

TECHNICAL SPECIAL PROVISIONS
FOR
CENTRAL FLORIDA COMMUTER RAIL TRANSIT
PLATFORM CANOPY STRUCTURAL SPECIFICATIONS
FINANCIAL PROJECT ID 412994-3-52-01

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Date:
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SECTION 03310 – CONCRETE WORK

PART 1 – GENERAL

1.01 SUMMARY

- A. The extent of concrete work is shown on the Drawings.

1.02 RELATED WORK

- A. PRECAST CONCRETE: Section 03450.
- B. MASONRY: Section 04810.
- C. STRUCTURAL STEEL: Section 05120.

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Conform to provisions of the following, unless otherwise indicated or specified.

- 1. American Concrete Institute (ACI):

- a. ACI 301 Specifications for Structural Concrete for Buildings.
- b. ACI 304 Guide for Measuring, Mixing, Transporting and Placing Concrete.
- c. ACI 305 Hot Weather Concreting.
- d. ACI 306 Standard Specification for Cold Weather Concreting.
- e. ACI 315 Manual of Standard Practice for Detailing Reinforced Concrete Structures.
- f. ACI 318 Building Code Requirements for Reinforced Concrete.
- g. ACI 347 Recommended Practice for Concrete Formwork.
- h. ACI 504R Guide to Sealing Joints in Concrete Structures.

- 2. American Society for Testing and Materials (ASTM):

- a. Referenced Standards.

- 3. Concrete Reinforcing Steel Institute (CRSI):

- a. Manual of Standard Practice.
4. United States Department of Commerce, National Institute of Standards and Technology; Products Standards (PS):
- a. PS-1 U.S. Product Standard for Construction and Industrial Plywood.
- B. Concrete Testing Service: Materials and installed work may require testing and retesting, as directed by the Engineer, at any time during progress of work. Retain an independent testing laboratory to perform testing.
- C. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.
- 1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated, as documented according to ASTM E548.
- 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- G. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixes.
 - c. Ready-mix concrete producer.
 - d. Concrete subcontractor.
- I. Deliver, store and handle steel reinforcement to prevent bending and damage.

1.04 SUBMITTALS

- A. Product Data: Submit product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, cementitious waterproofing, and others as requested by the Engineer.
- B. Shop Drawings, Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Conform to ACI 315, showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required and formed openings through concrete structures.
- C. Laboratory Test Reports: Submit copies of laboratory test reports for concrete materials and mix design test as specified.
- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirement indicated, based on comprehensive testing of current materials:
 1. Cementitious materials and aggregates.
 2. Form materials and form-release agents.
 3. Steel reinforcement and reinforcement accessories.
 4. Fiber reinforcement.
 5. Admixtures.
 6. Curing materials.
 7. Floor and slab treatments.
 8. Bonding agents.
 9. Adhesives.
- E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 1. Cementitious materials and aggregates.
 2. Form materials and form-release agents.
 3. Steel reinforcement and reinforcement accessories.
 4. Fiber reinforcement.
 5. Admixtures.
 6. Curing materials.
 7. Floor and slab treatments.
 8. Bonding agents.
 9. Adhesives.

10. Vapor retarders.
11. Epoxy joint filler.
12. Joint-filler strips.
13. Repair materials.

- F. Welding Certificates: Copies of certificates for welding procedures and personnel.

PART 2 – PRODUCTS

2.01 FORM MATERIALS

- A. The design and removal of all formwork is solely the responsibility of the Contractor.
- B. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork, for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Cardboard tube forms are not acceptable. Furnish in largest practicable sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
 1. Use medium density overlay (MDO) plywood conforming to PS-1 M.D. Overlay, Group 1, Exterior Grade.
- C. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, $\frac{3}{4}$ by $\frac{3}{4}$ inch, minimum.
- E. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
- F. Form Ties: Use factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
 1. Unless otherwise indicated and except as noted, provide ties so portion remaining within concrete after removal is $1\frac{1}{2}$ inches

inside concrete and will not leave holes larger than 1 inch diameter in concrete surface.

