

SECTION 13 34 16

HYBRID PRECAST STADIUM SYSTEM

PART 1 - GENERAL

1.1 GENERAL

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 - Specification sections, apply to work of this section.

1.2 SCOPE

- A. These Specifications cover the requirements for the design, fabrication, delivery and installation of the Dant Clayton Hybrid Precast Stadium System, including the following:
 - 1. Concrete foundations
 - 2. Structural steel framed understructure
 - 3. Hybrid precast concrete treads
 - 4. Aluminum risers
 - 5. Aluminum aisle steps
 - 6. Guardrails and handrails
 - 7. Seating
 - 8. Ramps, stairs and landings
 - 9. Vertical closure
 - 10. Grandstand finishes

1.3 RELATED SECTIONS AND DOCUMENTS

- A. Concrete – Division 3
- B. Stadium Seating – Division 12
- C. Pressbox – Division 13

1.4 CODES AND STANDARDS

- A. Perform all work in accordance with the latest editions and revisions of the following standards, which hereby become part of this section.
 - 1. ICC 300 – Standard for Bleachers, Folding and Telescopic Seating and Grandstands
 - 2. International Building Code, Edition 2018 **[2015, 2012]**
 - 3. Local Building Code Amendments **[LIST STATE]**
 - 4. AWS D1.1 – Structural Welding Code – Steel
 - 5. AWS D1.2 – Structural Welding Code – Aluminum
 - 6. AISC 360 – Specification for Structural Steel Buildings
 - 7. Aluminum Design Manual (ADM), 2015
 - 8. ACI 318 - Building Code Requirements for Structural Concrete

9. PCI – Precast Concrete Institute
10. American Galvanizers Association (AGA)
11. The Society for Protective Coatings (SSPC)
12. **[remove if not required] The Institute of Structural Engineers (IStructE), Dynamic Performance Requirements for Permanent Grandstands Subject to Crowd Action, 2008.**

1.5 GRANDSTAND CONTRACTOR QUALIFICATIONS

A. Manufacturer/Fabricator Qualifications:

1. Experience: Manufacturer/fabricator with not less than 10 years experience with successful production of products and systems to the specified scope of Work, with a record of successful in-service performance and completion of similar projects for a period of not less than 10 years, and with sufficient production capability, facilities, and personnel to produce required Work.
2. Approved manufacturer:
 - a) Dant Clayton Corporation – Louisville, KY
3. Manufacturer/fabricator shall be an AISC Certified Fabricator.
4. **[OPTIONAL, REMOVE IF NOT NECESSARY. NOT TYPICALLY PROVIDED ON CORE WORK] Supervision: Provide an on-site supervisor, who is experienced in fabricating/installing systems of the type and scope of Work specified, at the project during times the specified Work is in progress.**

B. Installer Qualifications:

1. Experience: Installer with not less than 5 years experience in performing specified scope of Work, with a record of successful in-service performance and completion of projects for a period of not less than 2 years, and with sufficient production capability, facilities, and personnel to produce required Work.
2. Supervision: Provide a full-time on-site supervisor, who is experienced in installing systems of the type and scope specified, at the Project during times the specified Work is in progress.
3. Manufacturer/Fabricator Acceptance: Installer shall be certified, approved, licensed, or acceptable to manufacturer/fabricator to install products.

C. Delegated Engineering Professional Qualifications: Professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated that have resulted in installations similar to this Project, and that has a record of successful in-service performance.

D. Delegated Engineering Responsibility: Contractor shall employ a qualified professional engineer licensed in the state where the project is located to provide engineering for products and systems as required to meet design intent of Contract Documents including, but not limited to, the following:

1. Preparation of structural analysis data including engineering calculations, shop drawings, and other submittals signed and sealed by the qualified professional engineer responsible for their preparation.
2. Comprehensive engineering analysis indicating governing unit types, connections, unit thicknesses and including any special details or conditions.
3. Location, type, magnitude, and direction of loads imposed on the building structural frame from units.

