

RFP: WJ HOOPER RESIDUALS HANDLING IMPROVEMENTS

CONTRACTOR QUESTIONS/REQUEST FOR CLARIFICATION AND ENGINEER RESPONSES

CLAYTON COUNTY WATER AUTHORITY

ADDENDUM NO. 1

MARCH 27, 2019

ITEM 1: QUESTIONS AND RESPONSES

1. Question: In Section 15200, 2.05J what is the Beck actuator in reference to?

Response: Section 15100, 2.05J is not applicable to this project. Eliminate Section 15100 2.05J.

2. Question: Specification (item 3.02, pg. 14500-5) states that the conveyor controls are to be “provided by the Contractor...” However, the drawings (sheet 97) states that the conveyor panel be “by vendor”. Also, the electrical drawings (sheets 97 and 109) seem to refer to the conveyor as a screw conveyor with slide gates.

Response: The Conveyor Local Control Panel is to be provided by the Conveyor manufacturer. Section 14500-5 3.02 refers to wiring and conduit only.

The conveyor is a belt driven conveyor with electrically actuated belt plows, not typical slide gates.

No revisions to drawings are required.

3. Question: The spec is apparently intended to cover the two (2) existing 30’ diameter thickeners bid as Alternate No. 1. There are no drawings in the Plans for the two (2) 30’ existing thickeners and the only information in the specification is found in Table 11700-1 that lists them as 30’ diameter, 16’-5” side water depth, and a 1 : 6 floor slope. In order to bid these thickeners, we would need drawings and specification details added. Please confirm they are being bid as Alternate No. 1 and if so add specification language and drawings so we know what to bid.

Response: Existing thickeners are an Alternate on the Proposal Form. Please see drawing set “Clayton County Hooper WPP Additions to Filter Plant 1977 “ included in “Volume 4 – Supporting Documents” for reference. The following specifications shall be used as the design criteria:

No. of Units	Two (2)
Tank Diameter	30’-0”
Side Water Depth	15’-1”
Minimum Continuous Torque Rating	30,000 ft-lbs
Rotating Speed	4 rev/hour
Bridge	Bridge Supported across tank diameter. Structural Steel Bridge.
Electrical	460V/60 Cycle/3 Phase
Influent Well	3/16” plate minimum
Effluent Weirs	FRP. ¼” X 8” deep 90-degree V-notches 2½” deep @ intervals

Components to be replaced include but is not limited to the access bridge/walkway, center drive assembly, influent feed well, drive cage, sludge collector arms, effluent weirs, control panel and all appurtenances needed for a fully functional gravity sludge thickener. New thickener should accommodate the existing process piping that will remain.

Materials of construction for support assembly, cage, influent well and rake arms shall be Steel.

Air system is not required.

Decant arm is not required.

No revisions to drawings are required.

4. Question: Plan sheet 68 shows a 4' wide access walkway with a 8'-3" x 10' center platform. Spec ¶2.07.A and ¶2.12.A call for a 42" wide bridge and a platform providing 3'-0" clearance around the drive. Please clarify which is required.

Response: The walkway shall be 42" wide. Platform shall provide a minimum 3'-0" clearance around the drive. Dimensions shown on plan for bridge and central platform will be deleted. Specification dimensions and clearances will govern.

5. Question: Plan sheet 69 shows an 18'-6" diameter x 9'-4" deep feedwell. Spec Table 11700-1 calls for an 18'-0" diameter x 7'-6" deep feedwell. Please clarify which is required.

Response: Feedwell dimensions shall be as specified in Specification 11700 with a minimum 18'-0" diameter x minimum 7'-6" deep feedwell. Dimensions have been removed on the drawings. Drawing Sheet 69 is revised as part of this addendum.

6. Question: Spec table 11700-1 calls for a continuous torque of 93,750 ft-lb. This is very high in our opinion for a 70' thickener as it represents an arm loading of 75 pounds per foot of tank diameter. We had recommended a torque of 40,000 ft-lb during prelim work on this project. We can provide a mechanism rated at 93,750 ft-lb but feel it is overrated and will result in significantly larger components such as the motor, drive cage, truss arms, etc. We would recommend to reconsider the specified torque rating.

Response: Minimum Continuous Torque Rating shall be 50,000 ft-lb.

7. Question: Spec 11700 ¶1.03.A.4 specifies the drive mechanism rating calculations be stamped by a GA professional engineer. While this requirement is reasonable for the structural components of the thickener, it is not practical for the drive because it was not designed by a GA PE. We recommend leaving the requirement for a PE but delete the requirement that they be from Georgia.

Response: The motor design shall be stamped by a registered Professional Engineer (PE) in the state from which the drive mechanism is designed.

8. Question: Plans sheets 43, 45, 46, and 69 show an offset sludge hopper near the center of the tank. Spec ¶2.02.A, ¶2.09.A, and ¶2.09.C call for a concentric sludge channel surrounding the center column with four (4) scraper blades extending into the channel to move the sludge to the withdrawal point. Please clarify which is required.

Response: A concentric sludge collection channel is required per the spec. Drawing Sheets 43, 45, 46 and 69 are revised as part of this addendum. See No. 10 under 'ITEM #2 - ADDITIONAL REVISIONS OUTSIDE OF CONTRACTOR QUESTIONS'.

9. Question: Is the inlet valve to the sludge thickener a Butterfly Valve (V3) as shown in the schedule & P&ID or a Plug Valve (V5) as shown in the tag number in the schedule?

Response: The valve shall be a Butterfly Valve (V3).

10. Question: Reference drawing I-1 which shows that the buried 30" butterfly valve (03-V3-001) at the proposed thickener is to be equipped with an electric motor actuator. Please provide detail for the required actuator stand and relevant protection. Additionally, please confirm this valve (03-V3-001) is a butterfly valve (V3) and not a plug valve (V5) as the valve tag on the EMA schedule (15100-11) for this valve references V5 in its tag number but states that it is a V3 valve.

Response: The butterfly valve requires an extended bonnet on a concrete pedestal. The centerline elevation of (CLE) of the valve is 727.80 and should be coordinated with the final grade elevation.

Please see response to Question #9 with respect to the type of valve.