2.02 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- C. Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports conforming to CRSI Specifications, unless otherwise acceptable.
 - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS

- A. General:
 - 1. Portland Cement: ASTM C 150, Type I or II.
 - 2. Aggregates: ASTM C 33, except as modified herein. Furnish aggregates for exposed concrete surfaces from one source. Aggregates shall not contain any substance that may be deleteriously reactive with the alkalis in the cement.
 - 3. Water: Potable, or free from foreign material in amounts harmful to concrete and embedded steel.
 - 4. Admixtures: Provide admixtures for concrete that contain not more than 0.1-percent of chloride ions.
 - 5. Slab, Fly Ash, and Other Pozzolanic Materials: ASTM C 618, Class F only.
 - 6. The materials used in concrete shall contain no hardened lumps, crusts, or frozen matter and shall not be contaminated with dissimilar material.

- B. Types of Cement: Unless a specific type of cement is designated elsewhere, cement used in concrete shall be Type I, Type IP, Type IS, Type IP(MS), Type II, or Type III.
- C. Fly Ash, Slag, and Other Pozzolanic Materials: Fly ash, slag, or other pozzolanic materials may be used as a cement replacement or as an admixture in concrete when Type I, Type II, or Type III cement is used.
- D. Mixing Different Coarse Aggregates: Substitution of aggregate of the same type and grade from a different source in an approved concrete mix may be permitted at the discretion of the Engineer.
- E. Admixtures:
 - 1. Air Entraining Admixture: ASTM C 260.
 - 2. Water Reducing Admixture: ASTM C 494, Type A, and contain not more than 0.1 percent chloride ions.
 - 3. High Range Water Reducing Admixture (Superplasticizer): ASTM C 494, Type F and contain not more than 0.1 percent chloride ions.
 - 4. Water Reducing Non-Chloride Accelerator Admixture: ASTM C 494, Type E and contain not more than 0.1 percent chloride ions.
 - 5. Water Reducing Retarding Admixture: ASTM C 494, Type D, and contain not more than 0.1 percent chloride ions.
 - 6. Chemical admixtures or additives containing calcium chloride shall not be permitted. Provide admixture manufacturer's written certification that chloride ion content is zero percent.

2.04 RELATED MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory packaged nonstaining grout conforming to ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
 - 1. Products: Provide one of the following products or approved equal:
 - a. "Euco-NS"; Euclid Chemical Co.
 - b. "Vibropruf #11"; Lambert Corp.
 - c. "Masterflow 928"; Master Builders Technologies, Inc.
 - d. "SonogROUT 14"; Sonneborn Building Products-Chemrex Inc.
- B. Sealer for Form-Lined Concrete and Adjacent Vertical Concrete: Colorless, proprietary solution for sealing concrete surfaces.

1. Product: "Clear Pruf"; The Burke Co. or approved equal.
- C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq.yd., conforming to AASHTO M 182, Class 2.
- D. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
1. Waterproof paper.
 2. Polyethylene film
 3. Polyethylene-coated burlap.
- E. Liquid Membrane Forming Curing Compound: Liquid type membrane-forming curing compound conforming to ASTM C 309, Type 1-D. Moisture loss not more than 0.55 gr./sq. cm. when applied at 200 sq. ft./gal. Compound to be clear and colorless at time of application and not change to a yellow or amber color over time and exposure.
1. Products: Provide one of the following products or approved equal:
 - a. "Clear Seal"; Tamms Div., LaPorte Construction Chemicals.
 - b. "Masterkure 200W"; Master Builders Technologies, Inc.
 - c. "Klearseal"; Setcon Industries.
 - d. "Kure-N-Seal"; Sonneborn Building Products-Chemrex, Inc.
- F. Bonding Compound: ASTM C 1059. Where concrete placement will be protected (interior) or delayed, use rewettable Type 1 bonding agent. Where concrete will be placed immediately after application of bonding agent, use non-rewettable acrylic Type II.
1. Products, Rewettable Type: Provide one of the following products or approved equal:
 - a. "Euco Weld"; Euclid Chemical Co.
 - b. "Hibond"; Lambert Corp.
 - c. "Everweld"; L&M Construction Chemicals, Inc.
 2. Products, Non-Rewettable Type: Provide one of the following products or approved equal:
 - a. "Acrylic Bondcrete"; The Burke Co.
 - b. "SBR Latex"; Euclid Chemical Co.
 - c. "Acrylbond"; Lambert Corp.