1.6 PERFORMANCE REQUIREMENTS

- A. General Performance: Engineer grandstand to withstand loads within limits of allowable working stresses of the materials involved under conditions indicated and without permanent deformation or failure of materials.
- B. Design Loads: Engineer to withstand design loads including but not limited to gravity, wind, seismic, and erection design loads and shrinkage/thermal movements as established by authorities having jurisdiction, applicable local building codes, and as indicated.
- | | | |
|----|------------------------|-------------------------------------|
| 1. | Superimposed Dead Load | 6 psf |
| 2. | Live Load | 100 psf |
| 3. | Sway Load | 24 plf per row parallel to row |
| 4. | Sway Load | 10 plf per row perpendicular to row |
| 5. | Wind Load | Design per local building code |
| 6. | Seismic Load | Design per local building code |
| 7. | Guardrail Loads | Design per local code |
- C. Grandstand System Self Weight: Self-weight of the grandstand system shall be incorporated into the project calculations for both foundations and framing.
- D. Structural Deflections: Limit live load deflections of precast treads and structural steel framing and any other flexural members to $L/200$ [**L/360**] of the span.
- E. Structural Drift: Limit the horizontal frame drift of the grandstand system to $H/200$ of the frame height under sway, wind and seismic loads.
- F. **[remove if not required] Vibration Control: Proportion framing system as required to provide a minimum natural frequency of [3.5 Hz, 4.5 Hz, 6.0 Hz] for stiffness and rhythmic activity (sporting event) vibration control.**
- G. Thermal Movements: Engineer products and systems to accommodate thermal movements of supporting elements resulting from the maximum change (range) in ambient and surface temperatures without buckling, damaging stresses, damaging loads on fasteners, failure of operating units to function properly, and other detrimental effects.
- H. Dimensional Tolerances: Engineer and detail products, systems and connections back to primary structural elements to accommodate fabrication tolerances and dimensional tolerances of framing members and adjacent construction.

1.7 SUBMITTALS

- A. Product Data: Manufacturer/fabricator's technical literature for each product and system indicated.
 - 1. Include manufacturer/fabricator's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.
- B. Approval Drawings: Submit for review detailed approval drawings as follows:
 - 1. Drawings shall include at a minimum:
 - a) All dead, live and other applicable loads used in the design.
 - b) Detailed and dimensioned foundation, framing, layout, and seating plans.
 - c) Foundation sizes, locations and elevations shall be shown in compliance with surrounding Work and relationships to finish grade.
 - d) Seating plan indicating all aisles, walkways, seating sections and exits.
 - e) Sections and details showing complete methods of assembly and anchorage:
 - i. Show riser heights and platform widths
 - ii. Show stair and ramp sections including railings
 - iii. Show overall sections showing railings systems, sightlines (when required by scope)
 - f) Connection details showing size, type, and grade of all plates, bearings, inserts and anchors.
 - g) Show proper welding symbols in accordance with AWS D1.1 and AWS D1.2.
 - h) Description of all loose and installed hardware, plates, inserts, etc.
 - i) Finishes.
 - j) Size, type and location of all drain holes, sleeves, and other openings.
 - k) Joint covers.
 - 2. All approval drawings submitted shall be sealed by a professional engineer who is licensed in the state where the project is located.
 - 3. Coordination of Contract Documents and Work:
 - a) Coordinate the design and installation of grandstand products and systems with interfacing and adjoining construction.
 - b) Furnish setting drawings, templates and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts and items with integral anchors that are to be embedded in concrete.
 - 4. Field Installed Seating Unit Attachment Drawings: Submit a drawing showing the method and proposed location for attaching all stadium seats to the seating units, as required.

