

**Bid No. 2021-11**  
**Ellisville Wastewater Treatment Plant Expansion**

**Addendum 1**  
**Revised Specifications and Drawings**

Below are the revised specifications and drawings.

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- 03 41 33 – Designed Pre-Cast Concrete Structures
- 05 51 17 – Aluminum Stairs
- 05 52 15 – Aluminum Handrails and Railings
- 05 53 16 – Aluminum Grating

Revised Drawings:

- Sheet M-01 – Wastewater Treatment Plant – Plan and Sections
- Sheet M-02 – Wastewater Treatment Plant – Sections
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- Sheet S-02 – Structural Details

**COLUMBIA COUNTY  
ELLISVILLE WASTEWATER TREATMENT PLANT EXPANSION**

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APPENDICES

The documents included herewith are being provided for informational purposes only and are not part of the Contract Documents. Arcadis U.S. does not warrant the accuracy or completeness of said documents, expressed or implied. The Contractor is responsible for any interpretations or conclusions the Contractor draws from the available documents. It is the responsibility of the Contractor to field verify all existing conditions.

- Appendix A Report of Geotechnical Exploration, Cal-Tech Testing Inc., June 12, 2014
- Appendix B Geotechnical Investigation, Cal-Tech Testing, Inc., July 21, 2016
- Appendix C South Columbia County Regional WWTF Permit

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## SECTION 03 41 33

### DESIGNED PRECAST CONCRETE STRUCTURES

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. Scope:
1. CONTRACTOR shall provide all professional services, labor, materials, equipment and incidentals as shown, specified and required to design, furnish, and install all precast concrete structures.
  2. The Work includes:
    - a. Precast Package Wastewater plant.
- B. General:
1. Structures shall conform in shape, size, dimensions, material, and other respects to the details shown or as ordered by ENGINEER.
  2. Concrete for inverts in precast concrete structures shall be Class A and shall conform to the requirements specified under Section 03 00 05, Concrete.
- C. Related Sections:
1. Section 03 00 0, Concrete.
  2. Section 46 07 53 Packaged Wastewater Treatment Plant

##### 1.2 QUALITY ASSURANCE

- A. Standards referenced in this Section are:
1. American Association of State Highway and Transportation Officials (AASHTO) HS-20.
  2. ASTM A 82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  3. ASTM A 153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  4. ASTM A 185, Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
  5. ASTM A 497, Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
  6. ASTM A 615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  7. ASTM A 706, Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
  8. ASTM C 33, Standard Specification for Concrete Aggregates.
  9. AWWA C 302, Reinforced Concrete Pressure Pipe, Non-Cylinder Type for Water and Other Liquids.
  10. ASTM C 150, Standard Specification for Portland Cement.

11. ASTM C 260, Air-Entraining Admixtures for Concrete.
12. ASTM C 478, Specification for Precast Reinforced Concrete Manhole Sections.
13. ASTM C 494, Standard Specification for Chemical Admixtures for Concrete.
14. PCI MNL-116, Manual for Quality Control for Plants and Production of Structural Precast Concrete Products.
15. ANSI/NSF 61 Drinking Water System Components – Health Effects
16. ACI 318 Building Code Requirements for Structural Concrete
17. ACI 350 Code Requirements for Environmental Engineering Concrete Structures

B. Fabrication Tolerances:

1. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances of PCI MNL-116, unless otherwise indicated. Keep bar sizes small, even where this will reduce the spacing of the bars.
2. Units shall be true to dimensions. Unit bow, as fabricated and installed, shall not exceed 1/8 inch per unit in the short dimension and 1/4-inch per unit in the long dimension. Step in alignment face and jog in alignment shall not exceed 1/4-inch. Provide a 3/4-inch chamfer or 1 x 2-inch radius on all exposed edges and corners.
3. Imperfections such as air bubbles, ripples, joint lines, warpage, stains, projections, honeycombs, uneven matrix plate, and other defects will not be acceptable.

C. Qualifications and Responsibilities of Contractor's Design Professional:

1. Professional Engineer:
  - a. Engage a registered professional engineer qualified to practice in the State of Florida and experienced in providing engineering services of the kind indicated.
  - b. Responsibilities include but are not necessarily limited to:
    - 1) Carefully reviewing precast concrete structure performance and design criteria stated in the Contract Documents.
    - 2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER.
    - 3) Preparing or supervising the preparation of design calculations and related drawings, Shop Drawings, testing plan development, test-result interpretation and a comprehensive engineering analysis verifying compliance of the precast concrete structure with the requirements of the Contract Documents.
    - 4) Signing and sealing all calculations and design drawings, and Shop Drawings.
    - 5) Certifying that:
      - i. It has performed the design of the precast concrete structure in accordance with the performance and design criteria stated in the Contract Documents, and
      - ii. The said design conforms to all applicable local, state and federal codes, rules and regulations, and to the prevailing standards of practice.

### 1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:

1. Qualifications:
    - a. Submit qualifications data for the CONTRACTOR'S Design Professional.
  2. Precast Structures:
    - a. Drawing showing design and construction of all precast concrete, as well as the location and details of all items that are to be embedded in the precast units.
    - b. Design calculations and shop drawings, signed and stamped with a seal of a Registered Professional Engineer licensed to practice in the State of Florida.
    - c. Test result from concrete cylinder strength tests.
- B. Shop Tests:
1. Submit description of proposed testing methods, procedures and apparatus. Prepare and submit report for each test.

#### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials:
1. Deliver precast concrete units to project site in such quantities and at such times to assure continuity of installation.
- B. Storage of Materials:
1. Store units at project site in a manner that will prevent cracking, distortion, warping, staining, or other physical damage and so that precast copings are without damage at time of installation.
- C. Handling of Materials:
1. Lift and support units only at designated lifting or supporting points as shown on final Shop Drawings.

### PART 2 – PRODUCTS

#### 2.1 PRECAST CONCRETE STRUCTURES

- A. Layout and details shall be as shown and specified. Design shall be adequate to withstand live loads, lateral earth pressure loading, and uplift case. The precast concrete structures shall be constructed to the lengths, widths and heights as shown on the contract drawings. The structure shall be designed to adequately and safely support all live and dead loads to which the structure will be subjected, and to withstand all conditions which may be encountered.
1. Design Criteria:
    - a. Top slab live load: 300 psf.
    - b. Lateral soil pressure above ground water surface: Refer to project geotechnical report.
    - c. Lateral soil pressure below ground water surface: Refer to project geotechnical report.
    - d. Maximum allowable soil bearing pressure: Refer to project geotechnical report

- e. Unit weight of soil = Refer to project geotechnical report
  - f. Ground water table for normal ground water = Refer to project geotechnical report .
  - g. Safety factor for uplift normal ground water > 1.5.
  - h. Safety factor for uplift 100 year storm ground water > 1.3
2. Design shall meet the requirements of ACI 350 and the Building Code.
- B. Concrete Mix: Standard-weight concrete consisting of specified portland cement, pigments, aggregates, admixtures, and water to produce the following properties:
- 1. Compressive Strength: 5,000 psi minimum at 28 days.
  - 2. Total Air Content: Not more than 3 percent.
- C. Where precast structures are made up of various precast components such as base sections, riser sections, and top sections, the joint between sections shall be watertight and be the tongue and groove type complying with AWWA C302.
- D. Walls shall be precast with wall pipes or with pipe sleeves with water stop suitable for use with mechanical link seal as shown on the Drawings.
- E. Precast structure shall be designed and constructed to accept access hatches or castings as shown and specified.
- F. Precast structures shall be designed to support the weight of equipment lifted from the structure to the top slab.
- G. Underground precast units shall have shop-applied coal tar epoxy applied to the exterior surface.
- H. Temporary lifting holes, if used, shall be tapered. Tapered, solid rubber plugs shall be furnished to seal the temporary lifting holes. Temporary lifting holes shall be made to be sealed by plugs driven from the outside face only.
- I. All wall penetrations shall be formed utilizing flanged-by-mechanical joint wall pipes, which shall be cast in the concrete as shown on the drawings. The wall pipe shall be constructed of Class 53 ductile iron pipe with one (1) ductile iron threaded Class 150 flange meeting ANSI A21.15 specifications. The other side of the pipe shall be supplied with a mechanical joint threaded bell. The water stop shall extend 3" min per side / 6" larger in diameter than the exterior of the pipe. The water stop shall be welded to provide a watertight seal. The interior of the pipe shall be double cement lined and seal coated in accordance with ANSI A21.4.
- J. Mark date of manufacture and name of trademark of manufacturer on inside of barrel.
- K. Joint sealant shall be as specified in Section 03 00 05 Concrete

## 2.2 ACCESS HATCHES AND CASTINGS

All necessary access hatches, manhole covers, and castings as shown and specified shall be cast into concrete as necessary.

## 2.3 SHOP TESTING

### A. Shop Tests:

1. At a minimum, conduct the following shop tests:
  - a. Conduct concrete cylinder strength tests. Cylinders shall be cured in the same manner as the precast structures. Collect a minimum of five test cylinders from every 50 cubic yards of concrete poured at a minimum.

## PART 3 – EXECUTION

### 3.1 INSPECTION

- A. CONTRACTOR and his installer shall examine the substrate and the conditions under which Work is to be performed and notify OWNER of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to OWNER.

### 3.2 INSTALLATION

#### A. Installation – General

1. Lift, place, and secure precast concrete units in accordance with manufacturer's printed instructions and recommendation, and approved Shop Drawings, the Contract Documents, and Laws and Regulations.
2. Keep precast concrete units tight and perpendicular to bearing supports.
3. Comply with erection procedures and sequence of erection as recommended by precast concrete unit manufacturer and as acceptable to ENGINEER.

#### B. Level and Alignment:

1. Set units in true alignment. All joints shall be sealed with cement mortar inside and out and troweled smooth to the contour of the wall surface. Raised or rough joint finishes will not be accepted.
2. Precast structures shall be set on a crushed stone, crushed gravel, or concrete foundation as shown on drawings and in accordance with geotechnical recommendations. Precast units shall be set at the proper grade and carefully leveled and aligned.
3. Where adjacent precast concrete units are not in vertical alignment, level out variations between adjacent members by jacking, loading, or other feasible method as recommended by precast concrete manufacturer and professional engineer, and acceptable to ENGINEER.

- C. Do not cut holes or install sleeves larger than size permitted by precast concrete unit manufacturer for pipe, conduits, duct or other penetrations after fabrication, except as otherwise shown or specified.
- D. Do not cut reinforcing or prestressing strands without approval of manufacturer and ENGINEER.
- E. Grouting Joints:
  - 1. Clean joints before grouting.
  - 2. Fill joints between units with grout.
  - 3. Before grout hardens, remove grout that seeped.
- F. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment, by removing dirt, stains, and deleterious materials that could affect the bonding of the topping grout. Perform cleaning in accordance with precast concrete unit manufacturer's recommendations. Protect other work from staining and damage.
- G. Replace precast concrete units damaged for any reason or which fail to perform as specified.

### 3.3 ATTACHMENTS

- A. Attachments listed below, following the "End of Section" designation, are part of this Specification section.
  - 1. Attachment A, Professional Design Services Performance Certification.