- d. "Sonocrete"; Sonneborn Building Products-Chemrex, Inc.
- G. Epoxy Adhesive: ASTM C 881, Type IV, two component 100 percent solids material suitable for use on dry or damp surfaces. Provide material grade and class to suit project requirements.
 - 1. Products: Provide one of the following products or approved equal:
 - a. "Burke Epoxy M.V."; The Burke Co.
 - b. "Euco Epoxy System #452 or #620"; Euclid Chemical Co.
 - c. "Sikadur 32 Hi-Mod"; Sika Chemical Corp.
- H. Joint Filler Material: Preformed strips of asphalt saturated fiberboard, conforming to ASTM D 1751.
- I. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from ¼ inch.
 - 1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to ¼ inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5700 psi at 28 days when tested according to ASTM C 109/C 109M.

2.05 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Engineer for preparing and reporting proposed mixed designs.
 - 1. Do not use the same testing agency for field quality control testing.
 - 2. Limit use of fly ash to not exceed 20 percent of cement content by weight.
- B. Submit written reports to the Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by the Engineer.
- C. Infill Pedestal: Proportion normal-weight concrete mix as follows:
 - 1. Compressive Strength: 3000 psi at 3 days, 4000 psi at 28 days.

2. Maximum Slump: 4 inches \pm 1 inch.
 3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch slump.
 4. Water/Cement Ratio: 0.50.
- D. Remaining Concrete: Proportion normal-weight concrete mix as follows:
1. Compressive Strength (28 Days): 4000 psi.
 2. Maximum Slump: 4 inches \pm 1 inch.
 3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch slump.
 4. Water/Cement Ratio: 0.50.
- E. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 2 to 4 percent, unless otherwise indicated.
- F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; as accepted by the Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Engineer before using in work.

2.06 ADMIXTURES

- A. Use water reducing admixture of high range water reducing admixture (super plasticizer) in concrete as required for placement and workability.
- B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50-degrees F.
- C. Use high-range water-reducing admixture in pumped concrete, heavy-use slabs, architectural concrete, concrete required to be watertight, and concrete with water-cement ratios below 0.050.
- D. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1½ percent within the following limits:
 1. Concrete not exposed to freezing, thawing, or hydraulic pressure, or to receive a surface hardener: 2 percent to 4 percent air.

- E. Use admixtures for waterproofing, water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

PART 3 – EXECUTION

3.01 FORMS

- A. Design, erect, support, shore, reshore, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct form-work so concrete members and structures are of correct size, shape, alignment, elevation and position. Maintain formwork construction tolerances conforming to ACI 347 and ACI 117.
- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is steeper than 1.5 horizontal to 1 vertical to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, rustications, and the like, to prevent swelling and for easy removal.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar matrix. Locate temporary openings on forms at inconspicuous locations.
- F. Chamfer exposed corners and edges $\frac{3}{4}$ inch unless otherwise indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of

openings, recesses and chases from trades providing such items.
Accurately place and securely support items built into forms.

- H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.02 PLACING REINFORCEMENT

- A. Comply with CRSI's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- D. Place reinforcement as called for on Drawings. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.03 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1½ inches into concrete.
 - 3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

4. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces. All bonding agents must be placed as recommended by the manufacturer.