5. Equipment Hung from Seating Units: No pipe, ducts or other equipment shall be hung from the seating units without written approval of the Delegated Design Engineer. Coordinate all attachment methods and fastener types with the Delegated Design Engineer to ensure they are suitable for the selected system.
- C. Delegated Design Engineering Calculations: Calculations submittal for products indicated to demonstrate conformance with specified design loads, element stiffness and performance requirements including structural analysis data signed and sealed by the professional engineer responsible for their preparation licensed in the state where the project is located.
1. Structural Design:
 - a) Provide for review design calculations for dead load, live load, wind load, seismic load including deflections, and vibration control. Refer to "Performance Requirements" for explicit requirements.
 2. Railings and guardrail inserts and connections: Shall be designed to resist design load reactions for all railings and guardrails. See related specification sections for design loads. Where not shown, loads shall be per code.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" to demonstrate their capabilities, experience and qualifications. Submit for record lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified
1. Manufacturer qualifications
 2. Professional Engineer qualifications
- E. Samples for Verification: For each type of exposed material, color, finish and texture indicated below:
1. Powder Coating Finish: Manufacturer's standard size unit, not less than 3 inches square.
 2. Aluminum Finishes: Manufacturer's standard size unit, not less than 3 inches square.
 3. Bench Seating: 18-inch long sample.
- F. Warranty: Sample of standard warranty.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver grandstand components in such quantities and at such times to sufficient for construction activities to occur without delay.
- B. Storage: Store components with adequate dunnage.
 1. Identification:

- a) Provide permanent markings to identify part numbers, orientation in the structure complying with markings indicated on final shop drawings. Markings on each component shall be on a surface which will not show in finished structure.
 - b) Provide additional marking as required by local building codes or ordinances.
- C. Handling: Handle and transport components in a position consistent with their shape and design to avoid excessive stresses which would cause damage.

1.9 PRE-INSTALLATION CONFERENCE

- A. Pre-Installation Conference: Before Installation begins, conduct conference to comply with requirements of applicable Division 01 Sections.

1. Required Attendees:

- a) Owner or Owner's Representative
- b) Architect
- c) Contractor
- d) Installer
- e) Manufacturer/fabricator's qualified technical representative
- f) Erectors of other construction interfaced with Work
- g) Owner's testing agency

2. Conference Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:

- a) Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
- b) Review Work requirements (Drawings, Specifications, and other Contract Documents).
- c) Review required submittals, both completed and yet to be completed.
- d) Review and finalize construction schedule related to Work and verify availability of materials, Erector's personnel, equipment, and facilities needed to make progress and avoid delays.
- e) Review required inspection, testing, certifying, and material usage accounting procedures.
- f) Review environmental conditions and procedures for coping with unfavorable conditions.
- g) Resolve deviations or differences between Contract Documents and the manufacturer/fabricator's specifications.

3. Contractor shall record discussions of conference, including decisions and agreements reached, and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

1.10 QUALITY CONTROL BY CONTRACTOR

- A. For grandstand members furnished under this Section, quality control inspection and testing shall occur during the manufacture of the components, and the components are subject to the approval of the engineered seating bowl supplier's Quality Control Manager.
- B. Plant Quality Control: Provide copies of plant quality control program describing procedures for the following:
 - 1. Overall quality control measures
 - 2. Verifying sizes and critical dimensions of members.
 - 3. Verifying position of plates, inserts, and other embedded items.
 - 4. Final inspecting of products prior to shipment.
 - 5. AISC certification

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard 1-year warranty is required in which manufacturer agrees to repair finish or replace components that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 HYBRID PRECAST STADIUM SYSTEM COMPONENTS

- A. Single Source Responsibility: Furnish each type of product from a single manufacturer/fabricator. Provide secondary materials only as recommended by manufacturer/fabricator of primary materials.
- B. Basis of Design: The design for Hybrid Precast Stadium System is based on the grandstand system designed and engineered by Dant Clayton. Other manufacturers requesting to bid shall be approved by written addendum at least seven (7) days prior to bid date. Listing as acceptable manufacturer does not remove responsibility to meet specifications.
- C. Concrete Foundations and Slabs: Design concrete foundations where shown on drawings in accordance with the project Geotechnical Investigation (provided by others).
 - 1. Foundations shall meet frost depth requirements.
 - 2. All design, detailing, fabrication and installation shall be in accordance with ACI 318.
 - 3. Cast-in-place concrete shall have a minimum compressive strength of 4,000 psi with air entrainment of 6% +/- 1%.
 - 4. All reinforcing steel shall be in accordance with ASTM A615 with a minimum yield strength of 60,000 psi.
- D. Structural Steel Framing