+ + END OF SECTION + +

ATTACHMENT A

Professional Design Services Performance Certification

1. My name is \_\_\_\_\_.

2. My State of Florida Professional Engineering license number is \_\_\_\_\_.

3. My license expires \_\_\_\_\_, 20\_\_.

4. The Project for which I have performed professional design services is described as  
\_\_\_\_\_.

5. The Specification Section(s) under which I have performed my services is/are  
\_\_\_\_\_.

6. The name and address of the individual or entity for whom I have performed my professional  
design services is:

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ATTACHMENT A (continued)

Professional Design Services Performance Certification (cont'd)

7. I hereby certify that, to the best of my knowledge, information and belief, I have performed or supervised the performance of the professional design services hereunder, and that said services have been performed in accordance with all applicable local, state and federal codes, rules and regulations and in accordance with the standard of care currently expected of professional engineers/architects performing similar services for projects of similar size and complexity in the State of Florida.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Typed or Printed Name

\_\_\_\_\_  
Name of Firm

\_\_\_\_\_  
Street Address

[ SEAL ]

\_\_\_\_\_  
City/State/Zip Code

Telephone: \_\_\_\_\_

Fax: \_\_\_\_\_

## SECTION 05 51 17

### ALUMINUM STAIRS

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

###### A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to design, furnish and install aluminum stairs including surface preparation and shop priming.
2. The extent of aluminum stairs shall be as shown.
3. The Work also includes:
  - a. Providing openings in and attachments to aluminum stairs to accommodate the Work under this and other Sections and providing for the aluminum stairs all items such as anchor bolts, studs and all items required for which provision is not specifically included under other Sections.

###### B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the aluminum stairs Work.

###### C. Related Sections:

1. Section 09 91 00, Painting.

##### 1.2 REFERENCES

###### A. Standards referenced in this Section are listed below:

1. Aluminum Association (AA), Specification for Aluminum Structures.
2. American Society for Testing and Materials, (ASTM).
  - a. ASTM B 209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - b. ASTM B 211, Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.
  - c. ASTM B 221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
  - d. ASTM B 308/B 308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
  - e. ASTM B 429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
  - f. ASTM F 593, Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
  - g. ASTM F 594, Specification for Stainless Steel Nuts.
3. American Welding Society, (AWS).

- a. AWS D1.2/D1.2M, Structural Welding Code-Aluminum.
4. National Association of Architectural Metal Manufacturers, (NAAMM).
  - a. NAAMM, Metal Stairs Manual and Metal Finishes Manual.

### 1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
  1. Manufacturer shall have a minimum of five years experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.
- B. Component Supply and Compatibility:
  1. Obtain all products included in this Section regardless of the component manufacturer from a single pre-engineered aluminum stair manufacturer.
  2. The pre-engineered aluminum stair manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
  3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the pre-engineered aluminum stair manufacturer.
- C. Codes: Comply with the applicable requirements of the state and local building codes.
- D. Source Quality Control: CONTRACTOR shall be responsible for entire design, fabrication and installation of pre-engineered aluminum stair Work.
- E. The Shop Drawings and calculations shall be prepared by a Registered Professional Engineer licensed in the State in which the pre-engineered aluminum stairs will be installed and is a recognized expert in the type of Work shown and specified.

### 1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
  1. Shop Drawings:
    - a. Erection and detailed Shop Drawings, which show the plan location, elevation and details for the fabrication and erection of the aluminum stair work. Show anchorage and accessory items. Include details of all connections between all materials.
  2. Delegated Design Submittals:
    - a. Provide Shop Drawings and design calculations signed and sealed by a Registered Professional Engineer licensed in the State in which the aluminum stairs will be installed.

### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling and Unloading:
  1. Deliver materials to the Site to ensure uninterrupted progress of the Work.

Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.

B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect materials from corrosion and deterioration.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

## PART 2 - PRODUCTS

### 2.1 DESIGN CRITERIA

- A. Pre-engineered aluminum stairs shall comply with the requirements of the NAAMM, "Metal Stairs Manual".
- B. Sizes of miscellaneous items such as carrier angles and platform stiffeners, and design stresses shall be as recommended in Section 4 of the "Metal Stairs Manual", unless otherwise shown.
- C. All required stair loadings and other stair related requirements shall comply with the governing building code in which the pre-engineered aluminum stairs will be installed.

### 2.2 FABRICATION

A. General:

1. Use welding for joining pieces together, unless otherwise shown or specified. Welding to comply with the applicable provisions of AWS D1.2/D1.2M. Fabricate units so that bolts and other fastenings do not appear on finish surfaces. Make joints true and tight, and make connections between parts light-proof tight. Provide continuous welds, ground smooth where exposed.
2. Construct stair units to conform to sizes and arrangements as shown. Provide pre-engineered aluminum framing, hangers, columns, struts, clips, brackets, bearing plates and other components for the support of pre-engineered aluminum stairs and platforms. Erect pre-engineered aluminum stair Work to line, plumb, square, and true with runs registering level with floor and platform levels.
3. Provide brackets and bearing surfaces as detailed and as required to anchor and contain the pre-engineered aluminum stairs on the supporting structure.

4. Finish: Provide Architectural mill finish as specified in the NAAMM Manual.
  5. Protection of Aluminum from Dissimilar Materials: Coat all surfaces of aluminum in contact with dissimilar materials, such as concrete, masonry and steel as specified in Section 09 91 00, Painting
- B. Stair Framing:
1. Fabricate stringers of structural aluminum channels, or plates, or a combination thereof, as shown. Provide closures for exposed ends of stringers.
  2. Construct platforms of structural aluminum channel headers and miscellaneous framing members, as shown. Bolt or weld headers to stringers. Bolt or weld framing members to strings and headers.
- CC. Aluminum Grating Treads and Platforms:
1. For aluminum grating and treads, refer to Section 05 53 16, Aluminum Grating.
  2. Fabricate grating treads with abrasive nosing on one edge and with aluminum angle or aluminum plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
  3. Fabricate grating platforms, with nosing matching that on grating treads, at all landings. Provide toe-plates at open-sided edges of floor grating fastened to platform framing members.
  4. Provide platforms 3/8-inch minimum thick with solid abrasive surface matching that on treads. Secure platforms to platform framing members with bolts.
- D. Stair Aluminum Railing:
1. Aluminum railings shall conform to the requirements of Section 05 52 15, Aluminum Handrails and Railings.

## PART 3 – EXECUTION

### 3.1 INSPECTION

- A. CONTRACTOR shall examine the conditions under which the Work is to be installed and notify the ENGINEER, 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.

### 3.2 PREPARATION

- A. Provide concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction.

### 3.3 INSTALLATION

- A. Fastening to In-Place Construction:
  - 1. Provide anchorage devices and fasteners where necessary for securing pre-engineered aluminum stairs to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts and other connectors as required. The anchorage devices and fasteners shall be Type 316 stainless steel.
  
- B. Cutting, Fitting and Placement:
  - 1. Perform cutting, drilling and fitting required for the installation of the pre-engineered aluminum stairs. Set the pre-engineered aluminum stairs accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry or similar construction.
  - 2. Fit exposed connections accurately together to form tight hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

+ + END OF SECTION + +

## SECTION 05 52 15

### ALUMINUM HANDRAILS AND RAILINGS

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

###### A. Scope:

1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install aluminum handrail and railing systems. The Work also includes:
  - a. Providing openings in, and attachments to, aluminum handrail and railing systems to accommodate the Work under this and other Specification Sections. Provide all items for aluminum handrails and railings, including anchorages, fasteners, studs, and other items required for which provision for is not specifically included under other Sections.
2. Aluminum handrails and railings Work shall include components and features shown and specified, and all components and features available from specified manufacturers required for providing complete aluminum handrail and railing system in accordance with the Contract Documents.

###### B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before aluminum handrails and railings Work.
22. Aluminum handrail and railing locations shall comply with Laws and Regulations.

###### C. Related Sections:

1. Section 05 05 33, Anchor Systems.
2. Section 09 91 00, Painting.

##### 1.2 REFERENCES

###### A. Standards referenced in this Section are:

1. AA, Aluminum Design Manual.
2. ASTM B26/B26M, Specification for Aluminum-Alloy Sand Castings.
3. ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
4. ASTM B136, Standard Method for Measurement of Stain Resistance of Anodic Coatings on Aluminum.
5. ASTM B137, Standard Test Method for Measurement of Coating Mass per Unit Area on Anodically Coated Aluminum.
6. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

7. ASTM B241/B241M, Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
8. ASTM B244, Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments.
9. ASTM B247, Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and rolled Ring Forgings.
10. ASTM B429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
11. ASTM E 935, Standard Test Methods for Permanent Metal Railing Systems and Rails for Buildings.
12. NAAMM/Architectural Metal Products Division (AMP), Pipe Railing Manual.
13. NAAMM/AMP AMP 501 Finishes for Aluminum.

### 1.3 QUALITY ASSURANCE

#### A. Qualifications:

1. Manufacturer:
  - a. Upon request manufacturer shall submit document at least five years successful experience in fabricating aluminum handrail and railing systems of scope and type similar to that required.
  - b. Manufacturer shall be capable of providing custom detail drawings for the products required.
2. Professional Engineer:
  - a. CONTRACTOR or handrail and railing manufacturer shall retain a registered professional engineer legally qualified to practice in same state as the Site. Professional engineer shall have at least five years experience designing aluminum handrails and railings.
  - b. Responsibilities include:
    - 1) Reviewing aluminum handrail and railing system performance and design criteria stated in the Contract Documents.
    - 2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.
    - 3) Preparing or supervising preparation of design calculations verifying compliance of aluminum handrail and railing system with requirements of the Contract Documents.
    - 4) Signing and sealing all calculations.
    - 5) Certifying that:
      - a) Design of aluminum handrail and railing system was performed in accordance with performance and design criteria stated in the Contract Documents, and
      - b) Design conforms to all applicable local, state, and federal Laws and Regulations, and to prevailing standards of practice.
3. Installer:
  - a. Retain a single installer trained and with record of successful experience in installing aluminum handrail and railing systems.

- b. Installer shall have record of successfully installing aluminum handrail and railing systems in accordance with recommendations and requirements of manufacturer, or shall provide evidence of being acceptable to the manufacturer.
  - c. Installer shall employ only tradesmen with specific skill and successful experience in the type of Work required.
  - d. When requested by ENGINEER, submit name and qualifications of installer with the following information for at least three successful, completed projects:
    - 1) Names and telephone numbers of owner and architect or engineer responsible for each project.
    - 2) Approximate contract cost of the aluminum handrail and railing systems for which installer was responsible.
    - 3) Amount (linear feet) of aluminum handrail and railing installed.
- B. Component Supply and Compatibility:
- 1. Obtain all materials furnished under this Section regardless of component manufacturer, from a single aluminum handrail and railing system manufacturer.
  - 2. Aluminum handrail and railing system manufacturer shall review and approve or prepare all Shop Drawings and other submittals (except for delegated design submittals, when professional engineer is retained by other than handrail and railing manufacturer) for all components furnished under this Section.
  - 3. Components shall be specifically constructed for specified service conditions and shall be integrated into overall assembly by aluminum handrails and railings manufacturer.
- C. Regulatory Requirements: Comply with Laws and Regulations including:
- 1. OSHA Part 1910.28, Duty to have fall protection and falling object protection.
  - 2. OSHA Part 1910.29, Fall protection systems and falling object protection-criteria and practices.
- D. Certifications:
- 1. Submit certification, signed by authorized officer of manufacturer and notarized, stating that handrail and railing systems comply with the design prepared by the professional engineer.
  - 2. Submit certification, signed by authorized officer of CONTRACTOR and notarized, stating that all components and fittings are furnished by the same manufacturer.