3.04 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.05 PREPARATION OF FORM SURFACES

- A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface conditions.
- B. Coat contact surfaces of forms with a form-coating compound before concrete is placed.
- C. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions pursuant to form-coating compound manufacturer's published instructions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply pursuant to manufacturer's published instructions.
- D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.06 CONCRETE PLACEMENT

- A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other trades sufficiently in advance, to permit installation of their work, cooperate with other trades in setting such work. All aforementioned work must be completed and the Engineer and/or Department notified at least 24 hours prior to concrete placement to allow

time for adequate inspection. Moisten wood forms immediately before placing concrete where form coating is not used.

1. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.
- B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Architect and/or Engineer of Record (EOR) unless the ready mix manufacturer's ticket indicates amount of mix water withheld for later addition.
- C. General: Conform to ACI 304 and as specified.
1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
 2. Concrete shall NOT drop freely from a height greater than 5-feet.
- D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
1. Cold joints will not be allowed except as approved by the Engineer.
 2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete pursuant to ACI 309R recommended practices.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- E. Cold Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use salt or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs. Do not use calcium chloride.
- F. Hot Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 or as specified in Section 2.05 (H).
1. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 2. Fog spray forms, reinforcing steel, and subgrade just before placing concrete.
 3. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Engineer.

3.07 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding ¼ inch in height rubbed down or chipped off.
- B. Smooth Formed Finish: Provide a smooth form finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.08 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 - 1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
 - 2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days pursuant to ACI 301 procedures. Avoid rapid drying at end of final curing period.

- B. Curing Methods: Perform curing of concrete by curing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.
 - 1. Provide moisture curing by following methods:
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Continuous water-fog spray.
 - c. Covering concrete, surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

 - 2. Provide moisture-cover curing as follows:
 - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

- C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

- D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.
 - 1. Final cure concrete surfaces to receive liquid floor sealer/dustproofer/hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.
 - 2. Do not use membrane curing compounds or a sealer on surfaces which are to be covered with coating material applied directly to concrete such as liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic tile, marble flooring, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to the Engineer.

3.09 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, wall, columns, and similar parts of the work, may be removed, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

3.10 RE-USE OF FORMS

- A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use “patched” forms for exposed concrete surfaces, except as acceptable to the Engineer.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling-in: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

1. Grout base plates and foundations, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.

3.12 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to the Engineer.
 1. Cut out honeycomb, rock pockets, voids over $\frac{1}{4}$ inch in any dimension, down to solid concrete but, in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar before bonding compound has dried.
 2. Patch holes left by tie rods and bolts with a mixture of sand and cement that, after curing, closely matches the appearance of the surrounding wall surface.
- B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
 1. Repair concealed formed surfaces, when possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- C. Repair of Unformed Surfaces: Test unformed surfaces, such as floors and slabs for smoothness and verify the surface plan to tolerance specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.
 1. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include spalls, popouts, honeycombs, rock pockets, crazing, cracks in excess of 0.01 inch wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.
 2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the Engineer.
- D. Repair defective areas, except random cracks and single holes not exceeding 1 inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least $\frac{3}{4}$ inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type of class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - E. Repair isolated random cracks and single holes not over 1 inch in diameter with patching mortar by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to $2\frac{1}{2}$ parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place patching mortar dry pack before compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
 - F. Perform structural repairs with prior approval by the Engineer for method and procedure, using specified epoxy adhesive and mortar.
 - G. Repair methods not specified above may be used, subject to the acceptance of the Engineer.

3.13 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. Employ a testing laboratory to perform tests and to submit test reports.
- B. Sampling and testing for quality control during placement of concrete may include the following, as directed by the Engineer.
 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.

- b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 - c. Concrete Temperature: Test hourly when air temperature is 40 deg. F. and below, and when 80 deg. F. and above; and each time a set of compression test specimens is made.
 - d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field cure test specimens are required.
 - e. Compressive Strength Tests: ASTM C 39; one set for each day's pour plus additional set for each 100 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day.; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
2. When frequency of testing will provide less than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
 3. When total quantity of a given class of concrete is less than 50 cu. yds., Engineer may waive strength test if adequate evidence of satisfactory strength is provided.
 4. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.
- C. Test results will be reported in writing to the Engineer, ready-mix producer, and Contractor within 24 hours that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day test and 28-day tests.