1. All detailing, fabrication, and erection shall be in accordance with the AISC Specification for Structural Steel Buildings.
2. All fabrication will be completed in a certified AISC facility.
3. Structural steel shall be ASTM A992 multi-certified grade 50.
4. Miscellaneous steel shall be ASTM A36.
5. Structural tubes shall be ASTM A500 grade B or C.
6. Bolts and nuts: All bolts 5/8-inch diameter and larger shall meet ASTM F3125 grade A325; 1/2-inch diameter and smaller shall meet ASTM A307.
7. Washers shall meet ASTM F436.
8. Threaded rod shall be ASTM A36 or F1554 if used for anchorage to concrete.
9. All welds shall conform to ANSI/AWS D1.1, latest edition. Electrodes shall be E70XX.

E. Hybrid Precast Tread and Riser System

1. Decking System: Fully-closed precast concrete deck system consisting of two components:
 - a) First component is a precast concrete tread that covers all walking surfaces and contains an embedded powder coated aluminum nosing die.
 - b) The second component is a vertical interlocking flat aluminum riser that attaches to female nose of embedded aluminum nosing, rotates down into position and overlaps the rear heel of tread below and is secured with a mechanical screw fastener.
 - c) Rise/Run as indicated on drawings.
 - d) The entire Hybrid system will be sloped one degree forward to cause water to drain to the front of the grandstand. (see Water Management).
 - e) The precast concrete treads will span from raker beam to raker beam. Provide a 3/4 inch +/- gap at the joints of the precast panels to allow for expansion and contractions of the concrete due to temperature variations and to allow for constructability tolerances.
 - f) The precast concrete treads will be secured to the raker with a headed stud welded to the raker and a hole in the precast tread. Hole is filled with an epoxy grout to lock the precast tread to the steel frame.
 - g) The joint in the precast concrete treads shall be filled with backer material and caulk (see Joints).
2. Precast Concrete:
 - a) Concrete Materials:
 - i. Portland Cement: ASTM C 150, Type I or III
 - ii. Supplementary Cementitious Materials
 - iii. Fly Ash Admixture: ASTM C 618, Class C or F
 - iv. Metakaolin Admixture: ASTM C 618, Class N
 - v. Silica Fume Admixture: ASTM C 1240 with optional chemical and physical requirements

- vi. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120
- vii. Normal Weight Aggregates: Except as modified by PCI MNL 116, ASTM C33, with coarse, non-reactive aggregates complying with Class A. Provide and stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for entire Project.
- viii. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with ASTM C 1602.
- ix. Air Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- x. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

b) Concrete mixes

- i. Prepare design mixes for each type of concrete required: limit use of fly ash to 25 percent replacement of portland cement by weight and granulated blast-furnace slag to 40 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.
- ii. Compressive Strength (28 Days): minimum 5000 psi.
- iii. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116, but no less than 6% +/- 1%.
- iv. When included in design mixes, add other admixtures to concrete mixes according to manufacturer's written instructions.

- c) Grout Materials: Nonshrink grout, premixed, packaged non-ferrous aggregate, shrink resistant grout containing silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A of consistency suitable for applications with a 30-minute working time.

F. Aluminum: Provide aluminum components at locations as shown on drawings, noted below and in compliance with the following:

- 1. All detailing, fabrication, and erection shall be in accordance with the code required edition of the Aluminum Design Manual.

G. Aisle Steps

- 1. Aisle step units are to be provided at all intermediate aisle locations as shown on the architectural drawings and be made from 2" thick precast concrete treads supported by a welded aluminum frame.

2. Aisle step units shall be mounted to the Hybrid stadia system with concrete screws.
3. Aisle steps will be designed to satisfy row depth with vertical closure panels at the ends of the intermediate steps. No cavity or recessed closure is allowed in area of foot travel.
4. Provide a finish and texture matching that of the stadia tread and riser system to which they are installed. See Finishes.
5. Provide stair nosing at steps and treads.
6. Shall be designed to resist loads imposed from any step mounted rails.