#### 1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
- 1. Shop Drawings:
    - a. Drawings for fabrication and installation of aluminum handrail and railing systems with sizes of members, pipe wall thickness, information

on components, and anchorage devices. Show all anchorages. Provide details drawn at scale of 1.5-inch equal to one foot.

- b. Indicate required location of posts.
- c. Indicate locations and details of all expansion joints, if any.
- d. Indicate locations and details of gaps across seismic joints, if any.
- e. Profile drawings of aluminum handrail and railing system components.
- f. Custom detail drawings. Details of forming, jointing, sections, connections, internal supports, trim and accessories. Provide details drawn at scale of 1.5-inch equal to one foot.

2. Product Data:

- a. Manufacturer's specifications, standard detail drawings, and installation instructions for aluminum handrail and railing systems.
- b. Manufacturer's catalogs showing complete selection of standard and custom components and miscellaneous accessories for selection by ENGINEER.

3. Delegated Design Submittals:

a. Design Data:

- 1) Design computations or complete structural analysis of handrail and railing systems, signed and sealed by professional engineer. Professional engineer's seal shall be clearly legible, including state of registration, registration number, and name on seal.
- 2) Certification by professional engineer that professional engineer has performed design of aluminum handrail and railing systems in accordance with performance and design criteria stated in the Contract Documents, and that design conforms to all local, state, and federal Laws and Regulations, and to prevailing standards of practice.

B. Informational Submittals: Submit the following:

1. Certificates:

- a. Certification on source of supply, as specified in Article 1.3 of this Section.
- b. Manufacturer certification specified in Article 1.3 of this Section.

2. Source Quality Control Submittals:

- a. Manufacturer's load testing report in accordance with ASTM E935 for completed aluminum handrail and railing systems, demonstrating compliance with applicable requirements of building codes, safety codes, and other Laws and Regulations.

3. Qualifications Statements: Submit qualifications for the following:

- a. Manufacturer, when requested by ENGINEER.
- b. Professional engineer.
- c. Installer, when requested by ENGINEER. Qualifications statement shall include record of experience with references specified.

C. Closeout Submittals: Submit the following:

- 1. Maintenance Manuals: Furnish detailed maintenance manuals that include the following:

- a. Product name and number.
  - b. Detailed procedures for routine maintenance and cleaning, including cleaning materials, application methods and precautions in use of products that may be detrimental to finish when improperly applied.
  - c. Handrail and railings systems manufacturer's current catalog including individual parts.
2. Guarantee: Provide in maintenance manual the guarantee specified.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Storage and Protection:
  1. Keep products off ground using pallets, platforms, or other supports. Protect products from corrosion and deterioration.
- B. Handling of Products:
  1. Do not subject handrail and railing products to bending or stress.
  2. Do not damage edges or handle products in a manner that will cause scratches, warping, or dents.
  3. Protect handrails and railings by paper or coating as acceptable to handrail and railing manufacturer, against scratching, splashes of mortar, paint, and other marring during transportation, handling, and erection. Protect until completion of adjacent work.

## 1.6 GUARANTEE

- A. Guarantee: Manufacturer shall provide written guarantee of availability of replacement parts and components for period of at least five years after completion of the Project.

## PART 2 – PRODUCTS

### 2.1 SYSTEM PERFORMANCE

- A. System Description: Aluminum handrail and railing system shall consist of equally spaced horizontal rails with totally concealed mechanical fasteners, internally threaded tubular rivets and components fastened to posts spaced no more than five feet on centers and system of handrails supported from adjacent construction by mounting brackets spaced at no more than five feet on centers.
- B. Design Criteria and Performance Criteria:
  1. Design, fabricate, and install aluminum handrail and railing systems to withstand the most critical effects resulting from the following loads (loads listed below do not act concurrently):
    - a. Uniform Load: 50 pounds per foot, applied at top in any direction.
    - b. Concentrated Load: 200 pounds single load, applied at any point along the top in any direction.

- c. Components: Intermediate rails (all rails except the handrail), balusters, and panel fillers, if any, shall withstand horizontally-applied normal load of 50 pounds on an area equal to one square foot, including openings and space between rails. Reactions due to this loading are not required to be superimposed to loading specified for main supporting members of handrails and railings.
  - d. Comply with AA Aluminum Design Manual for determining allowable stresses and safety factors for aluminum structural components.
  - e. Limit deflection in each single span of railing and handrail to 1.5-inch maximum, and to 1/4-inch maximum on railing posts. Applied loads shall not produce permanent deflection in the completed Work when loads are removed.
2. Thermal Control: Provide adequate expansion within fabricated systems that allows for thermal expansion and contraction caused by material temperature change of 140 degrees F to -20 degrees F without warp or bow of system components. Distance between expansion joints shall be based on providing 1/4-inch wide joint at 70 degrees F, which accommodates movement of 150 percent of calculated amount of movement for specified temperature range.
  3. Where handrail and railing systems cross expansion joints in the building or structure, provide expansion joints in handrail and railings systems.
  4. For posts located at or near end of runs as shown, uniformly space intermediate posts as required to conform to loading and deflection criteria specified, at intervals no greater than maximum post spacing specified. Where posts are shown for handrails along both sides of walkways and other similar locations, locate posts opposite each other; do not stagger post locations.

## 2.2 MANUFACTURERS

- A. Products and Manufacturers: Provide one of the following:
  1. Custom Fabricated Connectorail System, by Julius Blum & Company, Inc.
  2. Custom Fabricated Series 500 Non-Welded Aluminum Pipe Aluminum handrails and railing systems, by Superior Aluminum Products, Inc.
  3. Or approved equal.

## 2.3 MATERIALS

- A. Extruded Aluminum Architectural and Ornamental Shapes: ASTM B221, Alloy 6063-T52.
- B. Aluminum Forgings: ASTM B247.
- C. Extruded or Drawn Aluminum Pipe and Tube:
  1. ASTM B429 or ASTM B241/B241M, Alloy 6063-T5, 6063-T52, or 6063-T832 as required by loadings, deflections, and post spacing specified.
  2. Provide Schedule 40 pipe, minimum, unless conditions of detail and fabrication require extra-heavy pipe to comply with Specifications. Rails and posts shall have minimum outside diameter of 1.90 inches.

- D. Reinforcing Bars: Solid, circular profile, two feet long, 6061-T6 aluminum reinforcing bars with same outside diameter as inside diameter of post.
- E. Anchors and Fastenings:
  - 1. For anchors and fasteners, use Type 316 stainless steel; minimum 3/8-inch diameter.
  - 2. Provide minimum of four bolt fasteners per post where surface-mounted posts are shown. Components shall be in accordance with manufacturer's recommendations and as approved or accepted (as applicable) by ENGINEER on submittals.
- F. Castings:
  - 1. Provide high-strength aluminum alloy brackets, flanges, and fittings suitable for anodizing as specified.
  - 2. Aluminum alloy sand castings: ASTM B26/B26M.
- G. Connector Sleeves: Schedule 40, five-inch long by 1.610-inch diameter.
- H. Sockets: Provide six-inch deep by 2.5-inch outside diameter aluminum sockets with 3.5-inch wide socket cover on bottom of each socket and on top and bottom of removable post sockets.
- II. Custom Cover Flanges: 1/4-inch high by four-inch diameter, aluminum.
- JJ. Adhesive: Two-part waterproof epoxy-type as recommended by handrail and railing systems manufacturer.
- KK. Toeboards:
  - 1. Provide extruded Alloy 6063-T5 or T52 aluminum alloy toeboards, unless railing is mounted on curbs or other construction of sufficient height and type to comply with OSHA 1910.23. Bars or plates are not acceptable.
  - 2. Unless otherwise specified, toeboards shall comply with OSHA 1910.23, Section (e).
- L. System Components and Miscellaneous Accessories: Provide complete selection of manufacturer's standard and custom aluminum handrail and railing systems components and miscellaneous accessories required. Show type and location of all such items on Shop Drawings and other submittals as applicable.

## 2.4 FABRICATION

- A. General: Unless otherwise shown or specified, provide typical non-welded construction details and fabrication techniques recommended in NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501.
- B. Fabricate handrail and railing systems true to line and level, with accurate angles surfaces and straight edges. Fabricate corners without using fittings. Provide bent-

metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work. Form elbow bends and wall returns to uniform radius, free from buckles and twists, with smooth finished surfaces, or use prefabricated bends. Provide not less than four-inch outside radius.

- CC. Remove burrs from exposed edges.
- D. Close aluminum pipe ends by using prefabricated fittings.
- E. Weep Holes:
  - 1. Fabricate joints that will be exposed to weather to exclude water.
  - 2. Provide 15/64-inch diameter weep holes at lowest possible point on each post in handrail and railing systems.
  - 3. Provide pressure relief holes at closed ends of handrail and railing systems.
- F. Toeboards:
  - 1. Provide manufacturer's standard toeboard, that accommodates movement caused by thermal change specified without warping or bowing toeboards.
  - 2. Provide manufacturer's standard toeboard, which accommodates storage for removable socket covers.
  - 3. Coordinate and cope toeboard as required to accommodate cover flanges at posts.
  - 4. Toeboards shall follow curvature of railing. Where railing is shown to have curved contours at corners, or other locations, toeboard shall likewise be curved to follow line of railing system.
- G. Reinforcing Bars: Provide reinforcing bar friction-fitted at each post in railing system. Extend reinforcing bars of tubes six inches into cast-in-place sleeves or other types of supporting brackets.
- H. Mechanically Fitted Component Pipe Handrail and Railing System:
  - 1. Use non-welded pipe handrail and railing system with posts, top and intermediate rail(s), and flush joints.
  - 2. Provide top and one intermediate horizontal rail(s), equally spaced.
  - 3. Do not use blind rivets, pop rivets, or other exposed fastening devices in the Work under this Section. Fasteners used for side-mounting fascia flanges where shown or specified may be exposed in the Work. Provide internal threaded aluminum rivets, stainless steel through-bolts with lock nuts, stainless steel sheet metal screws with lock washers, and epoxy adhesive for fastening components of the Work.

## 2.5 FINISHES

- A. General:
  - 1. Prepare surfaces for finishing in accordance with recommendation of aluminum producer and the aluminum finisher or processor.
  - 2. Adjust and control direction of mechanical finishes specified to achieve best overall visual effect in the Work.