- D. Nondestructive Testing: Impact hammer, sonoscope, other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- E. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders comply with ASTM C42, or by other methods as directed.

END OF SECTION 03310

SECTION 05120 – STRUCTURAL STEEL

PART 1 – GENERAL

1.04 SUMMARY

- B. Extent of structural steel work is shown on the Drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
- B. Structural steel is that work defined in AISC “Code of Standard Practice for Steel Buildings and Bridges” and as otherwise shown on the Drawings.

1.02 RELATED WORK

- A. PAINTING: Section 09961
- B. CONCRETE WORK: Section 03310
- C. PRECAST CONCRETE: Section 03450
- D. MASONRY: Section 04810

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CASE or CSE.
- B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Cbd or Sbd.
- C. Codes and Standards: Comply with provisions of the following, unless otherwise indicated or specified:
 - 1. American Institute of Steel Construction (AISC):
 - a. AISC Code of Standard Practice for Steel Buildings and Bridges
 - b. AISC Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings, including “Commentary” and Supplements.

- c. AISC Specifications for Structural Joints using ASTM A 325 or A 490 Bolts; approved by the Research Council on Structural Connections (RCSC).
 - d. Steel Construction Manual, Thirteenth Edition.
 - 2. American Society for Testing and Materials (ASTM):
 - a. Referenced Standards.
 - 3. American Welding Society (AWS):
 - a. AWS D1.1-04 Structural Welding Code – Steel
- D. Qualifications for Welding Work: Comply with the following:
 - 1. Qualify welding processes and welding operators in accordance with AWS “Standard Qualification Procedure”.
 - 2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous twelve (12) months.
 - a. If re-certification of welders is required, re-testing will be Contractor’s responsibility.
- E. All structural steel work and material is subject to inspection and testing. The expense of removing and replacing any structural steel for testing purposes shall be borne by the Contractor if it is found to be unsatisfactory. Remove and replace work found to be defective and provide new acceptable work at no additional expense to the Department.

1.04 SUBMITTALS

- A. Product Data: Submit producer’s or manufacturer’s specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
 - 1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
 - 2. High-strength bolts (each type), including nuts and washers.
 - 3. Structural steel primer paint.
 - 4. Shrinkage-resistant grout.
- B. Shop Drawings: Submit shop drawings including complete details and schedules for fabrication and assembly of structural steel members procedures and diagrams.

1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.
 2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.
 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 5. For structural-steel connections indicated to comply with structural drawings unless approved otherwise. Proposed alternate connections must be submitted for review and approval. Submittal must include structural analysis data prepared by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification Data: For Installer and fabricator.
- E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
1. Structural steel including chemical and physical properties.
 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 3. Tension-control, high-strength bolt-nut-washer assemblies.
 4. Shear stud connectors.
 5. Shop primers.
 6. Nonshrink grout.
- F. Source quality-control test reports.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
- C. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace

damaged materials or structures as directed, at no additional cost to the Department.

PART 2.00 – PRODUCTS

2.01 MATERIALS

- A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
- B. Steel Angles: ASTM A36/A36M
- C. Plates and Bars: ASTM A36
- D. Steel Pipe: ASTM A53, Grade B.
- E. Structural Steel Tubes: ASTM A 500, Grade B.
- F. Anchor Bolts: ASTM F 1554.
- G. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
 - 1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.
- H. Electrodes for Welding: Comply with AWS Code E70XX.
- I. Structural Steel Primer Paint: Two-component polyamidoamine epoxy or approved equal, selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats.
- J. Structural steel intermediate primer paint: Two-component polyamidoamine epoxy or approval equal.
- K. Non-Metallic Shrinkage-Resistant Grout: Comply with the following:
 - 1. Pre-mixed non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with ASTM C 1107, Type A.