H. Guardrail & Handrail System

1. Chain Link Fence Guardrail System:
 - a) Vertical guardrail structural supports shall be aluminum rectangular tube 2.8" x 2.0 x .1888" or aluminum angle of equivalent strength and shall be 6061-T6 alloy. Guardrail shall have structural support on each leg of the fencing at all 90 degree turns. Steel angle supports do not meet this requirement and are not acceptable.
 - b) Guardrail horizontal and vertical framing members will be 1 5/8" O.D. aluminum pipe.
 - c) Chain link fence shall be **[2" x 9 ga mesh, galvanized fabric.] [2" x 6 ga black vinyl coated fabric.]**
 - d) Vertical guardrail supports will have cast aluminum safety end caps on top and bottom.
2. Vertical Picket Rail Guardrail System
 - a) Guardian Type (Channel Top and Bottom Rail)
 - i. Vertical guardrail support post shall be square structural steel tube HSS2x2x3/16 (min) using ASTM A500 Gr B material. Guardrail shall have structural support on each leg of the fencing at all turns.
 - ii. Infill panels shall bolt to the vertical post with top and bottom rails of 1 1/2" structural steel channels with 1/2" structural steel balusters spaced at no more than 4" c/c.
 - b) Classic Type (Circular Top and Bottom Rail)
 - i. Vertical guardrail support post shall be square structural steel tube HSS2x2x3/16 (min) using ASTM A500 Gr B material. Guardrail shall have structural support on each leg of the fencing at all turns.
 - ii. Infill panels shall slip onto welded studs of vertical post and are designed with top and bottom rails of 1 1/2" Ø structural steel pipes with 1/2" structural steel balusters spaced at no more than 4" c/c.
 - c) Regal Type (Square Top and Bottom Rail)

- i. Vertical guardrail support post shall be square structural steel tube HSS2x2x3/16 (min) using ASTM A500 Gr B material. Guardrail shall have structural support on each leg of the fencing at all turns.
 - ii. Infill panels shall slip onto welded studs of vertical post and are designed with top and bottom rails of HSS1.5X1.5X1/8 square steel tubes with 1/2" structural steel balusters spaced at no more than 4" c/c.
- d) Prestige Type (3-Line Sightline Rail)
 - i. Vertical guardrail support post shall be square structural steel tube HSS2x2x3/16 (min) using ASTM A500 Gr B material. Guardrail shall have structural support on each leg of the fencing at all turns.
 - ii. Infill panels shall bolt to the vertical post and are designed with 3-lines of horizontal rail.
 - (1) 1 1/2" steel channel
 - (2) 1 1/2"Ø O.D. steel pipe
 - (3) HSS1.5x1.5x1/8 square tube
 - iii. Infill pickets shall be 1/2" structural steel balusters spaced at no more than 4" c/c, between bottom rail and middle rail.
 - iv. Support pickets between middle rail and top rail will be installed as required for adequate top rail support determined by the engineer and railing layout.
 - v. Distance between top of middle rail and bottom of top rail shall not exceed 6" gap.

3. Cable Rail Guardrail System

- a) Vertical guardrail support post shall be square structural steel tube HSS2x2x3/16 (min) using ASTM A500 Gr B material. At corners, each end shall have its own termination post. Post shall be seal welded at top.
- b) Top Rail framing member shall consist of 2" x 1" x 3/16" structural steel channel.
- c) Top Rail mounting hardware to be stainless steel carriage bolts
- d) Infill cable shall be minimum 3/16" diameter 1x19 316 Stainless-Steel. Cables shall be spaced equally between top and bottom horizontally framing members, with 3 1/2" max spacing.
- e) All cable rail specific hardware to be stainless steel.
- f) Maximum individual cable run not to exceed 50 ft without terminating and starting a new cable run. A double post will be provided at the termination points.
- g) Cable at sides of stand and vomitories shall match the slope of the seating rise run.