3. Color and Texture Tolerance: Provide uniform color and continuous mechanical texture for aluminum components. ENGINEER reserves the right to reject aluminum materials because of color or texture variations that are visually objectionable, but only where variation exceed range of variations established by manufacturer prior to fabrication, by means of range of Samples approved by ENGINEER.
  4. Anodize aluminum components.
- B. Finish:
1. Mechanically finish aluminum by wheel or belt polishing with aluminum oxide grit of 180 to 220 size, using peripheral wheel speed of 6,000 feet per minute; AA Designation - M32 Medium Satin Directional Texture.
  2. Hand-Rubbed Finish: Where required to complete the Work and provide uniform, continuous texture, provide hand-rubbed finish to match medium satin directional texture specified to even out and blend satin finishes produced by other means.
- C. Cleaning:
1. Provide non-etching chemical cleaning by immersing aluminum in inhibited chemical solution, as recommended by coating applicator, to remove lard oil, fats, mineral grease, and other contamination detrimental to providing specified finishes.
  2. Clean and rinse with water between steps as recommended by aluminum manufacturer.
- D. Exposed Aluminum Anodic Coating: Provide anodic coatings as specified that do not depend on dyes, organic or inorganic pigments, or impregnation processes to obtain color. Apply coatings using only the alloy, temperature, current density, and acid electrolytes to obtain specified colors in compliance with designation system and requirements of NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501. Comply with the following:
1. Provide Architectural Class I high density anodic treatment by immersing the components in tank containing solution of 15 percent sulfuric acid at 70 degrees F with 12 amperes per square foot of direct current for minimum of sixty minutes; AA Designation A41 Clear.
  2. Physical Properties:
    - a. Anodic Coating Thickness, ASTM B244: Minimum of 0.7-mils thick.
    - b. Anodic Coating Weight, ASTM B137: Minimum of 32 mg/sq. in.
    - c. Resistance to Staining, ASTM B136: No stain after five minutes dye solution exposure.
    - d. Salt Spray, ASTM B117: 30,000 hours exposure with no corrosion or shade change.
  3. Seal finished anodized coatings using deionized boiling water to seal pores and prevent further absorption.
  4. Products and Manufacturers: Provide one of the following:
    - a. Alumilite 215 Clear by Aluminum Company of America, Inc.
    - b. Or approved equal.

## 2.6 SOURCE QUALITY CONTROL

- A. Allowable Tolerances:
  - 1. Limit variation of cast-in-place inserts, sleeves and field-drilled anchor and fastener holes to the following:
    - a. Spacing: Plus-or-minus 3/8-inch.
    - b. Alignment: Plus-or-minus 1/4-inch.
    - c. Plumbness: Plus-or-minus 1/8-inch.
  - 2. Minimum Handrails and Railings Systems Plumb Criteria:
    - a. Limit variation of completed handrail and railing system alignment to 1/4-inch in 12 feet with posts set plumb to within 1/16-inch in 3.0 feet.
    - b. Align rails so variations from level for horizontal members and from parallel with rake of stairs and ramps for sloping members do not exceed 1/4-inch in 12.0 feet.
  - 3. Provide “pencil-line” thin butt joints.

## PART 3 – EXECUTION

### 3.1 INSPECTION

- A. Examine conditions under which Work will be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.
- B. Verify to ENGINEER the gage of aluminum pipe railing posts and rails brought to the Site by actual measurement of on-Site material in presence of ENGINEER.

### 3.2 INSTALLATION

- A. General:
  - 1. Do not erect components that are scarred, dented, chipped, discolored, otherwise damaged, or defaced. Remove from Site railing and handrail system components that have holes, cuts, gouges, deep scratches, or dents of any kind. Repairs to correct such Work will not be accepted. Remove and replace with new material.
  - 2. Comply with installation and anchorage recommendations of NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501 in addition to requirements specified and approved or accepted (as applicable) submittals.
- B. Fastening to In-Place Construction:
  - 1. Remove protective plastic immediately before installing.
  - 2. Adjust handrails and railings prior to securing in place, to ensure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction. Secure posts and rail ends to building or structure as follows:
    - b. Anchor posts to stair stringers with stringer or support flanges, angle type or floor type as required by conditions, shop-connected to posts

and bolted to steel supporting members. Flanges shall be as recommended by manufacturer. Verify that reinforcing bars are inserted into posts before installation. Do not install posts without reinforcing bar.

3. Use devices and fasteners recommended by handrail and railing systems manufacturer and as shown on approved or accepted (as applicable) submittals.

C. Cutting, Fitting, and Placement:

1. Perform cutting, drilling and fitting required for installation. Set the Work accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels.
2. Fit exposed connections accurately together to form tight hairline joints. Do not cut or abrade surfaces of units that have been finished after fabrication, and are intended for field connections.
3. Make permanent field splice connections using manufacturer's recommended epoxy adhesive and five-inch minimum length connector sleeves. Tight press-fit field splice connectors and install in accordance with manufacturer's written instructions. Follow epoxy manufacturer's recommendations for requirements of installation and conditions of use.
4. Make splices as near as possible to posts, but not exceeding 12 inches from nearest post.
5. Field welding is not allowed. Make splices using pipe splice lock employing a single allen screw to lock joint.
6. Secure handrails to walls with wall brackets and end fittings as shown. Drill wall plate portion of the bracket to receive one bolt, unless otherwise shown for concealed anchorage. Locate brackets as shown or, if not shown, at not more than five feet on centers. Provide flush type wall return fittings with same projection shown for wall brackets. Secure wall brackets and wall return fittings to building or structure. Refer to Section 05 05 33, Anchor Systems.
7. Securely fasten toeboards in place with not more than 1/4-inch clearance above floor level.
8. Drill one 15/64-inch diameter weep hole not more than 1/4-inch above top of location of solid reinforcing bar or tube in each post.

D. Fastening to Existing Construction:

1. Provide heavy-duty floor flange and anchorage devices and fasteners where necessary for securing handrail and railing systems components to existing construction; including stainless steel threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as required. Refer to Section 05 05 33, Anchor Systems.
2. Use devices and fasteners recommended by handrail and railing systems manufacturer and as shown on approved or accepted (as applicable) submittals.

E. Expansion Joints:

1. Provide slip joint with internal sleeve extending not less than two inches beyond joint on each side.
  2. Construct expansion joints as for field splices, except fasten internal sleeve securely to one side of rail only.
  3. Locate joints within six inches of posts.
- F. Protection from Dissimilar Materials:
1. Coat aluminum surfaces in contact with dissimilar materials such as concrete, masonry, and steel, in accordance with Section 09 91 00, Painting.
  2. Do not extend coating beyond contact surfaces. Remove coating where exposed-to-view in the finished Work.

### 3.3 CLEANING AND REPAIRING

- A. Cleaning:
1. Clean exposed surfaces of handrail and railing systems after completion of installation. Comply with recommendations of both handrail and railing system manufacturer and finish manufacturer. Do not use abrasives or unacceptable solvent cleaners. Test cleaning techniques on an unused section of railing before employing cleaning technique.
  2. Remove stains, dirt, grease, and other substances by washing handrails and railings systems thoroughly using clean water and soap; rinse with clean water.
  3. Do not use acid solution, steel wool, or other harsh abrasives.
  4. If stain remains after washing, remove defective sections and replace with new material complying with this Section.
- B. Handrails and railings shall be free of dents, burrs, scratches, holes, and other blemishes. Replace damaged or otherwise defective Work with new material that complies with this Section at no additional cost to OWNER.
- C. Prior to Substantial Completion, replace adjacent work marred by the Work of this Section.

++ END OF SECTION ++

## SECTION 05 53 16

### ALUMINUM GRATING

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. Scope:
1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install aluminum grating and frames.
  2. The Work includes:
    - a. Providing grating, frames, and appurtenances.
    - b. Providing openings in aluminum grating to accommodate the Work under this and other Sections, and attaching to aluminum grating all items such as sleeves, bands, studs, fasteners, and items required for which provision is not specifically included under other Sections.
- B. Coordination:
1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before aluminum grating Work.
- C. Related Sections:
1. Section 09 91 00, Painting.

##### 1.2 REFERENCES

- A. Standards referenced in this Section are:
1. AA Aluminum Design Manual.
  2. ASTM B210, Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
  4. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
  5. NAAMM MBG 531, Metal Bar Grating Manual.
  6. NAAMM MBG 533, Welding Specifications for Fabrication of Steel, Aluminum and Stainless Steel Bar Grating.

##### 1.3 QUALITY ASSURANCE

- A. Qualifications:
1. Manufacturer: Shall have at least five years experience manufacturing products substantially similar to those required and shall be able to submit documentation of at least five installations in satisfactory operation for at least five years each.
- B. Component Supply and Compatibility:

1. Obtain all products and materials included in this Section regardless of component manufacturer from a single aluminum-grating manufacturer.
2. Aluminum grating manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all products and materials furnished under this Section.
3. Components shall be suitable for the specified service conditions and be integrated into overall assembly by aluminum grating manufacturer.
4. Provide only one type of aluminum grating exclusively throughout the Project.

#### 1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
1. Shop Drawings:
    - a. Fabrication and erection of all Work. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items.
    - b. Setting drawings and templates for location and installation of anchorage devices.
  2. Product Data:
    - a. Manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions.
  3. Samples:
    - a. Representative Samples of grating, appurtenances and other finished products requested by ENGINEER.
    - b. ENGINEER'S review will be for type and finish only. Compliance with all other requirements is exclusive responsibility of CONTRACTOR.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Shipping, Handling and Unloading:
1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices to be embedded in cast-in-place concrete in ample time to prevent delaying the Work.
- B. Storage and Protection:
1. Protect materials from corrosion and deterioration.
  2. Do not store materials in contact with concrete or other materials that might cause corrosion, staining, scratching, or damage materials or finish.

### PART 2 – PRODUCTS

#### 2.1 SYSTEM PERFORMANCE

- A. Aluminum Grating: Provide aluminum grating complying with the following:
1. Grating Design Loads: Uniform live load shall be as shown or indicated in the Contract Documents. Where live load is not shown or indicated, uniform

live and concentrated loads shall be as indicated in the table below, whichever results in the greater design stresses.

	<b>Live Load</b>	<b>Concentrated Load</b>
a.	100 psf	500 lbs. per foot of grating width at center of span

2. Maximum Clear Span Deflection for Uniform Live Loads: 1/120 of span, but not more than 1/4-inch.
  3. Maximum Fiber Stress: 12,000 psi.
  4. Do not install aluminum grating in areas subject to vehicular traffic.
  5. Minimum Size of Members:
    - a. Minimum size of bearing bars shall be within standard mill tolerance as indicated in load tables in NAAMM MBG 531 for applicable loading and deflection requirements.
    - b. Minimum dimensions of cross bars shall be as indicated in tables of Minimum Standard Cross Bars and Connecting Bars in NAAMM MBG 531.
  6. Banding bar shall be 1/4-inch thick minimum. Top of banding bar shall be flush with top of grating, unless otherwise shown or indicated. Banding bar shall be 1/4-inch shorter than the bearing bar height.
  7. Comply with requirements of AA Aluminum Design Manual.
- B. Stair Treads: Provide stair treads complying with the following:
1. Stair Tread Design Loads: Concentrated live load shall be:
    - a. 300 pounds on front-most five inches of tread at center of tread of span up to 5.5 feet.
    - b. 300 pounds on front-most five inches of tread at the one-third points of tread of span greater than 5.5 feet.
  2. Maximum Clear Span Deflection for Concentrated Live Loads: 1/240 of span, but not more than 1/4-inch.
  3. Maximum Fiber Stress: 12,000 psi.
  4. Minimum Size of Members:
    - a. Minimum size of bearing bars shall be within standard mill tolerance as indicated in load tables in NAAMM MBG 531 for applicable loading and deflection requirements.
    - b. Minimum dimensions of cross bars shall be as indicated in tables of Minimum Standard Cross Bars and Connecting Bars in NAAMM MBG 531.
  5. Carrier plate shall be 1/4-inch thick minimum. Top of carrier plate shall be flush with top of tread, unless otherwise shown or indicated. Provide carrier plate with hole and slot for attachment to stringer.
  6. Comply with requirements of AA Aluminum Design Manual.