11. Question: Specification 15100 2.04A 2.04.A states "Plug valve shall be eccentric plug valve of rectangular port construction" and 2.04.B last sentence states: "Spherical shaped plugs are not acceptable." Will you allow round ported plug valves.

Response: Plug Valves sized 12" and below shall have either a round port or a rectangular port. Plug valves sized 14" and larger shall have a rectangular port.

12. Question: Reference drawing P-DTL-03 (sht 76).

Valves shown at the pumps are called out as "V7". I find no information regarding "V7" valves. Please clarify requirement.

The V7 valve reference calls for "TYP. FOR 3". I only see two. Please clarify if two or three valves are necessary at this location.

Response: The "V7" is an error and should be a "V8" which is a Check Valve. See Valve Spec Section 15100 for details. Only two (2) V8 check valves are necessary at this location.

No revisions to drawings are required.

13. Question 13: Specification Section 02660 indicates a cathodic protection system will be supplied on the installed pipeline. Please clarify what if any pipes required cathodic protection. Please clarify if an Alignment Corrosion Study is required. This specification section seems to be more intended for carbon steel pipe rather than ductile iron.

Response: Cathodic Protection is not required on this project. An alignment Corrosion Study is not required. Spec Section 02660 – Cathodic Protection System shall be deleted in its entirety.

14. Question 14: In section 02660 Part 1 General 1.01 C #2B it states that "the corrosion specialist shall act as a subcontractor to the contractor and the costs for the study shall be covered by an owners allowance in the bid". Number 3 states "The design and installation of the galvanic anode system shall

be paid by an Owner's allowing in the bid and shall be supplied according to the provisions of paragraph 2.03 of this section". Can you confirm that cathodic protection is going to be needed and the allowance amount?

Response: Please see response to Question #13.

15. Question: Specification Section 02200 1.02H indicates the contractor will be responsible for compaction testing. Please clarify.

Response: The materials testing firm, as selected by the Owner, will be responsible for the compaction testing and will be paid for out of the respective Allowance.

16. Question: Reference Specification Section 11280 (Slide Gates): Please clarify as to whether or not the gates are to be new per the "Fabricated Slide Gate Schedule" or are only the existing gate actuators being replaced per the drawings?

Response: The slide gates shown in the "Fabricated Slide Gate Schedule" in Section 11280 are to be new slide gates with electric actuators.

17. Question: Can the questions deadline be extended to 7 days prior to the proposal date?

Response: The deadline for questions cannot be extended.

18. Question: Is there is an existing and proposed grading plan cad file available to the contractors? If so I would like to request it.

Response: CAD files will not be available to Contractors during solicitation.

19. Question: Reference specification 15060-2.01.K. Paragraphs 1.a & 2.b reference to a "Insulation Schedule" that I am unable to find. Additionally, paragraph 2.a states to heat trace all outdoor pipe except A and AA. I am unable to find a definition of "A" and "AA". Please clarify where heat tracing and insulation is required for this project.

Response: Any exposed piping "W1" and "SS" shall have insulation and heat tracing.

20. Question: Please clarify specification section 15060-4 para. 2.01-E ... Item 5 states "mechanical joints with retainer glands are not acceptable." However in section 2665-6 para. 2.02-L Item 3b the Ebaa megalug series 1100 is listed as an approved mechanical joint restraint. Is the megalug an acceptable means of fitting restraint. Also, are compact C153 fittings allowable as pointed out in specification 2.01-C section 2665-3?

Response: The EBAA MEGALUG series 1100 is approved to provide mechanical joint restraint. Compact C153 fittings are allowed.

21. Question: How will the NPDES monitoring be handled during Construction?

Response: The Contractor will be required to abide by all the regulations under the GAEPD General Permit No. GAR 100002. The cost for the Permit and the requirements for meeting the regulatory compliances shall be paid for through the Permitting Allowance.

22. Question: Reference drawing 76 which shows the new 24" FBWW line running from JB-1 to WW-1 to be 24" RCP. The piping schedule calls for this to be CLDI. Please clarify material for this 24" FBWW line.

Response: The material for this specific 24" FBWW line shall be CLDI.

23. Question: Section 11313 2.02.E.1 lists shafting must be carbon steel or stainless steel. Will non-metallic shafting and stub shafts also be acceptable?

Response: Nylon stub shaft is acceptable.

24. Question: Spec section 01300-4.01C requires the contractor to provide the software and licenses for the DTCS system. Please provide information on what system is required and an estimate of the quantity of licenses.

Response: The Contractor shall select the Document Tracking and Control System (DTCS) and submit it for approval in accordance with Section 01300-4.01C. The system must be capable of managing work flow, communication and tracking of documents as specified. The Engineer will need access for a minimum of two seats. The Owner will need access for a minimum of two seats.

25. Question: Spec section 01650-1.01 requires a 30-day acceptance period. Will this 30-days period be required once the thickener equipment is on line before any work can be done on the holding basins?

Response: Yes. Completion of the testing steps identified in Section 01650 will be required to obtain a certificate of Substantial Completion for the Thickener and Pump Station (complete system). Once a certificate of Substantial Completion is issued and temporary by-pass pumping provisions of wash-water is in place, the Owner will have beneficial use of the system and the Contractor may commence work.

26. Question: Does the Owner warrant the adequacy of the design documents, or is this specifically disclaimed in SC-3.03.A.2?

Response: GC 3.03.A.2 and the associated SC 3.03.A.2 reflects CCWA's position regarding the design documents.

27. Question: Please enumerate the authority and responsibilities of the Resident Project Representative as required by GC 10.03.A.

Response: See GC 10.08 Limitations on Engineer's Authority and Responsibilities.

28. Question: Please define "good cause" as used in SC-7.06.F. How will the Owner determine "good cause"?

Response: Justification will need to be provided and agreed upon between both parties. Such justification will be identified solely on the basis of substantive, reasonable objection after due investigation.

29. Question: SC-10.02.A. and SC-10.08.E. both reference the Engineer’s responsibilities in the Owner-Engineer Contract for engineering services. Please provide a copy of the subject contract so that Contractor may understand how it relates to these provisions.