4. Handrail System

- a) Aluminum handrails shall be provided in all areas required by building code and as indicated on the architectural drawings at all locations of new aluminum stadia treads and risers.
- b) Handrails shall be 1 15/16" O.D. extruded aluminum pipe. Straight pipe shall be 6061-T6 aluminum alloy with minimum yield strength of 35 ksi. Bent pipe shall be 6061-T4 aluminum alloy with minimum yield strength of 21 ksi.
- c) Aisle handrails shall be two-line and feature internal fittings for both lines of rail. External fittings are not permitted.
- d) Aisle handrails shall be mounted to the aisle steps with connecting bracket or floor flange.
- e) Handrails on all ramps and stairs shall provide 1-1/2" clearance from the guardrail material and shall extend 12" past the last riser with a return. Newel posts will not interrupt handrails. Handrails will not project more than 4.5" into the width of a stair or ramp.

I. Seating

1. Aluminum Bench Seats:

- a) Aluminum bench seats shall be 6063-T6 extruded aluminum with a fluted surface and a minimum of 4 vertical legs making up the extrusion.
- b) The exact size of seat board is 2" x 10" x .080" wall thickened at the joints and weighing 1.9 lbs. per foot with 1" radius comfort curve front edge.
- c) Aluminum shall be cleaned, pre-treated and clear anodized (unless otherwise noted in Finishes).

2. Aluminum Bench Seats with Backrest:

- a) Shop bent aluminum backrest stanchion brackets shall be 6063-T6 extruded aluminum attaching at each bench seat mounting bracket.
- b) Stanchions shall be heat treated and clear anodized (unless otherwise noted in Finishes).
- c) Contoured 7" aluminum backrest shall be 6063-T6 extruded aluminum with fluted surface and extruded legs that allow it to rest on the tops of the stanchion brackets.
- d) Ends of backrest will have cast aluminum endcaps.

3. Colosseum 1 – Molded Plastic Seat:

- a) Seat construction shall be one-piece, double wall construction, rotationally molded, polyethylene, with an average wall thickness of 3/16".
- b) The chair back must be compound curved and full-length, and an integral part of the seat unit, with no gap construction between the back and the seat pan.
- c) The seat pan shall be full width of the chair. The seat pan shall be designed so any water or liquid spills will be channeled to a drainage slot which releases water or liquid under the seat.

- d) Polyethylene shall be treated with ultraviolet inhibitors and proper pigments to insure minimum fading.
- e) Mounting brackets: Galvanized ASTM-36 steel and aluminum "W" channels.
- f) Seat numbers for chairs shall be anodized aluminum plates, attached with rivets. Numbers shall be 1" high, minimum and finished in weather-resistant recessed pockets.

4. Colosseum 2 – Molded Plastic Bench Seat

- a) Seat construction shall be one-piece, double wall construction, rotationally molded, polyethylene, with an average wall thickness of 3/16".
- b) Seat depths be 10" or 12". Seat widths will consist of 18", 19", or 20". Customer to specify seat depths, and minimum seat widths
- c) Seats to bolt directly to aluminum seatboard below with galvanized hardware
- d) The seat pan shall be full width of the chair. The seat pan shall be designed so any water or liquid spills will be channeled to a drainage slot which releases water or liquid under the seat.
- e) Polyethylene shall be treated with ultraviolet inhibitors and proper pigments to insure minimum fading.
- f) Seat numbers for chairs shall be anodized aluminum plates, attached with rivets. Numbers shall be 1" high, minimum and finished in weather-resistant recessed pockets.

5. Mounting Brackets:

- a) Made from 3/16" thick (min) A36 steel plate, plasma cut, bent and hot dip galvanized.

J. Stairs

- 1. Stairs are constructed of structural steel understructure with a precast tread and aluminum riser.
- 2. Structural understructure consists of C12x10.6 steel channels for outside stringer assemblies, L3x3x1/4 steel support legs at locations identified on plans, and FL1/4x2 steel flat strap x-bracing between support legs where indicated on plans.
- 3. Precast concrete treads are 2" x 11" with finish to match Hybrid panels.
- 4. Interlocking flat aluminum riser will attach to female nose of tread, rotate down into position and overlap rear heel of tread below and secured with mechanical screw fastener.
- 5. Handrail will be inset from guardrail 1½" to 3". Guardrail will not be used for handrail.
- 6. Stair guardrails shall match the guardrail system used on the balance of the grandstand.