## 2.2 MANUFACTURERS

- A. Grating, Products and Manufacturers: Provide one of the following:
1. Swage-Locked rectangular Bar Grating, by IKG Industries.
  2. Swage-Locked rectangular Bar Grating, by AMICO.

3. Or approved equal.
- B. Stair Treads, Products and Manufacturers: Provide one of the following:
1. Rectangular Bar Treads, by IKG Industries.
  2. Rectangular Bar Treads, by AMICO.
  3. Or approved equal.

### 2.3 MATERIALS

- A. Bearing Bars: Aluminum alloy 6061-T6 or alloy 6063-T6, complying with ASTM B221.
- B. Cross Bars or Bent Connecting Bars: Aluminum alloy 6061-T6 or alloy 6063-T6, complying with either ASTM B221 or ASTM B210.
- C. Frames: Aluminum alloy 6061-T6 or alloy 6063-T6, complying with ASTM B221.
- D. Stud anchors welded to steel supports and other fasteners shall be Type 316 stainless steel.

### 2.4 FABRICATION

- A. Use materials of minimum depth and thickness specified and required to comply with performance criteria in the Contract Documents.
- B. Provide grating as follows:
  1. Grating Type: Aluminum rectangular bar with swage-locked cross bars at right angles to bearing bars.
  2. Depth: One-inch minimum.
  3. Bearing Bars: Aluminum rectangular bar minimum of one-inch spaced at 1-3/16-inch on centers.
  4. Cross-Bars: Swage-locked to bearing bars at maximum spacing of four inches on centers.
  5. Surface: Grooved.
  6. Finish: Mill.
- C. Provide stair treads as follows:
  1. Tread Type: Aluminum rectangular bar with swage-locked cross bars at right angles to bearing bars.
  2. Depth: One-inch minimum.
  3. Bearing Bars: Aluminum rectangular bar minimum one-inch spaced at 1-3/16-inch on centers.
  4. Cross Bars: Swage-locked to bearing bars at maximum spacing of four inches on centers.
  5. Surface: Grooved.
  6. Nosing: Cast aluminum abrasive nosing.
  7. Finish: Mill.

- D. Provide cutouts in grating for passage of piping, electrical conduit, valve stems, columns, ducts, and similar work. Where more than two bearing bars are included in a cut out, provide banding bars of same dimensions as bearing bars around opening welded to grating component parts.
- E. Gratings shall be accurately fabricated, free from warps, twists, and other defects that would affect grating appearance and grating serviceability.
- F. Welding shall conform to requirements of NAAMM MBG 533. Welds shall be ground smooth at top surfaces and bearing surfaces.
- G. Openings in and edges of gratings sections shall be banded with banding bars. Weld bands to intersecting members.
- H. Size each section of grating to weigh not more than 100 pounds, unless otherwise indicated in the Contract Documents.

### PART 3 – EXECUTION

#### 3.1 EXAMINATION

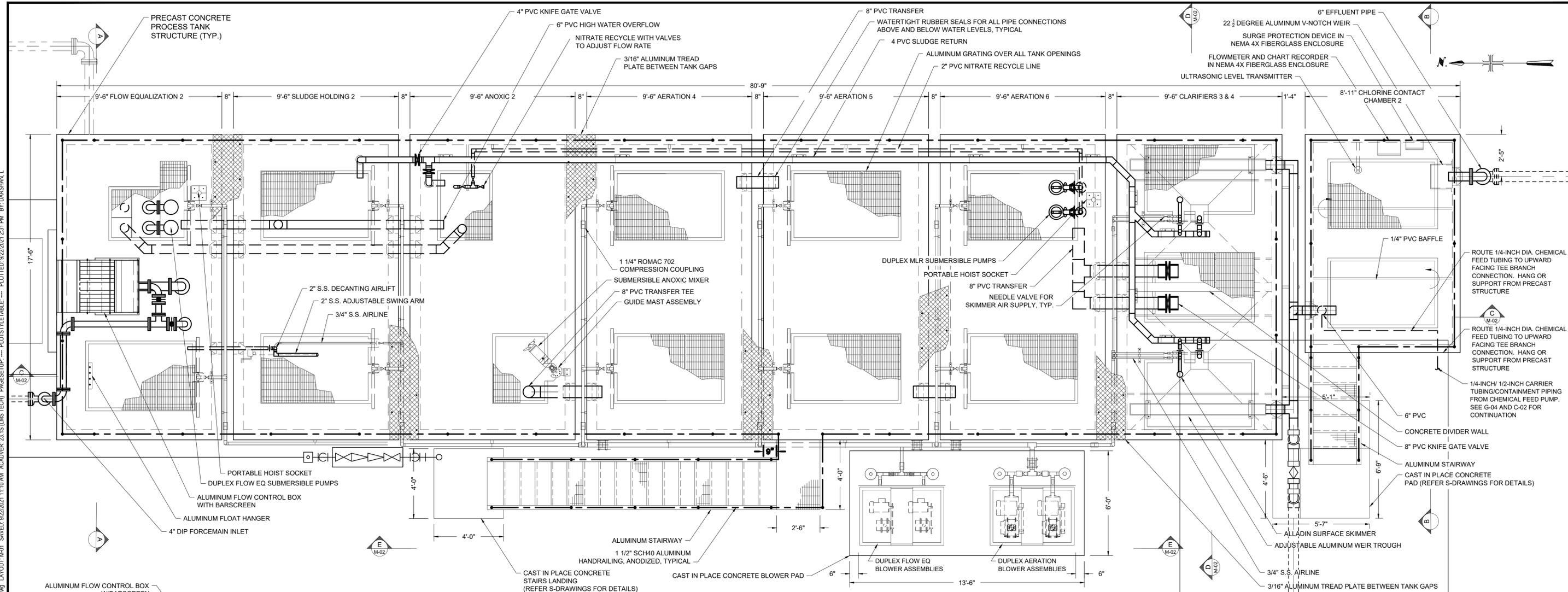
- A. Examine conditions under which Work is to be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.
- B. Check all dimensions at the Site after piping and equipment are in place and determine exact locations of openings and cutouts.

#### 3.2 INSTALLATION

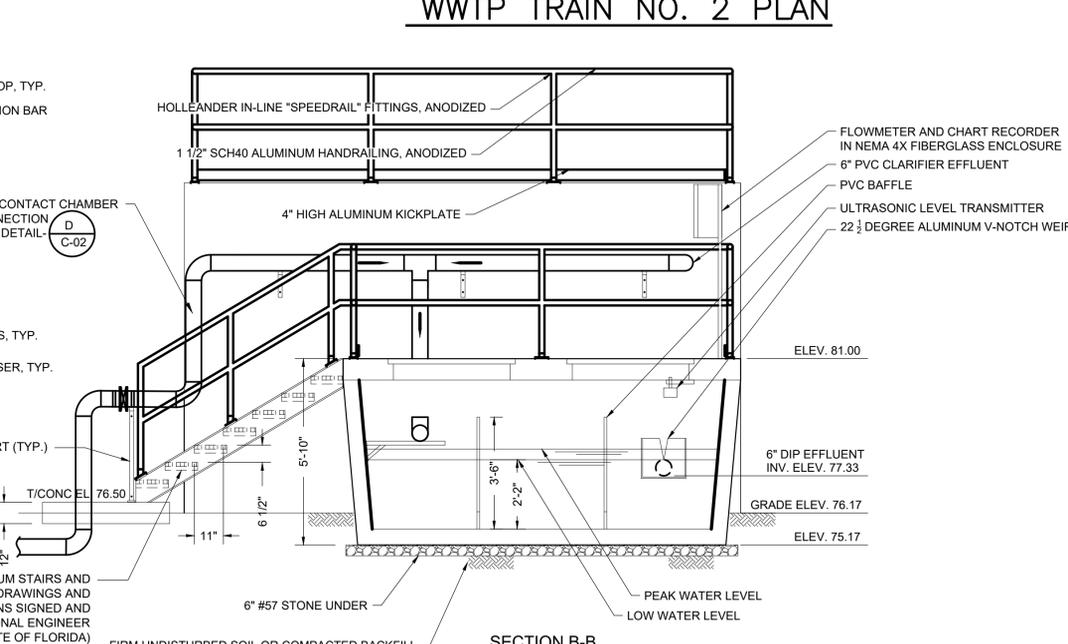
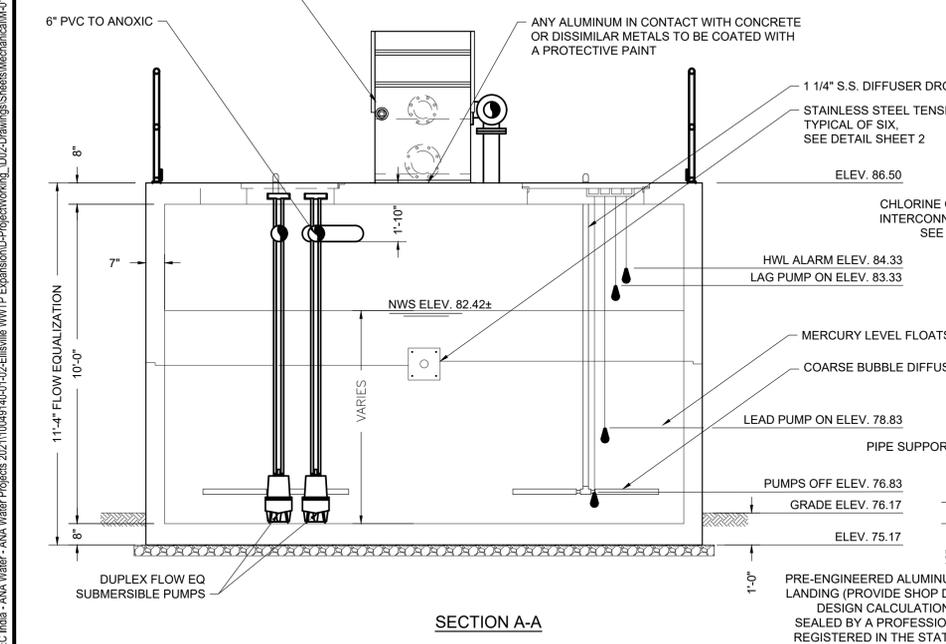
- A. Fastening to In-Place Construction:
  - 1. Use anchorage devices and fasteners to secure aluminum grating to supporting members or prepared openings, as recommended by manufacturer.
  - 2. Weld Type 316 stainless steel stud bolts to receive saddle clip or flange block anchors to supporting steel members. Drill for machine bolts when supports are aluminum.
- B. Cutting, Fitting, and Placing:
  - 1. Perform cutting, drilling and fitting required for installation. Set the Work accurately in location, alignment and elevation, plumb, level, true, and free of rack. Do not use wedges or shimming devices.
  - 2. Where gratings are penetrated by piping, electrical conduit, ducts, structural members, or similar protrusions, cut openings neatly and accurately to size and attach banding bar as specified.
  - 3. Divide panels into sections only to extent required for installation where aluminum grating is to be installed around previously installed piping, electrical conduit, ducts, structural members, or similar protrusions.