Response: There is some standard language within our Master Services Agreement with the Engineer relating to construction projects, and those portions of the Agreement are provided in “ITEM 1 ATTACHMENT A”. However, each construction project has a separate authorization that details the specific scope of service for a particular project. The Owner is not currently under contract with the Engineer for Services During Construction for this project. Based on the current procurement schedule, we anticipate that scope of services will not be finalized until the June Board of Directors meeting.

30. Question: Please identify all decisions that require Owner’s Board of Director’s approval per SC-11.09.A. (our assumption it this is tied to a NTE dollar threshold).

Response: Change orders to the construction contract valued at \$20,000 or more require Board of Director’s approval. Allowances for unforeseen conditions that don’t exceed the line item value can be negotiated between the Engineer, Contractor, and Owner without Board of Director’s approval.

31. Question: SC-15.01.B is a revised payment provision. It incorporates by reference O.C.G.A. 13-10-20, which addresses bid bonds. What do bid bonds have to do with Contractor payment?

Response: This is not the correct reference. The reference shall be O.C.G.A. 13-11 which relates to Prompt Payment. Please see revised spec “ITEM 1 ATTACHMENT B”.

32. Question 32: It is unclear what is included in the Contract Documents. Article 8 of the proposed Form of Agreement points to the General Conditions. The General Conditions point back to the Agreement. Please provide an all-inclusive list of all the Contract Documents.

Response: GC 1.01.A.13 defines Contract Documents. Article 8 of the Agreement Form is accurate.

33. Question: Are the liquidated damages in the proposed Form of Agreement additive and/or cumulative? Will they be assessed concurrently?

Response: Each Liquidated Damage item is independent of the other items in the table. Here is the table for reference:

Date / Consecutive Calendar Days after Notice to Proceed	Milestone	Liquidated Damages Per Calendar Day
50	Administration Period	\$0.00

260	Substantial Completion of New Thickener and Sludge Pumping Vault (Complete System)	\$750
500	Substantial Completion of All Other Work	\$1,000
560	Final Completion of All Work	\$1,500

34. Question: Exhibit A, General Liability, 8 – Requires Completed Operations coverage to be shown for 5 years on the certificate. Our insurance provider has stated that they cannot write a five-year locked policy on current certificates as we renew on a yearly basis. Would it be adequate to provide you with five years coverage by sending renewed certificates with each renewal for a term of five years. Please confirm with owner this is acceptable.

Response: Yes, the intent of this requirement is for the Contractor to provide an acceptable certificate of insurance for each annual renewal for a term of five years.

35. Question: In the documents the Contractor’s Pollution insurance policy requires the pollution coverage to be written on an occurrence form. We don’t typically see this coverage as a per occurrence, can this be modified to a claims made basis.

Response: The owner would like the Contractor’s Pollution insurance policy to be on a per occurrence basis however the owner will accept this coverage on a claims made basis.

36. Question: The pipe schedule for water service (W1) shows material to be copper. Should this be for anything under 3” or 4”? I would think the 6” W1 line should be DIP. Please clarify material for the 6” water service.

Response: W1 lines 3” and under shall be Copper. W1 lines 4” and larger shall be CLDI.

37. Question: In review of the bid form unit price bid schedule several of the units seem to be non-standard. Can you please review these to make sure they line up with what you expect?

Response: Yes, the unit prices do line up with what we expect. For items 21 through 26 of the Unit Price Bid Schedule in Section 00300, the units are in form of the finished product (or yield). Manufacturers have different yields per product and contractor material waste could vary. Repair area/volume will be measured prior to repair and payment will be made based on that measurement and the unit price on the bid form.

38. Question: Can you please provide measurement and payment definitions for the unit price bid items?

Response: The measurement and payment for all Unit Price Work items is the same and as specified in Section 01200, Measurement and Payment.

39. Question: Unit price bid items 19 & 20 for bypass pumping. Will these items be used for the bypass required for the work in the holding basin? What are the requirements for these bypass unit prices?

Response: Unit price work item 19 and 20 are for by-pass pumping work in addition to the by-pass pumping required for the work in the Wash Water Holding Basin and will be as authorized and directed by the Owner or Engineer. Assume unit price work item 19 and 20 includes pumping and equipment that can pump up to 10 MGD.

40. Question: Unit price bid items 17 & 18 for replacement of unsuitable soils. Shouldn't this include a depth of undercut or use a "CY" unit?

Response: Unit price bid items 17 and 18 are for replacement of unsuitable material as encountered during trenching and excavation for linear pipeline work. Unit price work will be completed as authorized and directed by the Owner or Engineer. The depth of undercut for other structure excavation is as indicated on the Drawings.

41. Question: Please consider extending your deadline for questions to COB 3/26/19 as we are finding quite a few significant concerns that we believe the engineer should address prior to bid time.

Response: Please see response to Question 17.

42. Question: Drawing P-DTL-03 there are (2) 18" valves called out as type V7. There is no type V7 specified

Response: Please see response to Question 12.

43. Question: Reference drawing C-07 (sheet 13) at the holding basin SS piping to the new sludge thickener. The pipe is sized to be 6". However record drawings show that the existing pipe is 4" (2012 set, sheet M-04). Please clarify if 4" or 6" pipe is necessary for this SS line.

Response: The pipe size should be 6". On Drawing DP-02, it calls for a 6x4 reducer.

No revisions to drawings are required.

44. Question: Can Val-matic be added to the Valve spec as an acceptable manufacturer for the Check, Plug, and Butterfly valve.

Response: No substitutes will be considered at this time. The Contractor may submit substitutes pursuant to the General Conditions Article 7.

45. Question: Can Whipps be added to the Slide Gate spec as an acceptable manufacturer?

Response: Please see response to Question 44.

46. Question: Can Hydrogate be added as an acceptable slide gate manufacturer in the Section 11280 2.01A?

Response: Please see response to Question 44.

47. Question: With regard to Section 14500 (Loadout Belt Conveyors), we respectfully request that Custom Conveyor Corporation (CCC) as an acceptable named supplier.

Response: Please see response to Question 44.

48. Question: Section 11700.1.01.A - This specification provides the tank dimensions for the two (2) existing 30' thickeners but does not describe any of the mechanism's components. Please acknowledge that Evoqua can provide its standard equipment and design for these 30' thickeners.

Response: Please see response to Question 3.