K. Ramps

- 1. Ramp support frame shall use structural steel for the stringers, post and supports. Anchor to slab on grade with post installed concrete anchors.

2. Walking surface shall use galvanized metal deck with a poured in place concrete slab with a minimum thickness of 4".
3. Handrail will be inset from guardrail 1½" to 3". Guardrail will not be used for handrail.
4. Ramp guardrails shall match the guardrail system used on the balance of the grandstand.

L. End Caps

1. Seat board end caps shall be one-piece cast aluminum and shall be friction –fit to the plank without the use of mechanical fasteners. Plastic end caps are not permitted.
2. CLF Guardrail posts shall be covered with cast aluminum top and bottom safety caps.

M. Vertical Closure System

1. Aluminum Plate

- a) Powder coated flat plate closure constructed of minimum 3/16" thick aluminum 6063-T6.
- b) Manufacturer to provide adequate backing materials for additional vertical and horizontal support. Backing material to be made of L2x2x3/16 6061-T6 aluminum angle or equivalent.

2. Corrugated Aluminum Riser

- a) Riser closure shall consist of an overlapping configuration of 8" x 0.100" wall thickness 6063-T6 aluminum extrusions, with a 1" forward facing corrugation.
- b) Riser overlap shall be ½" min. and 2" max.
- c) Riser closure to span between rail post spaced at 6'-0" c/c.
- d) Aluminum top cap to be provided where gaps are created between top of closure and decking walking surface.
- e) Closure to be attached to rail post with stainless steel mechanical screws.

3. Flat Stackable Aluminum Riser

- a) Riser closure shall consist of a stackable riser consisting of 6", 8", or 10" tall x 1" wide x 0.078" wall thickness 6063-T6 aluminum extrusions.
- b) Extrusions to snap male to female ends together to required riser closure height.
- c) Riser closure to span between rail post spaced at 6'-0" c/c.
- d) Aluminum top cap to be provided where gaps are created between top of closure and aluminum decking walking surface.
- e) Closure to be attached to rail post with stainless steel mechanical screws.

N. Water Management

1. Slope treads and risers forward to allow water to drain off the front of the stand. Overlapping treads and risers allow majority of surface water to shingle to the front via gravity.
 2. Gutters and open channels in the decking system are strictly prohibited due to inability to shed water and lead to clogging of the system over time.
- O. Joints: Unless shown otherwise on the drawings, provide joint widths as follows:
1. Joints at member ends abutting walls: $\frac{3}{4}$ "
 2. Joint width between ends of adjacent seating units: $\frac{3}{4}$ "
 3. At Expansion Joints: Refer to the drawings.
 4. Joint Alignment: Align the tread/riser joints with the adjoining units. Do not stagger the joints without explicit approval from the Architect.
 5. Joints in Hybrid Precast shall be filled with a backer rod and finished with caulking consisting of a two-part epoxidized polyurethane sealant formulated for dynamic movement joints.
- P. Finishes
1. Structural Steel:
 - a) All structural steel framing shall be hot dip galvanized in accordance with ASTM A123.
 - b) **[REMOVE IF NOT REQUIRED] All structural steel framing shall be powder coated meeting the following specifications:**
 - i. **Meets AAMA 2604 specification for a Super Durable Polyester TGIC**
 - ii. **All ferrous metal components shall be blast cleaned to an SSPC-6 commercial blast clean.**
 - iii. **Powder for coating shall be a polyester-based thermal setting resin.**
 - iv. **Impact Resistance: ASTM D2794, (Direct 160 in.-lbs, Indirect 160 in.-lbs)**
 - v. **Pencil Hardness: ASTM D3363, HB-2H**
 - vi. **Film Thickness: ASTM D1186 (4.0-8.0 mils)**
 - vii. **Salt Spray Resistance: ASTM D1654, plus 3,000 hours**
 - viii. **Humidity Resistance: ASTM D 714, plus 3,000 hours**
 - ix. **Color: ASTM D2244, E308, E1164, (1.0 Max – Delta E)**
 - x. **Gloss: ASTM D523 (55-65% at 60 degrees)**
 - xi. **Conical Bend: ASTM D522 (1/4" pass)**
 - xii. **Particle Size: ASTM D5861 (45-55 micron median)**
 - c) All structural hardware shall be hot dip galvanized in accordance with ASTM F2329.
 - d) All structural steel brackets and fasteners shall be hot dip galvanized in accordance with ASTM A123.
 2. Hybrid Precast Concrete