- C. Aluminum gratings in concrete floors shall be removable and arranged in sizes to be readily lifted. Provide aluminum gratings in concrete with aluminum angle frames with mitered corners and welded joints. Grind exposed joints smooth. Frames shall have welded anchors set into concrete. Angle size shall match grating depth selected for flush fit.
- D. Clearance at ends or between sections of grating shall be a maximum of 1/4-inch.
- E. Tops of aluminum gratings shall be set flush with surrounding construction.
- F. Aluminum gratings shall be set with full and uniform end bearing on frames to preclude rocking movement; do not use wedges or similar shimming devices.
- G. Protection of Aluminum from Dissimilar Materials: Coat aluminum surfaces in contact with dissimilar materials such as concrete, masonry, steel, or other metals, in accordance with Section 09 91 00, Painting.

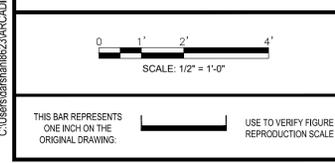
+ + END OF SECTION + +



**WWTP TRAIN NO. 2 PLAN**



- GENERAL NOTES:**
1. PRECAST CONCRETE TO HAVE A COMPRESSIVE STRENGTH OF 5000 PSI AT 28 DAYS.
  2. PRECAST CONCRETE SHALL INCLUDE 'PENETRON' WATERPROOFING ADMIXTURE.
  3. TRANSFER, SLUDGE, AND WETLINE PIPING SHALL BE SCH80 PVC UNLESS OTHERWISE NOTED.
  4. AIRLINE PIPING SHALL BE SCH40 TYPE 316 STAINLESS STEEL, NON-DOMESTIC.
  5. BRACING, PIPE SUPPORTS, AND MISC FASTENERS TO BE TYPE 316 STAINLESS STEEL, NON-DOMESTIC.
  6. PRECAST CONCRETE STRUCTURES SHALL BE FILLED WITH WATER BEFORE MAKING ALL PIPING CONNECTIONS AND THESE CONNECTIONS SHALL BE MADE OF ARTICULATING FLEXIBLE JOINTS.



Professional Engineer's Name <b>SEAN K. CHAPARRO, P.E.</b>		Professional Engineer's No. <b>75865</b>	
No.	Date	Revisions	By
2	22/09/2021	ADDENDUM	AGG SKC
1	06/09/2021	BID SET	AGG SKC

Designed by <b>SKC</b>	Drawn by <b>AGG</b>	Checked by <b>SKC</b>	Date Signed	Project Mgr. <b>SKC</b>
Designed by <b>SEAN K. CHAPARRO</b>			Checked by <b>P.E. NO. 75865</b>	



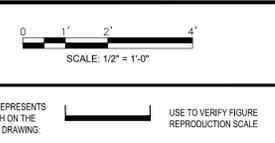
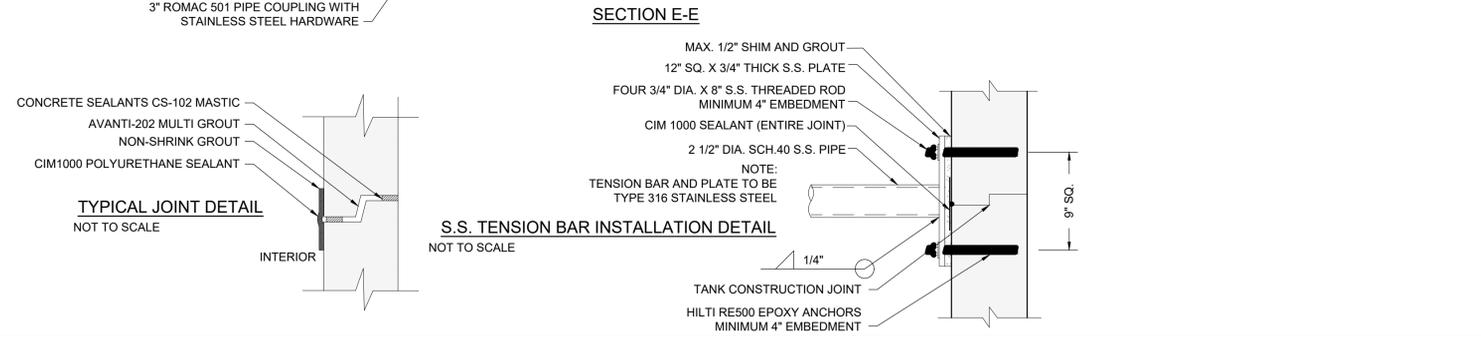
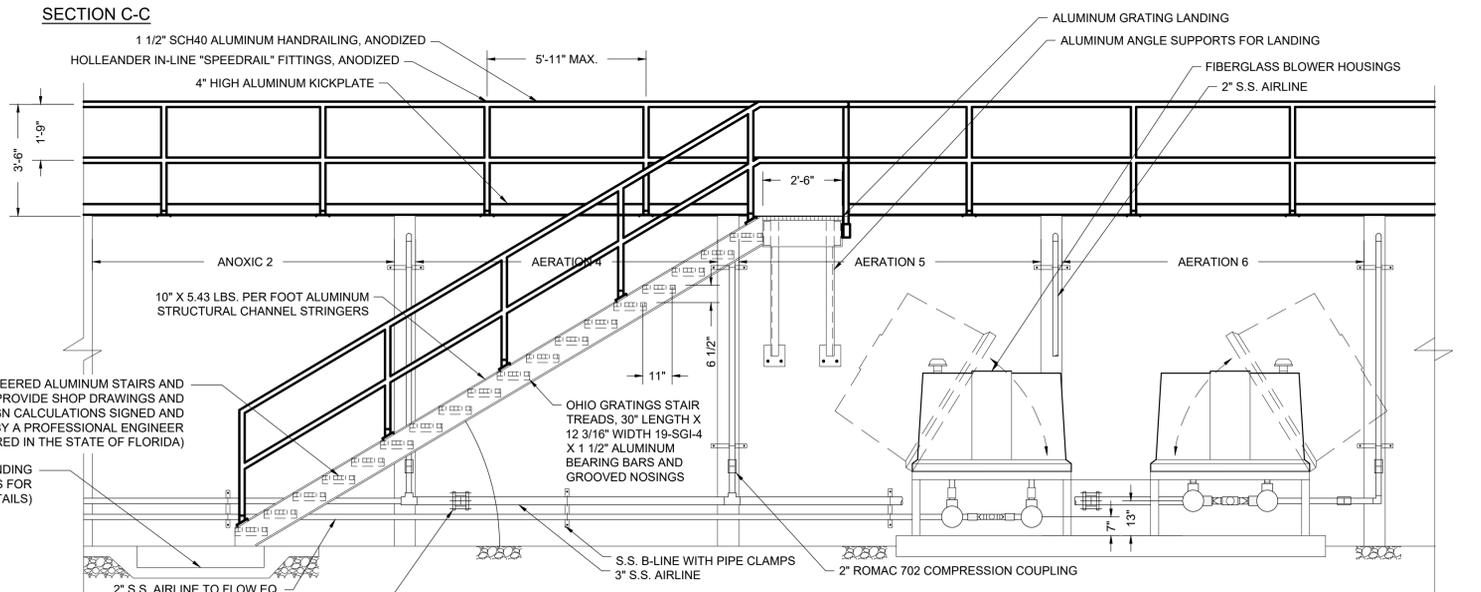
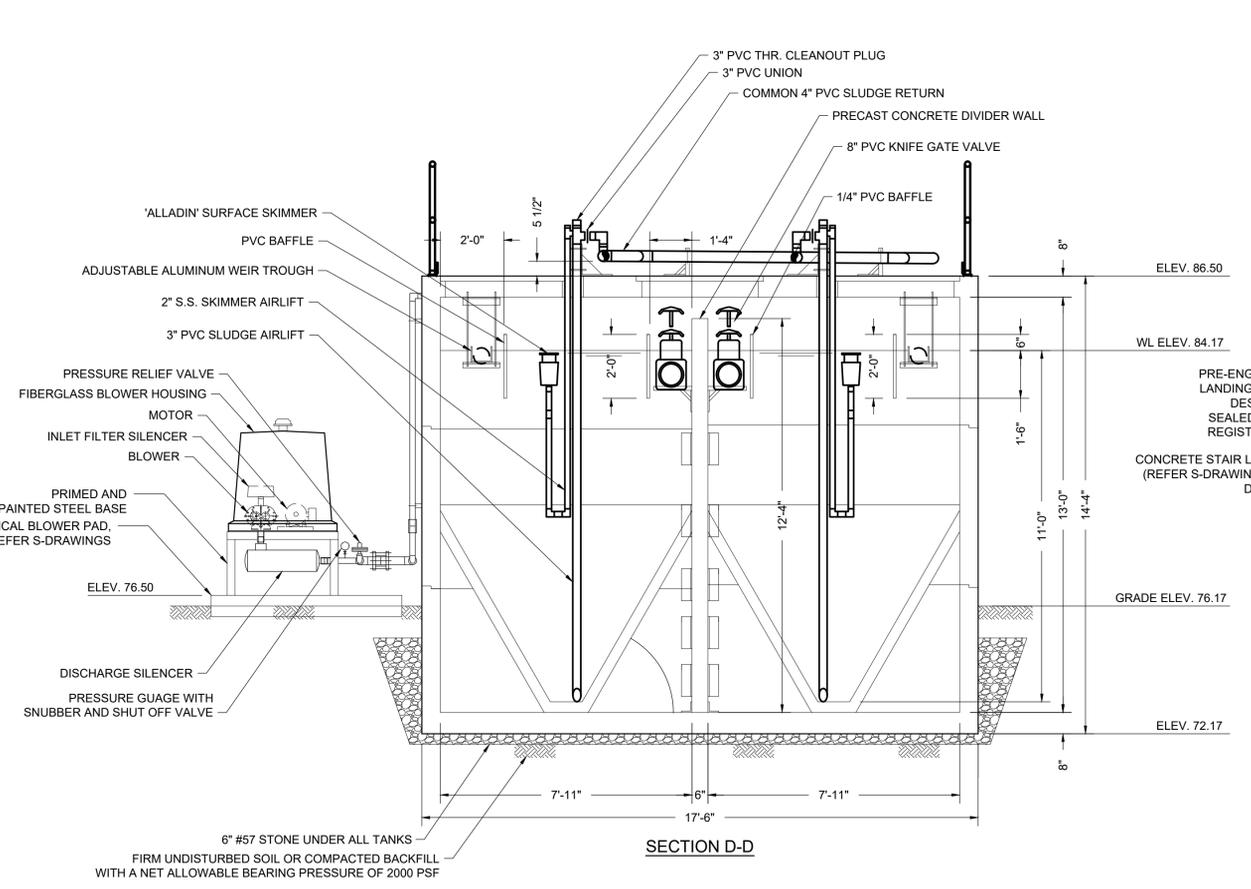
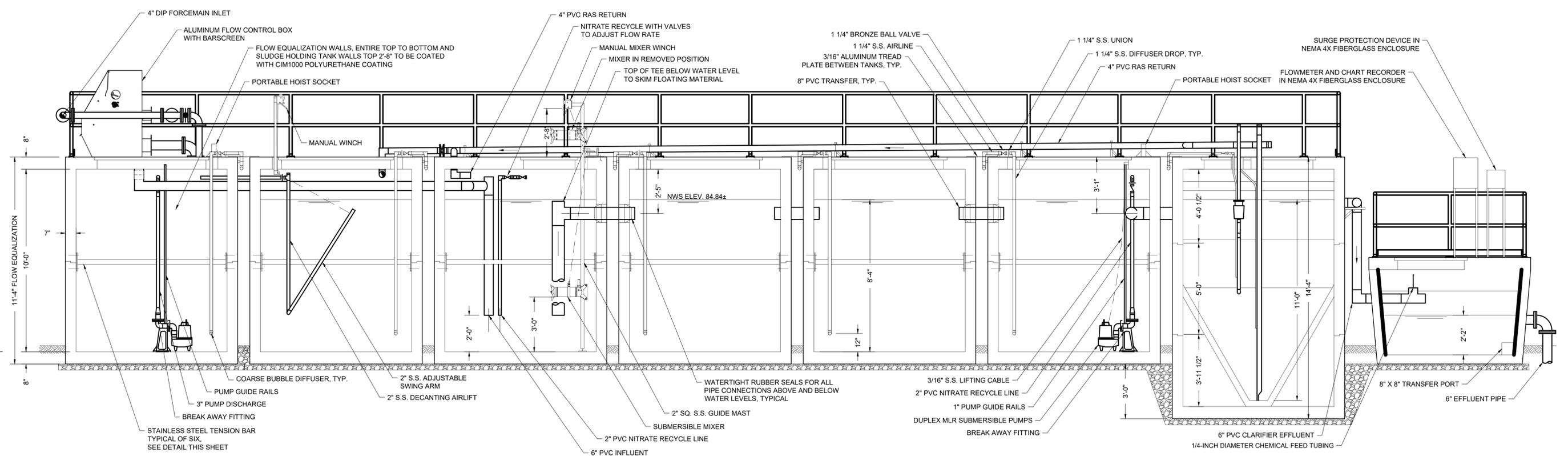
COLUMBIA COUNTY, FLORIDA  
**ELLISVILLE WASTEWATER TREATMENT PLANT EXPANSION**  
**WASTEWATER TREATMENT PLANT - PLAN AND SECTIONS**