49. Question: Table 11700-1 Thickener Design Criteria - The minimum AGMA continuous torque rating of 93,750 ft-lbs seems to be a calculated number. Please clarify how this minimum torque value was calculated. When thickening alum sludge, a standard sludge loading rate (w) of 20lbs/ft can be used to calculate the thickener's running torque (T). When using the equation $T=(\text{Radius}^2)*w$, we see that the running torque needed for this application comes out to be 24,500 ft-lbs. The specified "minimum" AGMA continuous torque of 93,750 ft-lbs is almost four times greater than the calculated running torque for this application. This table also mentions that the structural members shall be designed for 200% of the minimum AGMA continuous torque (187,500 ft-lbs). Designing a thickener of this size and application for this amount of torque will greatly increase the size of all members and will add unnecessary cost to the project. Please consider changing the minimum AGMA continuous torque rating to 24,500 ft-lbs.

Response: Please see response to Question 6.

50. Question: Table 11700-1 Thickener Design Criteria - Note 4 below this table says "Precision Bearing type drive requirement only." Please clarify the intention of this note.

Response: Note 4 below Table 11700-1 shall be removed from the Specification.

51. Question: Section 11700.2.04.A.1 - This section specifies "Minimum raceway diameter and minimum ball diameter shall be in accordance with Table 11700-1." However, Table 11700-1 does not show this information. Please specify that the drive mechanism shall have a minimum raceway diameter of 42".

Response: Minimum raceway diameter and ball diameter shall be as required by the manufacturer.

52. Question: Section 11700.2.04.A.10 - This section specifies that the "Main drive bearings shall be designed for a minimum ABMA L-10 life of 1,000,000 hours." 1,000,000 hours equates to 114 years of continuous operation. Please acknowledge that Evoqua's standard minimum ABMA B-10 bearing life of 200,000 hours is sufficient for this application.

Response: The L-10 life shall be minimum 200,000 hours.

53. Questions: Section 11700.2.05.A - This section mentions a "countershaft". Please clarify what this item is in reference to the clarifier mechanism.

Response: The countershaft is referring to the driveshaft.

54. Questions: Section 11700.2.12.A - This section specifies that the bridge must be designed for a "live load of 100 pounds per square foot". Since the industry standard for clarifier bridge design is a width of 36", a 42" wide bridge will already be a reinforced design. Adding a live load requirement of 100 pounds per square foot will create an unnecessarily conservative design and will add additional material cost to the project. Please approve of a 42" wide bridge designed for a live load of 50 pounds per square foot.

Response: See response to Question 4 for dimension and clearance requirements. Live load for bridge will be reduced to 60 psf on Drawing Sheet 43.

55. Question: In Section 11313 1.02 F., change from "...meeting the requirements of NSF-61." to "...meeting the requirements of NSF-61 and be NSF-61 listed."

Response: No update to this specification section will be made as related to this question.

56. Question: In Section 11313 1.03 A., consider changing "One ultimate strength test shall be performed for each 100 feet of chain provided." As written, it will require we destroy (and not ship) every tenth strand of chain, and this material cost will be included in the price to the customer. Consider changing this to one ultimate strength test for the whole run, or acceptance of Evoqua's previously performed test data.

Response: No update to the specification will be made for this Addendum as testing is not required to be done in the field.

57. Question: In Section 11313 2.02 E. 1., please add "FRP shafts shall not be acceptable."

Response: No update to this specification section will be made as related to this question

58. Question: In Section 11313 2.06 A., delete "and chain rim saver type". This is only available for NCS720NX molded chain projects. Loop™ chain does not have curved side bars to accommodate sprocket rims.

Response: Section 11313 2.06A shall be revised to say "Compatible with chain material."

59. Question: Please delete Section 11313 2.11 C. For FRP return tracks, normal practice is to ship full length angles for field cutting and drilling. This is believed to be more overall efficient than field surveying and shop tag identification of each piece of FRP track.

Response: FRP return track angles can be shipped to the field in standard lengths for cutting and drilling in the field as required.

60. Question: Section 11313 2.03.D lists flights are to be 3" x 8", and Section 2.03.J.3 states the EI value should be $12.14 \times 10^6 \text{ lb-in}^2$. In our experience these will not be sufficient for tanks of this width. We propose 3.5" x 8" flights with a minimum EI value of $2.47 \times 10^7 \text{ lb-in}^2$ to ensure the flights do not have an extreme bow in them, which could lead to attachment link failure. Will a change to the specification be considered to make all manufacturers abide to this EI value?

Response: The scraper flights must be designed and sized as to meet the requirements for Maximum Deflection specified.

61. Question: Section 11313 2.04 calls for Polymeric type loop chain or 316 stainless steel chain. Will NCS-720-S type chain be permitted? Polychem NCS-720-S collector chain has a working load of 3100 lbs and an average ultimate strength of over 7000lbs. We believe these will be much more than sufficient for these tanks.

Response: The chains must meet the strength and technical requirements listed within the spec.

62. Question: Section 11313 2.06 states chain sprockets shall be manufactured of Polyurethane. Will Cast Nylon also be acceptable? We cannot procure polyurethane and our Cast Nylon 6 sprockets are much harder than Polyurethane. (Hardness measured on Rockwell hardness scale in lieu of Shore D.)

Response: Cast Nylon with a Rockwell hardness of R110 is acceptable.

63. Question: Section 11313 2.07 states flight wearing shoes shall be manufactured from UHMW-PE. Will Nylon 6-6 material also be acceptable? Polychem's Nylon 6-6 wear shoes have a hardness of R110 and a minimum tensile strength of 11,800 psi.

Response: Nylon 6-6 material with minimum hardness of 80/85 Shore "A" is acceptable.

64. Question: Section 11313 2.10 calls for wall brackets made from polypropylene or fiberglass. Will glass reinforced nylon material also be acceptable?

Response: Nylon 6-6, minimum 3/8-inch construction is acceptable.

65. Question: Section 11313 2.13 calls for a metallic type stub shaft. Will non-metallic type stub shafts made of Cast Nylon also be acceptable?

Response: Cast Nylon-6 is acceptable.

66. Question: Section 11313 2.02E.2 Can head shafts be 403 stainless steel?

Response: The head shafts can be 403 stainless steel provided that it meets the required design criteria of the equipment.