2. Products: Subject to compliance with specified requirements, provide one of the following or approved equal:
 - a. “Euco N.S.”; Euclid Chemical Co.
 - b. “Crystex”; L&M Construction Chemicals, Inc.
 - c. “Masterflow 713”; Master Builders Technologies, Inc.
- L. Clevises/Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.
- M. Galvanizing: ASTM A123 – Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products or ASTM A153 – Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware as applicable.
- N. Galvanizing Repair Material: Dri-Galv or Galvicon, or equal, approved 90% zinc rich cold process repair material.

2.02 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on approved shop drawings. Provide camber in structural members where indicated.
- B. Splice members only where indicated and accepted on shop drawings.
- C. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
- D. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- E. Welded Connections: All shop connections shall be seal welded for exposed structural steel.
 1. Provide high-strength threaded fasteners for principal bolted connections.
- F. Bolted Connection: Install high-strength threaded fasteners in accordance with AISC “Specifications for Structural Joints using ASTM A 325 or A 490 Bolts” (RCSC).

- G. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.
- H. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.
- I. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on approved shop drawings.
- J. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.
- K. Cut, drill, or punch holes perpendicular to metal surfaces. Do not thermally cut holes or enlarge holes by burning. Drill holes in bearing plates.
- L. Provide connection plates for signage and other trades.
- M. Contractor must coordinate with all trades prior to fabrication.
- N. Fabrication shall comply with Section 10 Architecturally Exposed Structural Steel in the Steel Construction Manual – 13th edition.

2.03 SHOP PAINTING

- A. General: Comply with the following:

1. Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches of embedded areas only.
 2. Do not paint surfaces that are to be welded or high-strength bolted with friction-type connections.
 3. Apply 2 coats of paint, primer and intermediate coat, to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.
- B. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
1. SP-6 “Commercial Blast Cleaning.”
- C. Painting: Comply with the following:
1. Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer’s instruction and at a rate to provide dry film thickness of not less than 2.0 mils. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 2. Primer shall be Tnemic: Two-component polyamidoamine epoxy or approved equal. Primer shall be compatible with intermediate and finish coat paint products specified in Section 09961-PAINTING for structural steel indicated or scheduled to be finish painted.
 3. Intermediate coat shall be Tnemic: Two-component polyamidoamine epoxy applied at a spreading rate recommended by manufacturer to achieve a dry film thickness of 4.0 to 6.0 mils.
 4. Comply with Section 09961 Painting Specification.
- D. Galvanize structural steel members conforming to ASTM A123. Provide minimum 1.25 oz/sq. ft. galvanized coating.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify elevations of concrete surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

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

3.02 ERECTION

- A. Surveys: Employ a registered professional land surveyor in the State of Florida for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Engineer.
 - 1. Do not proceed with erection until the surveyor's report has been submitted, corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Engineer.
- B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds. Provide temporary planking and working platforms as necessary to effectively complete work.
- C. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
- D. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.
- E. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
- F. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
- G. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
- H. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

1. For proprietary grout materials, comply with manufacturer's published instructions.
- I. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - J. Level and plumb individual members of structure within specified AISC tolerances.
 - K. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
 - L. Splice members only where indicated and accepted on shop drawings.
 - M. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - N. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts only after notification and acceptance by the Engineer.
 - O. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Engineer. Finish gas-cut sections equal to a sheared appearance when permitted.
 - P. Touch-Up Painting:
 1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
 2. Apply by brush or spray to provide minimum dry film thickness of 2.0 mils.
 - Q. Erector must coordinate all erection activities with other trades when necessary for the installation of those trades. See architectural, plumbing, electrical and other drawings for pipes and conduits inside the hollow

structural sections. Comply with Section 10 Architecturally Exposed Structural Steel in the Steel Construction Manual – 13th edition.