ARCADIS Project No.  
30028119.0000  
 Date  
SEPTEMBER 2021  
 ARCADIS  
3109 W. DR. MARTIN LUTHER KING, JR.  
BLVD., SUITE 350  
TAMPA, FLORIDA 33607  
TEL. 813.903.3125

**M-01**

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Professional Engineer's Name <b>SEAN K. CHAPARRO, P.E.</b>		Professional Engineer's No. <b>75865</b>	
No.	Date	Revisions	By
2	22/09/2021	ADDENDUM	AGG SKC
1	06/09/2021	BID SET	AGG SKC

Designed by <b>SKC</b>	Drawn by <b>AGG</b>	Checked by <b>SKC</b>	Project Mgr. <b>SKC</b>
Date Signed		Date	
State <b>FL</b>		Professional Engineer's No. <b>75865</b>	
Professional Engineer's Name <b>SEAN K. CHAPARRO, P.E.</b>		Professional Engineer's No. <b>75865</b>	

**ARCADIS**  
ARCADIS U.S., INC.  
FLORIDA CERTIFICATE OF AUTHORIZATION NUMBER 7917

COLUMBIA COUNTY, FLORIDA  
ELLISVILLE WASTEWATER TREATMENT PLANT EXPANSION

## WASTEWATER TREATMENT PLANT - SECTIONS

ARCADIS Project No.  
30028119.0000  
Date  
SEPTEMBER 2021  
ARCADIS  
3109 W. DR. MARTIN LUTHER KING, JR.  
BLVD., SUITE 350  
TAMPA, FLORIDA 33607  
TEL. 813.903.3125

**M-02**

**GENERAL**

- G-1 THESE NOTES ARE GENERAL AND SUPPLEMENTAL TO THE SPECIFICATIONS. THESE NOTES APPLY TO THE ENTIRE PROJECT UNLESS MODIFIED OR NOTED OTHERWISE IN THE CONTRACT DOCUMENTS.
- G-2 DESIGN IS IN ACCORDANCE WITH AND CONSTRUCTION SHALL COMPLY WITH THE 2020 FLORIDA BUILDING CODE (7TH EDITION) EXCEPT WHERE OTHER APPLICABLE CODES AND THE CONTRACT DOCUMENTS ARE MORE RESTRICTIVE.
- G-3 LIVE LOADS:  
FLOOR LIVE LOAD = 250 PSF  
STAIRS, WALKWAYS,  
ELEVATED PLATFORMS: 100 PSF (U.O.N.)  
PLATFORMS WITH EQUIPMENT: 150 PSF (U.O.N.)
- G-4 WIND DESIGN:  
ULTIMATE DESIGN WIND SPEED = 130 MPH  
EXPOSURE CATEGORY = C  
RISK CATEGORY = III
- G-5 ALL DIMENSIONS INDICATED (\*) ARE TO BE VERIFIED EITHER BY FIELD MEASUREMENTS FOR EXISTING STRUCTURES OR BY SHOP DRAWINGS FOR EQUIPMENT FURNISHED. STRUCTURAL DIMENSIONS NOT SHOWN BUT CONTROLLED BY OR RELATED TO EQUIPMENT SHALL BE VERIFIED BY THE CONTRACTOR WITH THE MANUFACTURER PRIOR TO CONSTRUCTION.
- G-6 EQUIPMENT ANCHOR BOLT SIZES, TYPES, AND PATTERNS SHALL BE VERIFIED WITH THE MANUFACTURER. ALL BOLT PATTERNS SHALL BE TEMPLATED TO INSURE ACCURACY OF PLACEMENT.
- G-7 STRUCTURAL DRAWINGS SHALL BE USED IN COORDINATION WITH DRAWINGS OF ALL OTHER DISCIPLINES AND MANUFACTURER'S SHOP DRAWINGS.
- G-8 IF A CONFLICT IS FOUND BETWEEN DIFFERENT PORTIONS OF THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY. CONTINUED CONSTRUCTION OF THE AREA IN CONFLICT SHALL BE AT THE CONTRACTOR'S OWN RISK UNTIL THE CONFLICT IS RESOLVED BY THE ENGINEER.
- G-9 STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL LOADS ON THE COMPLETED STRUCTURE. DURING CONSTRUCTION, THE STRUCTURES SHALL BE PROTECTED BY BRACING AND TEMPORARY SUPPORTS WHEREVER EXCESSIVE CONSTRUCTION LOADS MAY OCCUR. OVERSTRESSING OF ANY STRUCTURAL ELEMENT IS PROHIBITED.
- G-10 NO BACKFILL SHALL BE PLACED AGAINST ANY WALL UNLESS ALL SUPPORTING ELEMENTS OF THE STRUCTURE HAVE BEEN CONSTRUCTED AND HAVE REACHED THE SPECIFIED MINIMUM CONCRETE STRENGTH.
- G-11 NO COLD WEATHER CONSTRUCTION OR HOT WEATHER CONSTRUCTION, AS DEFINED IN SPECIFICATIONS, IS PERMITTED WITHOUT WRITTEN APPROVAL OF THE ENGINEER.
- G-12 OPENINGS AND PENETRATIONS: THE CONTRACTOR SHALL SUBMIT COMPOSITE DRAWINGS INDICATING ALL FLOOR OPENINGS AND PENETRATIONS THROUGH STRUCTURAL MEMBERS REQUIRED TO ACCOMMODATE ALL OTHER WORK. THE CONTRACTOR SHALL FOLLOW THE TYPICAL FRAMING DETAILS AT OPENINGS AND REINFORCEMENT DETAILS AT PENETRATIONS THROUGH STRUCTURAL MEMBERS. ACCORDINGLY, THE CONTRACTOR SHALL SUBMIT SHOP DETAILS TO THE ENGINEER FOR REVIEW.

**FOUNDATIONS**

- F-1 ALL FOUNDATION WORK SHALL BE PER GEOTECHNICAL ENGINEERING REPORT FOR ELLISVILLE WWTP - NEW WATER STORAGE STRUCTURES, ISSUED BY CAL-TECH TESTING, INC.
- F-2 FOUNDATION WORK SHALL FOLLOW THE PROCEDURES RECOMMENDED IN THE GEOTECHNICAL REPORT.
- F-3 THE CONTRACTOR SHALL PROVIDE ADEQUATE PROTECTION TO EXISTING UNDERGROUND UTILITIES. VERIFY UTILITIES LOCATION BEFORE PROCEEDING WITH FOUNDATION EXCAVATION.
- F-4 ALL CONSTRUCTION OPERATIONS DEALING WITH EARTHWORK, EXCAVATIONS AND EXCAVATION BOTTOMS SHALL BE INSPECTED BY AN EXPERIENCED GEOTECHNICAL ENGINEER AT THE CONTRACTOR'S EXPENSE.
- F-5 SLAB AND FOUNDATIONS PARAMETERS:  
A) MAXIMUM ALLOWABLE NET SOIL PRESSURE = 2000 PSF  
B) MODULUS OF SUBGRADE REACTIONS FOR SLABS-ON-GRADE = 150 PSI/IN
- F-6 COMPACTED #57 STONE AND COMPACTED EXCAVATION BOTTOM AS SHOWN ON THE DRAWINGS SHALL BE UNDER THE ENTIRE FOUNDATION FOOTPRINT.