67. Question: Section 11313 2.04A Can flight chains be 403 stainless steel?

Response: The flight chains can be 403 stainless steel provided that it meets the required design criteria of the equipment and does not increase the motor size.

68. Question: Section 11313 2.04B add "or 403 stainless steel chain shall have an average weight of 3.7 pounds per foot"

Response: "or 403 stainless steel chain shall have an average weight of 3.7 pounds per foot" shall be added end of sentence in Section 11313 2.04B.

69. Question: Section 11313 2.06E.2.C Can the drive sprocket body be made of Nylon?

Response: No.

70. Question: Section 11313 2.09A.1 Is a nylon sleeve acceptable?

Response: Yes, a nylon sleeve is acceptable.

71. Question: Section 11313 2.10A Is HDG steel or stainless steel wall bracket acceptable?

Response: No.

72. Question: Section 11313 2.11A Suggest having return bracket supports every 8 feet instead of 10 feet.

Response: Brackets shall be placed as required for the Manufacturer to guarantee performance. Brackets shall not be spaced more than 10 feet apart.

73. Question: Section 11313 2.11C Add “Additionally, the FRP return track angles can be shipped to the field in standard lengths for cutting and drilling in the field as required”

Response: FRP return track angles can be shipped to the field in standard lengths for cutting and drilling in the field as required.

74. Question: Section 11313 2.13A Can the wall bracket be cast nylon or fabricated stainless steel?

Response: Cast Nylon-6 is acceptable.

75. Question: Section 11313 2.17E.4.b.ii Add “Alternately, a drive and driven sprocket with drive chain arrangement shall be used to drive the screw cross collector. Materials for these components shall be as specified for the chain and flight collectors and sized as required for this application. Calculations shall be submitted with the approvals.”

Response: No update to this specification section will be made as related to this question

76. Question: Section 11313 2.17E.13 Is a helical type Drive Unit Speed Reducer acceptable?

Response: It is acceptable provided it meets the minimum efficiency.

ITEM #2 - ADDITIONAL REVISIONS OUTSIDE OF CONTRACTOR QUESTIONS

1.

There is a typo in Section 00500-2 4.1.2.1.

4.1.2.1 Cash Allowance for Field and Laboratory Testing:

Forty Thousand Dollars and No Cents \$50,000

TO BE REPLACED WITH:

4.1.2.1 Cash Allowance for Field and Laboratory Testing:

Fifty Thousand Dollars and No Cents \$50,000

2.

Drawing C-07 (Sheet 13) shows a temporary 18" diversion line for backwash from the manhole to the Washwater Holding Basin.

Specification Section 01011-5 1.05 I specifies a temporary 24" HDPE line.

The temporary diversion line from the manhole to the Washwater Holding Basin shall be a 24" HDPE.

3.

Specification Section 01510-1 1.03 A1 states that "Costs for water and electricity may be paid by Owner".

All temporary utilities are to be paid for by the Contractor.

4.

ALL buried DIP (in addition to DIP water lines) shall be wrapped in Polyethylene. This should be done in accordance with Specification Section 02616 – Polyethylene Encasement of Ductile Iron Pipe.

5.

Please see revised Drawing Sheets 72 and 73 for Sludge Loading Platform. The conveyor length has been reduced and there are now a total of six (6) chutes, of which five (5) are for the electrically actuated belt plows and the sixth is for the emergency chute.

Replace Section 14500-2.01C with

"The Loadout Conveyor shall cleanly accept loading from the existing belt conveyor for discharge to truck chutes by means of five (5) electrically operated belt plows and one (1) emergency chute furnished with the Loadout Conveyor. The Conveyor shall be supported from the sludge loading platform"

6.

See revised Drawing Sheet 62 for "Existing Slab Opening Repair" detail added to plans.

7.

See revised Drawing Sheet 46 for excavation requirements recommended by geotechnical engineer at thickener.

8.

Replace the following to note D.2 on Sheet 33:

“UNLESS NOTED OTHERWISE, ALL CONCRETE SHALL BE NORMAL WEIGHT AND HAVE A THE FOLLOWING MINIMUM 28 DAY STRENGTHS:

TYPICAL, UNO	4500 PSI
CONCRETE EQUIPMENT PADS	4000 PSI
CONCRETE FILL	3500 PSI
PIPE ENCASEMENT*	3500 PSI
DUCT BANK	3500 PSI
PAVEMENT, CURB AND SIDEWALK	3500 PSI

*NOT CAST MONOLITHICALLY WITH CONCRETE BASE MATS OR SLABS”

With:

“UNLESS NOTED OTHERWISE, ALL CONCRETE SHALL BE NORMAL WEIGHT AND HAVE A THE FOLLOWING MINIMUM 28 DAY STRENGTHS:

TYPICAL, UNO	4500 PSI
CONCRETE EQUIPMENT PADS	4000 PSI
CONCRETE FILL	4500 PSI
PIPE ENCASEMENT*	3500 PSI
DUCT BANK	3500 PSI
PAVEMENT, CURB AND SIDEWALK	4000 PSI
GROUT TOPPING	4500 PSI

*NOT CAST MONOLITHICALLY WITH CONCRETE BASE MATS OR SLABS”

9.

See revised Drawing Sheets 37 and 42 for the following changes:

- Added sections cuts N and P to the enlarged bottom plan.
- Added sections N and P to sheet 42.

10.

See revised Drawing Sheets 43 through 46 for the following changes:

- Thickener stair foundation requirements added to the plan.
- Bridge live loading reduced to 60 psf.
- Revised torque loading at concrete pier.
- Revised sump to concentric sump on plans and section D on Sheet 46.

- Provided minimum over-excavation requirement at thickener as recommended by geotechnical engineer.

11.

See revised Drawing Sheets 50 through 54 for the following changes:

- Assumed truck scale loading added to plans.
- Limits of existing railing to be demolished and limits of new railing at Sludge Loading Platform has been shown on plans.
- Revised slab opening locations at Sludge Loading Platform shown on plans.
- Dowel requirements for new Sludge Loading Platform to existing Sludge Loading Platform is now shown on plans and details.

12.