3.03 FIELD QUALITY CONTROL

- A. Engage an independent testing and inspection agency to visually inspect all of the high-strength bolted connections and welded connections and to perform tests and prepare test reports.
 - 1. Perform a magnetic particle test on 25 percent of all fillet and full penetration welds. If more than 20 percent of welds made by a welder contain defects identified by testing, then all welds made by that welder shall be tested.
 - 2. Provide a minimum ten (10) day notice to the testing agency prior to commencement of erection work.
- B. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
- C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- D. Testing agency may inspect structural steel at plant before shipment; however, Engineer reserves right, at any time before final acceptance, to reject material not complying with specified requirements.
- E. Correct deficiencies in structural steel work which inspections and laboratory tests reports have indicated to be not in compliance with requirements. Perform additional tests as may be necessary to re-confirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

3.04 FIELD PAINTING

- A. General:
 - 1. Prepare surfaces in a manner appropriate to the condition, and as approved by the Engineer.
 - 2. Clean spots and surfaces where primer coats have been removed, damaged, or burned off, and clean field bolts and other field connections not concealed in the finished work.
 - 3. Remove dirt, oil, and grease.
 - 4. Apply a spot coat of the approved primer.

5. Do not apply paint to wet, damp, oily, or improperly prepared surfaces.
- B. Notify the Architect and Engineer when the work of this Section is ready to receive field painting. Lapse time between surface preparation and field painting shall not exceed 7 days. Reclean all surface areas if necessary at no additional cost to the Department.
1. Secure inspection and approval by the Architect and Engineer prior to field painting.
 2. Using spray or brush, as recommended by the manufacturer of the approved paint material, fill all joints and corners and cover the surfaces with a smooth unbroken film of at least 1.5 dry mils thickness.
 3. Apply two coats to all surfaces of steel which will be inaccessible for painting after fabrication and erection.

3.05 FIELD GALVANIZING

- A. Required: For protective coating of damaged galvanized surfaces resulting from welding or other construction operations in the field or at the job-site.
- B. Method: By Dri-Galv or Galvicon or equal method in accordance with manufacturer's directions, herein before specified in Subsection 2.1 (L).

3.06 CLEAN-UP

- A. Remove from time to time, as directed, all rubbish and debris resulting from the Work and upon completion of the Work remove all unused materials, equipment, scaffolding, and similar construction related items, and perform such final cleaning services as may be necessary to leave the completed Work in a condition acceptable to the Department.

END OF SECTION 05120

SECTION 05300 – METAL DECKING

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Extent of metal decking is indicated on Drawings, including basic layout for the following type of deck required:

1. Metal Roof Deck.

1.02 RELATED WORK

- A. Structural Steel: Section 05120

1.03 QUALITY ASSURANCE

- A. Reference Standards: Comply with provisions of the following, except as otherwise indicated or specified:

1. American Iron and Steel Institute (AISI):
 - a. AISI Specification of the Design of Cold-Formed Steel Structural Members.
2. American Society for Testing and Materials (ASTM):
 - a. Referenced Standards
3. American Welding Society (AWS):
 - a. AWS D1.1 Structural Welding Code – Steel.
 - b. AWS D1.3 Structural Welding Code – Sheet Steel.
4. Steel Deck Institute (SDI):
 - a. SDI Pub. No. 28 Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Decks with Electrical Distribution.

- B. Qualification of Field Welding:

1. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
 2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous twelve (12) months.
 - a. If re-certification of welders is required, re-testing will be Contractor's responsibility.
- C. Welded decking in place is subject to inspection and testing. The expense of removing and replacing portions of decking for testing purposes will be borne by the Department if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

1.04 SUBMITTALS

A. Product Data:

1. Submit manufacturer's specifications and installation instructions for each type of decking and accessories. Include manufacturer's certification as may be required to show compliance with these Specifications.

B. Shop Drawings:

1. Submit detailed drawings showing layout and types of deck panels, anchorage details (including the type, size, spacing, location of all welds/screws), and conditions requiring closure strips, supplementary framing, cant strips, cut openings, special jointing or other accessories.

C. Insurance Certification:

1. Assist the Department in preparation and submittal of roof installation acceptance certification may be necessary in connection with fire and extended coverage insurance.