**CONCRETE**

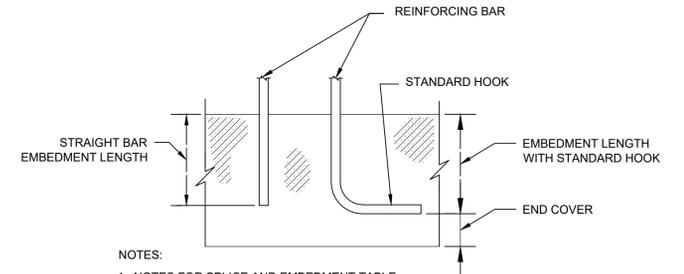
- C-1 CONCRETE 28-DAY COMPRESSIVE STRENGTH: 4500 PSI
- C-2 REINFORCEMENT: ASTM A615, GRADE 60, OR ASTM A706, GRADE 60 WHERE REINFORCEMENT IS TO BE WELDED.
- C-3 CONCRETE COVER FOR REINFORCING:  
A) SURFACES CAST AGAINST EARTH 3"  
B) SURFACE WITH EMBEDDED PVC WATERSTOP 3"  
C) ALL OTHER SURFACES 2"
- C-4 CONSTRUCTION JOINTS SHALL BE LOCATED AS SHOWN ON THE DRAWINGS. WHERE NOT SHOWN, CONSTRUCTION JOINTS SHALL BE LOCATED AT NO MORE THAN 40' ON CENTER. CONSTRUCTION JOINT LOCATIONS SHALL BE AS APPROVED BY THE ENGINEER
- C-5 EQUIPMENT SUPPORTS, ANCHORAGES, OPENINGS, RECESSES AND REVEALS NOT SHOWN ON THE STRUCTURAL DRAWINGS BUT REQUIRED BY OTHER CONTRACT DOCUMENTS, SHALL BE PROVIDED FOR PRIOR TO PLACING CONCRETE.
- C-6 AT ALL TYPICAL CURBS, EQUIPMENT PADS, AND PIPE SUPPORT PIERS, REINFORCING DOWELS SHOWN MAY BE REPLACED WITH MATCHING DOWELS SET IN EPOXY ADHESIVE IN DRILLED HOLES AS SPECIFIED. DOWELS LOCATED CLOSER THAN 3" FROM ANY EDGE OF CONCRETE SHALL NOT BE REPLACED WITH DRILLED DOWELS.
- C-7 WHERE DRILLED EPOXY ADHESIVE DOWELS ARE SHOWN TO BE PLACED INTO HARDENED CONCRETE, ADJUST THE DOWEL LOCATIONS AS NEEDED TO AVOID DRILLING THROUGH ANY REINFORCING BARS. IF THE DOWEL LOCATION NEEDS TO BE MODIFIED, CONTACT THE ENGINEER.
- C-8 WHERE HORIZONTAL CONSTRUCTION JOINTS, LOCATED ABOVE THE FOUNDATION SLAB, EXTEND BEYOND WHERE NEEDED, THEY SHALL BE TERMINATED AT A VERTICAL CONSTRUCTION JOINT AS APPROVED BY THE ENGINEER.
- C-9 DOWELS, ANCHOR BOLTS, PIPES, AND OTHER EMBEDDED ITEMS SHALL BE HELD SECURELY IN POSITION WHILE CONCRETE IS BEING PLACED.
- C-10 CONDUITS AND PIPES SHALL NOT BE EMBEDDED IN OR PASS THROUGH COLUMNS OR BEAMS UNLESS INDICATED OTHERWISE OR AUTHORIZED BY ENGINEER.
- C-11 ALL EXPOSED CORNERS SHALL HAVE A 3/4" CHAMFER OR A 1/2" RADIUS TOOLED CORNER.
- C-12 LAP SPLICES SHALL BE IN ACCORDANCE WITH THE TABLE SHOWN ON THIS DRAWING.

**ABBREVIATIONS**

AB ANCHOR BOLTS	E EAST	ID INSIDE DIAMETER	R RADIUS, RISER
ADD'L ADDITIONAL	EA EACH	IF INSIDE FACE	REINF REINFORCEMENT
AL ALUMINUM	EF EACH FACE	INV INVERT	REQD REQUIRED
ALT ALTERNATE	EJ EXPANSION JOINT	JT JOINT	RM ROOM
APPROX APPROXIMATE	EL ELEVATION	L ANGLE (STRUCTURAL SHAPE)	RO ROUGH OPENING
ARCH ARCHITECTURAL	ELEC ELECTRICAL	LL LIVE LOAD	S SOUTH
BAL BALANCE	EMB EMBEDMENT	LLH LONG LEG HORIZ	SECT SECTION
BL BUILDING LINE	ENCL ENCLOSURE	LLV LONG LEG VERT	SH SHEET
BLDG BUILDING	EQ EQUAL	LOC LOCATION	SIM SIMILAR
BM BEAM	EQUIP EQUIPMENT	LP LOW POINT	SL SLAB
BOT BOTTOM	ES EACH SIDE	LW LONG WAY	SPEC SPECIFICATION
BRG BEARING	EW EACH WAY	MAX MAXIMUM	SO SQUARE
C CHANNEL STRUCTURAL SHAPE	EW T&B EACH WAY TOP & BOTTOM	MECH MECHANICAL	SS STAINLESS STEEL
CANT'L CANTILEVER	EXIST EXISTING	MFR MANUFACTURE, MANUFACTURER	STD STANDARD
CJ CONSTRUCTION JOINT	EXP EXPANSION	MH MAN-HOLE	STIR STIRRUP
CL CLEAR	EXT EXTERIOR	MID MIDDLE	STL STEEL
COL COLUMN	FB FLOOR BEAM	MIN MINIMUM	STRUCT STRUCTURAL
COMP COMPRESSIBLE	FDN FOUNDATION	N NORTH	SW SHORT WAY
CONC CONCRETE	FF FAR FACE	NF NEAR FACE	T&B TOP AND BOTTOM
CONN CONNECTION	FIN FINISH	# NUMBER	TOC TOP OF CONCRETE
CONST CONSTRUCTION	FL FLOOR	NTS NOT TO SCALE	THK THICK
CONT CONTINUOUS	FTG FOOTING	OC ON CENTER	T/ TOP OF
CSTG CASTING	GA GAUGE	OD OUTSIDE DIAMETER	T TREAD
C/C CENTER TO CENTER	GALV GALVANIZE	OF OUTSIDE FACE	TYP TYPICAL
CTR CENTER	GB GRADE BEAM	OPNG OPENING	UON UNLESS OTHERWISE NOTED
DET DETAIL	GD GRADE	OPP OPPOSITE	VERT VERTICAL
DIA DIAMETER	GRGT GRATING	PC PRECAST CONCRETE	W/ WITH
DIAG DIAGONAL	H HIGH	PL PLATE	WP WORKING POINT
DIM DIMENSION	HT HEIGHT	PSF POUNDS PER SQUARE FOOT	WS WATERSTOP
DL DEAD LOAD	HORZ HORIZONTAL	PVC POLYVINYL CHLORIDE	WWF WELDED WIRE FABRIC
DN DOWN	HP HIGH POINT		
DP DEEP	HS HIGH STRENGTH		
DWG DRAWING	HSS HOLLOW STRUCTURAL SECTION		
DWL DOWEL			

REINFORCING LAP SPlice & EMBEDMENT LENGTH								
BAR SIZE	MIN LAP LENGTH (IN)				MIN EMBEDMENT LENGTH (IN)			
	TOP BARS		OTHER BARS		STRAIGHT BARS		WITH STD HOOK	
	CLASS	CLASS	TOP BARS	OTHER BARS				
A	B	A	B					
SLABS & WALLS WITH 2" + COVER								
#3	16	21	12	16	16	12	6	
#4	16	21	12	16	16	12	7	
#5	20	25	15	19	20	15	9	
#6	24	30	18	23	24	18	10	
#7	33	43	25	33	33	25	12	
#8	38	49	29	37	38	29	14	
#9	49	63	37	48	49	37	15	
#10	60	78	46	60	60	46	17	
#11	75	97	57	74	75	57	19	
SLABS & WALLS WITH < 2" COVER								
#3	16	21	12	16	16	12	8	
#4	16	21	12	16	16	12	10	
#5	20	25	15	19	20	15	12	
#6	24	30	18	23	24	18	15	
#7	38	49	29	37	38	29	17	
#8	47	62	36	47	47	36	19	
#9	58	76	44	58	58	44	22	
#10	71	91	54	70	71	54	25	
#11	85	110	65	84	85	65	27	
BEAMS & COLUMNS WITH 3.75" CLEAR SPACING **								
#3	16	21	12	16	16	12	6	
#4	16	21	12	16	16	12	7	
#5	20	25	15	19	20	15	9	
#6	24	30	18	23	24	18	10	
#7	33	43	25	33	33	25	12	
#8	39	51	30	39	39	30	14	
#9	50	64	38	49	50	38	15	
#10	60	78	46	60	60	46	17	
#11	72	94	55	72	72	55	19	

\*\* FOR BAR CLEAR SPACING LESS THAN 3.75", ADD 46%  
FOR BAR CLEAR SPACING LESS THAN 2.25", ADD 104%



- NOTES:
- NOTES FOR SPLICE AND EMBEDMENT TABLE:
    - A. THE MINIMUM LENGTH OF LAPS FOR SPLICES SHALL BE AS GIVEN IN THE TABLE FOR CLASS "B" LAPS UNLESS SHOWN OTHERWISE ON THE DRAWINGS. PROVIDE CLASS "A" LAPS ONLY WHERE NOTED ON THE DRAWINGS.
    - B. THE SPLICE AND EMBEDMENT LENGTHS FOR WALLS AND SLABS ARE BASED ON A 5" MINIMUM ON CENTER BAR SPACING. SEE THE DRAWINGS FOR SPLICE AND EMBEDMENT WHERE BARS ARE SPACED CLOSER THAN 5".
    - C. HOOK EMBEDMENTS APPLY ONLY WHERE THE SIDE COVER (NORMAL TO THE HOOK PLANE) IS AT LEAST 2.5". THE COVERS REFERENCED ON THE TABLE ARE FROM THE HOOK EXTENSION TO THE FACE OF THE CONCRETE.
    - D. THE TABLE DOES NOT APPLY TO LIGHTWEIGHT CONCRETE OR EPOXY COATED REINFORCING BARS. SEE ACI 318 FOR APPROPRIATE ADDITIONAL MULTIPLIERS FOR THOSE CASES.
  - WHERE SPLICES ARE REQUIRED BETWEEN BARS OF DIFFERENT SIZES, THE LAP LENGTH SHALL BE NO LESS THAN THE EMBEDMENT LENGTH OF THE LARGER BAR OR THE LAP LENGTH OF THE SMALLER BAR, WHICHEVER IS GREATER.
  - VERTICAL REINFORCEMENT FOR CONCRETE SHALL BE SPLICED WITH DOWEL BARS OF THE SAME SIZE AND SPACING FROM THE FOUNDATION USING A STANDARD SPLICE LENGTH.
  - DOWELS SHOWN EXTENDING FROM PREVIOUSLY PLACED CONCRETE SHALL EXTEND ONE SPLICE LENGTH BEYOND THE JOINT, UNLESS DIMENSIONED OTHERWISE. WHERE A DIMENSION IS PROVIDED, THE BAR SPLICING TO THE DOWEL SHALL END ONE SPLICE LENGTH FROM THE END OF THE DOWEL.

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THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING.	USE TO VERIFY FIGURE REPRODUCTION SCALE	THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.	Professional Engineer's Name  Professional Engineer's No.	State: _____ Date Signed: _____ Project Mgr.: _____	Designed by: _____ Drawn by: _____ Checked by: _____	COLUMBIA COUNTY, FLORIDA ELLISVILLE WASTEWATER TREATMENT PLANT EXPANSION <b>STRUCTURAL NOTES, LEGEND, AND ABBREVIATIONS</b>	ARCADIS Project No. 30028119.0000 Date SEPTEMBER 2021 ARCADIS 3109 W. DR. MARTIN LUTHER KING JR. BLVD., SUITE 350 TAMPA, FLORIDA 33607 TEL. 813.903.3125	S-01
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