Replace specification Section 03310, Cast-in-Place Concrete with the one attached herein. The following changes were made:

- Paragraph D was added to article 1.01.
- Paragraphs I and J were added to article 1.03.
- Paragraph R was added to article 1.05.
- Paragraph F in article 2.08 was replaced. Subparagraphs 1 through 5 were added.
- Air Content table in 2.08,G,2 was revised to include air content based on exposure categories F1, F2 and F3.
- Paragraph F was added to article 2.12.
- Paragraph I was added to article 3.08.
- Article 3.09 was revised.
- Paragraph D in article 3.10 was revised.
- Subparagraph B,1 in article 3.14 was revised.

13.

Add specification Section 03700, Mass Concrete.

Note, as defined in the document, mass concrete applies to concrete sections shown on the drawings with a minimum specified dimension that is equal to or greater than 30 inches. The following components are examples requiring mass concrete:

- Concrete fill shown in Sections A and C on drawing S-16.

Pedestal supporting center shaft of thickener mechanism as shown in Section D on drawing S-34.

14.

In specification Section 05095:

Change the following in 1.03,B:

“1. WPQs.

a. Concrete and Masonry Anchors:

- 1) Manufacturer's product description and installation instructions.
- 2) Current ICC-ES or IAPMO-UES Report for each type of post-installed anchor to be used.
- 3) Adhesive Anchor Installer Certification."

To:

"1. Concrete and Masonry Anchors:

- b. Manufacturer's product description and installation instructions.
- c. Current ICC-ES or IAPMO-UES Report for each type of post-installed anchor to be used.
- d. Adhesive Anchor Installer Certification."

Change: "3.03 Fastener Application" to "3.04 Fastener Application".

15.

In specification Section 05500, Add:

"2.11 Roof Hatch

- A. Style: Double Leaf.
- B. Load Capacity: 40 psf with maximum deflection of 1/150th of span.
- C. Frame Opening Size: Equal to rough opening size as indicated on the Drawings.
- D. Component Fabrication:
 1. Covers and Frame: 11 gauge minimum aluminum angle frame with insulation, with concrete anchors and with integral neoprene gasket strip.
 2. Curb: 12 inches in height with integral capflashing and fully welded corners.
 3. Gasket: Extruded EPDM rubber gasket permanently adhered to cover
- E. Door Hardware:

1. Material: Stainless steel, AISI Type 316, unless otherwise specified.
 2. Hinges: Heavy-duty stainless steel AISI Type 316 tamper-proof hinges.
 3. Lifting Mechanism: Stainless steel compression lift springs enclosed in telescoping vertical housing or stainless steel torsion lift springs.
 4. Latch: Enclosed two point spring latch with interior and exterior turn handles and padlock hasps.
 5. Hold-Open Arm: Locks automatically in open position. Door can be easily closed with one hand using grip handle release.
- F. Aluminum: Mill finished with electrolytic protective coating applied to surfaces to be in contact with concrete.
- G. Warranty: Provide for correction, or at option of Owner, removal and replacement of roof hatch found defective during a period of 5 years after date of Substantial Completion.
- H. Manufacturers and Products:
1. Bilco Co., New Haven, CT; Type D.
 2. Nystrom Products Co., Brooklyn Park, MN; RHE-D Series.”

16.

Add the following note to Sheet 36:

- “7. CLEAN RECESSED AREA AT EACH EXISTING FLOOR MOUNTED PRESSURE RELIEF VALVE. CLEAN AND SERVICE EACH EXISTING PRESSURE RELIEF VALVE IN ACCORDANCE WITH MANUFACTURER’S MAINTENANCE INSTRUCTIONS. VERIFY VALVE IS NEENAH R-5000, TYPE C. REPLACE SEALS AS NEEDED. FOR BIDDING, REPLACE 10 SEALS.”

17.

Revised Table of Contents is provided to identify all specs with revisions. Not all specs have been reissued. See responses to questions for revisions made to specs that have not been reissued as an attachment to this addendum.

ATTACHMENTS TO ADDENDUM NO. 1

ITEM 1 – ATTACHMENT A

ITEM 1 – ATTACHMENT B

REVISED SECTION 00010 - TABLE OF CONTENTS

REVISED SECTION 03310 - CAST-IN-PLACE CONCRETE

SECTION 03700 – MASS CONCRETE

REVISED DRAWINGS

(SHEET NO. 37, 42-46, 50-54, 62, 67-69, 72, 73)

ITEM 1 – ATTACHMENT A

Division 3**Contract Forms****Section 1: Agreement Form****4.3 ENGINEER'S Personnel at Construction Site**

4.3.1 If a Task Order includes the presence of engineer's personnel at a construction site, unless otherwise provided in the Task Order, the ENGINEER shall not be responsible for construction means, methods, techniques, sequences, and procedures nor shall ENGINEER be responsible for the performance of the OWNER or any contractor. Nothing herein, however, shall in any manner whatsoever relieve, discharge, release or excuse the performance by ENGINEER of any of its duties or responsibilities as set forth in this Agreement.

4.3.2 If a Task Order includes the presence of engineer's personnel at a construction site, and unless otherwise provided in a Task Order, ENGINEER and ENGINEER'S personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions, and have no duty for inspecting, noting, observing, correcting, or reporting on health or safety deficiencies of the construction contractor(s) or other entity or any other persons at the site except ENGINEER'S own personnel. However, if ENGINEER'S personnel observe any deficiencies in the performance of the Work, or health or safety deficiencies, they shall promptly report same to OWNER in writing.

4.3.3 If a Task Order includes the presence of engineer's personnel at a construction site, and unless otherwise provided in a Task Order, the presence of ENGINEER'S personnel at a construction site is for the purpose of carefully inspecting the work of any contractor as described in any particular task order. If, however, in the opinion of ENGINEER, more frequent inspections are required to protect OWNER'S interest, ENGINEER shall so notify OWNER in writing, and OWNER may elect to require ENGINEER to make more frequent Project inspections for which ENGINEER shall be compensated on the basis of COST REIMBURSABLE-PER DIEM (TIME AND EXPENSE) as set forth in Exhibit "B." It is expressly agreed that the inspections required by this paragraph are in addition to any and all other inspections which may be required elsewhere in this Agreement or in any Task Order. The purpose of the inspections required herein is to determine the quality, quantity and progress of the work in comparison with the requirements of the applicable construction contract. In making such inspections, ENGINEER shall exercise care to protect OWNER from defects and deficiencies in the work, from unexcused delays in the schedule, and from overpayment to the contractor. Following each such inspection, ENGINEER shall submit a written report of same, together with any appropriate comments or recommendations, to OWNER.