- a) Broom Finish Formliner: Use a formliner with a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

3. Aluminum:

- a) Aluminum Finish Descriptions:

- i. Mill Finish: natural appearance of the aluminum as it comes from the rolling mill with no further surface treatment.

- ii. Anodized Finish: Anodized aluminum provided shall meet or exceed the following requirements:

- (1) AAMA 611-14 specification for Anodized Architectural Aluminum

- (2) Class II anodizing, designated A31 "Clear" finish. Transparent finish allows natural aluminum color to show through, for all anodized aluminum, excluding handrail

- (3) Class I anodizing, designated A41 "Clear" finish. Transparent finish allows natural aluminum color to show through, for all anodized aluminum handrail

- (4) Minimum Oxide Coating: ASTM D7091, Class II: 10 microns (0.4-0.7 mils) Class I: 18 microns (0.7≤ mils)

- (5) Corrosion Resistance: ASTM B117 using 5% salt solution, plus 1,000 hours

- (6) Seal Test: Maximum weight loss shall be 40 mg/dm²

- iii. Powder Coat Finish: Powder coat system provided shall meet or exceed the following test requirements:

- (1) AAMA 2604 specification for a Super Durable Polyester TGIC

- (2) Impact Resistance: ASTM D 2794, 160 direct, 160 indirect in.-lbs.

- (3) Pencil Hardness: ASTM D 3363, 2H

- (4) Film Thickness: ASTM D1186, 3.5-4.5 mils

- (5) Salt Spray Resistance: ASTM D 714, plus 3,000 hours

- (6) Humidity Resistance: ASTM D1654, plus 3,000 hours

- (7) Color: ASTM D2244, E308, E1164 (1.0 Max – Delta E)

- (8) Gloss: ASTM D523 (55-65% at 60 degrees)

- (9) Conical Bend: ASTM D522 (1/4" pass)

- (10) Particle Size: ASTM D5861 (45-55 micron median)

- b) Risers & Channel Dies

- i. Powder Coated
- c) Seat boards
 - i. Anodized
- d) Seat backs
 - i. Anodized
 - ii. Powder Coated
- e) Vertical Closure
 - i. Anodized
 - ii. Powder Coated

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work
- B. Before installation proceeds, installer shall prepare written report, endorsed by installer, listing conditions detrimental to performance of the work. This includes survey of elevations and locations of concrete foundations or pads and anchor bolts to verify compliance with the requirements of the grandstand manufacturers' specified tolerances.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install grandstand and all components according to manufacturer's written instruction and the approved shop drawings.
- B. Do no field cut, drill or alter structural members without written approval from grandstand system manufacturers' engineer.
- C. Set structural framing in locations and to elevations indicated and according to AISC specifications.

3.3 CLEANING

- A. Clean all surfaces according to manufacturer's recommendations.
- B. Use cleaning solutions and methods that do not damage finishes or the adjacent surfaces.
- C. Mill finish aluminum surfaces are unprotected from oxidation. All mill finished aluminum will oxidize at various rates during the manufacturing, shipping,

installation and usage of the grandstand as it is exposed to various weather conditions. Oxidation is natural and expected, and in no way impacts the life cycle or structural performance of the grandstand. Grandstand manufacturer is not responsible for repair, replacement or cleaning of oxidized aluminum.

- D. Remove all metal burrs, sharp edges or other cutting, unsafe, conditions.
- E. Touch up finishes as recommended by manufacturer.

END OF SECTION