D. Welding Certifications:

1. Submit copies of certificates for welding procedures and personnel.
2. Contractor shall submit certificates to the Engineer for review.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Products: Provide metal decking by one of the following manufacturers or approved equal:
 - 1. Vulcraft Div., Nucor Corp.
 - 2. Wheeling Corrugating Co. Div. of Wheeling-Pittsburgh Steel Corp.
 - 3. Epic Metals Corp.

2.02 MATERIALS

- A. Steel for Galvanized Metal Deck Units: ASTM A653, Grade 33, G60 zinc coating.
- B. Miscellaneous Steel Shapes: ASTM A 36.
- C. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces conforming to Department of Defense (DOD) P-21035A (SH).
- D. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.
- E. Self-Drilling Screws: Hilti No. 10 self-drilling screws or approved equal.
- F. Powder Actuated Fasteners: Hilti ENP³/ENPH3/ENP2/ENKK pins or approved equal.

2.03 FABRICATION

- A. Provide deck configuration complying with SDI “Specification and Commentary for Steel Roof Deck”.
- B. Deck Profile: Type “N” at 3” deep deck and Type “B” at 1½” deep deck.

- C. Profile Depth: 3 inches at spans > 6'-0".
1½ inches at spans ≤ 6'-0" unless noted otherwise.
- D. Design Uncoated Thickness: 0.03581 inches or per structural drawings, whichever is greater.
- E. Span Condition: Triple span or more.
- F. Side-laps: Overlapped.
- G. Metal Closure Strips:
 - 1. Fabricate metal closure strips, for openings between decking and other construction, of not less than 0.045" minimum (18 gage) sheet steel. Form to provide tight-fitting closures at open ends of flutes and sides of decking.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Installer must examine the areas and conditions under which metal decking items are to be installed. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 INSTALLATION

- A. General: Comply with the following:
 - 1. Install deck units and accessories in accordance with manufacturer's published instructions and current recommendations and approved shop drawings, and as specified herein.
 - 2. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
 - 3. Do not start placement of deck units before supporting members are installed. Place deck units on supporting metal steel framework and adjust to final position with ends bearing on supporting members and accurately aligned end to end before being permanently fastened.
 - a. Lap ends 1½ inch deck units not less than 2 inches.

- b. Butt ends of 3 inch deck units.
 - c. Do not stretch or compress the side-lap interlocks.
 - d. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
4. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.
 5. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
 6. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
 7. Do not place deck units on concrete supporting structure until concrete has cured and is dry.
 8. Do not use deck units for storage or working platforms until permanently secured.
- B. Fastening Roof Deck Units: Comply with the following:
1. Install and anchor roof deck units to resist gross uplift loading as indicated on the Drawings.
 2. Fasten roof deck units to steel supporting members as shown on roof plans. In addition, secure deck to each supporting member in ribs where side laps occur.
 3. Comply with AWS requirements and procedures for manual shielded metal arc welding for appearance and quality of welds, and methods used in correcting welding work. Use welding washers where recommended by deck manufacturer.
- C. Touch-Up Painting:
1. After decking installation, wire brush, clean and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members. Touch up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.
- D. Cutting and Fitting:
1. Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.
- E. Reinforcement at Openings:

1. Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, as shown.

F. Joint Covers:

1. Provide metal joint covers at abutting ends and changes in direction of deck units, except where taped joints are allowed.

G. Closure Strips:

1. Provide metal closure strips at open uncovered ends and edges of roof decking, and in voids between decking and other construction. Weld into position to provide a complete decking installation.

H. Architecturally Exposed:

1. Where the metal deck is “architecturally exposed,” the installer must conform to AISC and Steel Deck Institute (SDI) standards for “architecturally exposed” steel construction. Care must be taken during shipping, storage and erection to prevent damage and corrosion. Conform to the SSPC protective coating standards.

3.03 CLEAN-UP

- A. Periodically and as directed, remove all rubbish and debris resulting from the Work. Upon completion of the work, remove all unused materials, equipment, scaffolding, and similar construction related items, and perform final cleaning services as may be necessary to leave the completed Work in a condition acceptable to the Department.

END OF SECTION 05300

END OF PLATFORM CANOPY STRUCTURAL PACKAGE