Division 3**Contract Forms****Section 1: Agreement Form**

For this AGREEMENT only, construction sites include places of manufacture for materials incorporated into the construction work, and construction contractors include manufacturers of materials incorporated into the construction work.

4.4 Opinions of Cost, Financial Considerations, and Schedules

In providing opinions of cost, financial analyses, economic feasibility projections, and schedules for the PROJECT, ENGINEER has no control over cost or price of labor and materials; unknown or latent conditions of existing equipment or structures that may affect operation or maintenance costs; competitive bidding procedures and market conditions; time or quality of performance by operating personnel or third parties; and other economic and operational factors that may materially affect the ultimate PROJECT cost or schedule. Therefore, ENGINEER makes no warranty that OWNER'S actual PROJECT costs, financial aspects, economic feasibility, or schedules will not vary from ENGINEER'S opinions, analyses, projections, or estimates. ENGINEER shall, however, use its best professional care and skill in preparing any such opinions, analyses, projections or estimates. If OWNER wishes greater assurance as to any element of PROJECT cost, feasibility, or schedule, OWNER will employ an independent cost estimator, contractor, or other appropriate advisor.

4.5 Construction Progress Payments

If a Task Order includes obligations by the engineer to provide recommendations for periodic payments, and unless otherwise provided in a Task Order, recommendations by ENGINEER to OWNER for periodic construction progress payments to the construction contractor(s) will be based upon inspections of the work as required hereinabove, evaluation of the contractor's rate of progress in light of the remaining contract time, and upon evaluations of the contractor's Applications for Payment. Recommendations by ENGINEER for payment shall furthermore constitute a representation by ENGINEER to OWNER that ENGINEER has made an inspection of the work as provided in paragraph 4.3.3 of this Agreement, that the work has progressed to the level indicated, that the quality of the work meets or exceeds the requirements of the applicable construction contract, and that, to the best of the knowledge, information and informed belief of ENGINEER, the contractor is entitled to payment of the amount approved.

4.6 Additional Contract Administration Duties of Engineer

In addition to the duties and responsibilities set forth hereinabove, in the event any Task Order requires ENGINEER to perform contract administration services, such services shall include, but shall not be limited to, the following:

(a) ENGINEER shall reject work which does not conform to the contract documents unless directed by OWNER, in writing, not to do so. Whenever, in ENGINEER'S opinion, it is necessary or advisable, ENGINEER shall require special inspection or testing of the

Division 3**Contract Forms****Section 1: Agreement Form**

work in accordance with the provisions of the contract documents whether or not such work is fabricated, installed or completed;

(b) ENGINEER shall review and approve, or take such other appropriate action, upon the contractor's submittals such as shop drawings, product data and samples. Approval by ENGINEER of the contractor's submittal shall constitute ENGINEER'S representation to OWNER that such submittal is in conformance with all requirements of the contract documents. Such action shall be taken with reasonable promptness so as to cause no delay to the contractor or the Project;

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Section 1: Agreement Form

(c) ENGINEER shall review, and advise OWNER concerning, proposals and requests for change orders from the contractor. ENGINEER shall prepare change orders for OWNER'S approval and execution in accordance with the construction contract, and shall have authority to order, by field order, minor changes in the work not involving an adjustment in the contract price or an extension of the contract time;

(d) ENGINEER shall conduct inspections to determine the dates of substantial completion and final completion, shall receive and forward to OWNER for OWNER'S review all written warranties and related documents required by the construction contract and assembled by the contractor, and shall, when appropriate, issue a final certificate for payment;

(e) ENGINEER shall, without additional compensation, promptly correct any errors, omissions, deficiencies or conflicts in ENGINEER'S work product.

ITEM 1 – ATTACHMENT B

At least 30 days before the date established for each progress payment (but not more than once each month), Contractor shall submit to Owner and Engineer for review an Application for Payment filled out and signed by Contractor covering Work completed as of the date of the Application and accompanied by such supporting documentation as required by the Contract Documents or as may be otherwise specified by Owner or Engineer. In its Application for Payment, Contractor may request payment for 90 percent of that portion of the Contract Price properly applicable to Contract requirements properly provided, labor, materials and equipment properly incorporated in the Work, plus 90 percent of that portion of the Contract Price properly allocable to materials or equipment properly stored on-site (or elsewhere if approved in advance in writing by Owner) for subsequent incorporation in the Work, less the total amount of previous

payments received from Owner. Payment for stored materials and equipment shall be conditioned upon proof of appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner. Each Application for Payment shall constitute Contractor's representation that the Work has progressed to the level for which payment is requested in accordance with the schedule of values, that the Work has been properly installed or performed in full accordance with the requirements of the Contract Documents, and the Contractor knows of no reason why payment should not be made as requested. Thereafter the Engineer shall review the Application for Payment and may also review the Work at the Project site or elsewhere to determine the quantity and quality of the Work as represented in the Application for Payment and as required by the Contract Documents. Engineer shall determine and recommend to Owner the amount owing to Contractor. Owner shall make partial payments on account of the Contract Price to Contractor within 30 days following Owner's receipt of each Application for Payment with Engineer's approval. The amount of each partial payment shall be in the amount recommended by Engineer less such amounts, if any, otherwise owing by Contractor to Owner or which Owner shall have the right to withhold as authorized by this Agreement. Any recommendation by Engineer for payment to Contractor shall not preclude Owner from the exercise of any of its rights as set forth in this Agreement. Provided, however, that when 50 percent of the contract value, including Change Orders and other additions to the contract value, provided for by the Contract Documents is due, and the manner of completion of the Contract Work and its progress are reasonably satisfactory to Owner, Owner shall withhold no more retainage. At the discretion of Owner, and with the approval of Contractor, the retainage of any Subcontractor may be released separately as the Subcontractor completes its work. If after discontinuing the retainage, Owner determines that the Work is unsatisfactory or Contractor has fallen behind schedule, Owner may resume retainage at the rate set forth hereinabove. Retainage shall be invested at the current market rate and any interest earned on the retained amounts shall be paid to Contractor upon completion of the Project within the time specified and for the Contract Price as same may have been amended by Change Order. For purposes of this Agreement, the terms and conditions of O.C.G.A. § 13-11 are herein incorporated by reference and shall take precedence over, and shall control, any other terms or conditions in the Contract Documents.

