed metal containers, or remove from the site daily. Benzine, gasoline, and distillate will not be permitted on the job site.

C. Protection: Care shall be exercised in the handling of painting materials to ensure that this work and the work of other trades are not damaged before, during, or after the installation.

D. Replacements: Repair or replace damaged work, if any, as necessary to the approval of the Engineer at no additional cost to OCTA.

# PART 2 - PRODUCTS

## 2.01 ACCEPTABLE MANUFACTURERS

A. For metal surfaces paint materials shall be the products of Tnemec Co., Inc., or equal products by Ameron Protective Coatings Group, Rust-Oleum Industrial Coatings, Sherwin Williams, Porter International, Pittsburgh Paints, or substantially equivalent product approved in writing by OCTA.

B. For gypsum board surfaces paint and stain materials shall be the products of Dunn-Edwards or equal products by Frazee Paint Co. Sherwin Williams, or substantially equivalent product approved in writing by OCTA.

C. Materials selected for coating systems for each type of surface shall be the product of a single manufacturer.

D. All paint materials shall be the respective equivalent, in the opinion of the Engineer, to the several types of materials specified. Deliver all materials to the job site in the original, unbroken containers, bearing the manufacturers' labels indicating the contents and directions for use, storage, and handling.

E. Materials not specifically noted but required for the work, such as linseed oil, shellac, thinners, etc., shall be the product of the approved paint manufacturer.

## 2.02 MIXING

A. Mix paint products according to the manufacturers' painted directions. Do not adulterate in any manner except upon specific approval of, and in the presence of the Engineer.

## 2.03 COLOR SELECTION

A. The color selection will be made by the Engineer from submitted manufacture’s standard colors.

B. Submit color samples requested by the Engineer, allowing ample time for consideration before the material to be painted is delivered or ready for painting.

## 2.04 IDENTIFICATION

A. The manufacturers' identification numbers and specifications listed are for the purpose of indicating the type and quality of paint product desired for the purpose indicated.

# PART 3 - EXECUTION

## 3.01 GENERAL

A. Apply paints in accordance with the manufacturers' recommendations as to the application, weather, and temperature conditions. Provide "highest" quality workmanship performed to the Engineer's satisfaction. Use clean equipment and brushes when applying paint; spread paint materials evenly, without runs, sags, laps, or brush marks, without variations in color, texture, or sheen, and without "holidays."

B. Vary colors or sheen between coats and apply all coats to uniform thicknesses.

C. Cut sharp lines against glass, other materials, and different colors. Recoat suction spots in the first coat as necessary to produce uniformity of color and gloss.

D. Refinish any work judged defective at no additional cost to OCTA; repair all work damaged during the progress of the construction.

E. Leave finished surfaces clean, completely covered, uniform in appearance, and satisfactory to the Engineer.

## 3.02 SURFACE PREPARATION

A. General: Clean all surfaces thoroughly, removing all rust, mill scale, fabrication films, dust, dirt, and other foreign matter from surfaces. Grind smooth all welds flush with adjacent surfaces. Apply film to completely dry surfaces.

B. Galvanized metal: Thoroughly clean surfaces, wiping with mineral spirits or xylol. If silicone surface treatments have been applied in the fabrication shop, use xylol; remove silicates or similar surface treatments and deposits of "white rust" by sanding or other approved abrasive methods. Thoroughly clean and rinse contaminants from surfaces.

C. Ferrous metal surfaces: Thoroughly clean using mineral spirits, xylol, or toluol in accordance with SSPWC-SP No. 1. Take care to ensure that adequate ventilation is provided at all times when using solvents. Carefully rinse and clean surfaces before applying paint.

D. Gypsum Board:

1. Remove dust, loose particles or other matter that would prevent proper paint adhesion.

2. Check to see that joints and screw heads are properly covered with joint compound and sanded smooth and flush with adjacent surfaces.

E. Condition of surfaces: Inspect and approve conditions of substrate surfaces scheduled to receive paint; notify the Engineer of any surfaces unsuitable for application as specified. The application of a Paint finish constitutes an acceptance of the surface as suitable, unless directed to proceed in writing by the Engineer. The work shall not be performed during wet or freezing weather, or until surfaces have thoroughly dried from the effect of such weather.

F. Mixing and thinning: Mix and thin paint products in strict accordance with the manufacturers' directions; mix and thin other materials in accordance with the "best" trade practices as approved.

## 3.03 APPLICATION

A. Number of coats: As specified for each type of finish.

B. Thickness of coats: Use ample undiluted materials; apply in a uniform thickness over entire areas; do not exceed the manufacturers' recommended spreading rate per gallon. Comply with DFT specified.

C. Color of coats: Tint prime coats if necessary to obtain uniform finish coats. Vary color between coats; the final coat shall exactly match approved samples.

D. Approval of successive coats: Obtain the Engineer's approval of each coat before the succeeding coat is applied; if this approval is not obtained, the Engineer reserves the right to require an additional coat.

## 3.04 MECHANICAL OR ELECTRICAL EQUIPMENT

A. Apply primer and 2 finish coats as specified for the appropriate metal surface according to the finish schedule.

## 3.05 PROTECTION OF FINISHED WORK

A. Use tarpaulins or drop cloths when working above or adjacent to completed work. Clean all paint splatters and stains from finished surfaces. Protect all work from dust and insects.

## 3.06 METAL SURFACES

A. General: Provide the following paint systems for the various substrates, as indicated.

B. Surface preparation not performed under other Sections: SSPWC-SP11 Power Tool Cleaning to bare metal all welds and damaged prime coat.

C. Paint system:

1. Spot prime for galvanized surfaces and surfaces primed with zinc-rich primer: 90-97 Tneme-Zinc applied at 2.5 to 3.5 mils DFT.

2. First coat: Tnemec 60 Epoxoline applied at 4 to 6 mils DFT.

3. Top coat: Tnemec 75 Endura-Shield applied at 2 to 3 mils DFT.

## 3.07 GYPSUM BOARD

A. First coat: PVA sealer

B. Second coat: 100% acrylic

C. Third coat: 100% acrylic

# PART 4 – MEASUREMENT AND PAYMENT

## 4.01 MEASUREMENT

A. Painting and Coatings required for the station canopies, station light poles, and railing at the station area will be measured by the unit or fraction thereof furnished and completed in accordance with the Contract Documents and as measured by the Engineer. The quantities as contained on the Schedule of Quantities and Prices, or approved schedule of values, as applicable, as derived from the Plans will be used as the basis for this measurement.

B. All other work of this Section is considered incidental to work under other payment items and no separate measurement and payment will be made to the Contractor for Work of this Section. Work of this section shall include furnishing all labor, materials, tools, equipment, supplies, supervision, and incidentals, and doing all

work, as shown on the Plans, and as specified in these Specifications, and as directed by the Engineer.

## 4.02 PAYMENT

A. Painting and Coatings furnished and completed in accordance with the Contract Documents will be paid for at the Contract Unit Price, as listed on the Schedule of Quantities and Prices. This price shall include full compensation for furnishing all labor, materials, tools, equipment, supplies, supervision, surface preparation, expendable materials, protection of existing facilities, and incidentals, and doing all work, as shown on the Plans, and as specified in these Specifications, and as directed by the Engineer.

**END OF SECTION**