SC-15.01 D. Paragraph 15.01 D. of the General Conditions is amended by the deletion of the phrase "Ten days" and the substitution in lieu thereof of the phrase "Thirty days". Additionally, the following provision is added to said Paragraph and shall state as follows:

Within three days of receipt of payment from Owner, Contractor shall pay all Subcontractors and Suppliers whose work or products was included in the partial payment. If Owner fails to make any payment as provided herein, or as required elsewhere in the Contract Documents, interest shall accrue on any such payment, to the extent it is late, at the rate of 6 percent per annum.

SC-15.01 E. Paragraph 15.01 E. of the General Conditions is amended by the addition of the subparagraph 4. Thereto which shall state as follows:

In addition to the right to reduce or withhold payment as set forth hereinabove, Owner may furthermore demand return of some or all of the amounts previously paid to Contractor in order to protect Owner from the risk of loss arising from any of the items set forth in this Paragraph 15.01 E. In the event Owner makes demand upon Contractor for the return of any such amounts, Contractor shall promptly comply with such demand.

REVISED SECTION 00010 - TABLE OF CONTENTS

**Hooper WPP Technical Specifications
Reissued – Addendum No. 1**

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00100	Instructions to Proposers
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00480	Statement of Non-Collusion
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REVISED SECTION 03310 - CAST-IN-PLACE CONCRETE

Part 1 General

1.01 Scope

- A. Furnish and install cast-in-place concrete including formwork, reinforcing, mix design, accessories, placement procedures and finishes as shown on Drawings and as specified.
- B. Furnish labor, materials, equipment and incidentals necessary to fabricate and install cast-in-place concrete and complete the Work.
- C. Specification ACI 301 shall apply except as amended herein.
- D. Mass Concrete: For additional requirements of cast-in-place concrete, refer to Section 03700, Mass Concrete.

1.02 References

- A. The following is a list of standards which may be referenced in this section:
 - 1. American Concrete Institute (ACI):
 - a. 117, Specifications for Tolerances for Concrete Construction and Materials.
 - b. 301, Specifications for Structural Concrete.
 - c. 305.1, Specification for Hot Weather Concreting.
 - d. 306.1, Specification for Cold Weather Concreting.
 - e. 308.1, Specification for Curing Concrete.
 - f. 315, Details and Detailing of Concrete Reinforcement.
 - g. 347, "Guide to Formwork for Concrete".
 - h. 350.1, Specification for Tightness Testing of Environmental Engineering Concrete Containment Structures.
 - i. SP-66, Detailing Manual.
 - 2. American Society for Testing and Materials International (ASTM):
 - a. A185, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - b. A497, Standard Specification for Steel Welded Reinforcement, Deformed, for Concrete.
 - c. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

- d. A1064, Standard Specification for Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
- e. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- f. C33, Standard Specification for Concrete Aggregates.
- g. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- h. C94, Standard Specification for Ready-Mixed Concrete.
- i. C143, Standard Test Method for Slump of Hydraulic-Cement Concrete.
- j. C150, Standard Specification for Portland Cement.
- k. C171, Standard Specification for Sheet Materials for Curing Concrete.
- l. C172, Standard Practice for Sampling Freshly Mixed Concrete.
- m. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- n. C260, Standard Specification for Air-Entraining Admixtures for Concrete.
- o. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- p. C494, Standard Specification for Chemical Admixtures for Concrete.
- q. C567, Standard Test Method for Determining Density of Structural Lightweight Concrete.
- r. C595, Standard Specification for Blended Hydraulic Cements.
- s. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- t. C881, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- u. C920, Specification for Elastomeric Joint Sealants.
- v. C939, Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
- w. C989, Standard Specification for Slag Cement for Use in Concrete and Mortars.
- x. C1012, Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution.
- y. C1017, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

- z. C1064, Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
- aa. C1077, Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
- bb. C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- cc. C1116, Standard Specification for Fiber-Reinforced Concrete.
- dd. C1218, Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
- ee. C1260, Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).
- ff. C1293, Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction.
- gg. C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- hh. C1567, Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).
- ii. C1602, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
- jj. C1611, Standard Test Method for Slump Flow of Self-Consolidating Concrete.
- kk. D226, Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- ll. D227, Specification for Coal-Tar Saturated Organic Felt Used in Roofing and Waterproofing.
- mm. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
- nn. D1056, Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.
- oo. D1751, Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- pp. D1752, Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- qq. D2240, Standard Test Method for Rubber Property – Durometer Hardness.

- rr. E329, Standard Specification for Agencies Engaged in Construction Inspection, Special Inspection, or Testing Materials Used in Construction.
- 3. Concrete Reinforcing Steel Institute (CRSI):
 - a. Manual of Standard Practice.
 - b. Recommended Practice for Placing Reinforcing Bars.
- 4. Corps of Engineers (COE): CRD-C-572, Corps of Engineers Specifications for Polyvinylchloride Waterstop.
- 5. National Ready Mixed Concrete Association (NRMCA).

1.03 Definitions

- A. Cold Weather: When ambient temperature is below 40 degrees F or is approaching 40 degrees F and falling.
- B. Contractor's Licensed Design Engineer: Individual representing Contractor who is licensed to practice engineering as defined by statutory requirements of professional licensing laws in state or jurisdiction in which Project is to be constructed.
- C. Defective Area: Surface defects that include honeycomb, rock pockets, indentations, and surface voids greater than 3/16-inch deep, surface voids greater than 3/4 inch in diameter, cracks in liquid containment structures and below grade habitable spaces that are 0.005-inch wide and wider, and cracks in other structures that are 0.010-inch wide and wider, spalls, chips, embedded debris, sand streaks, mortar leakage from form joints, deviations in formed surface that exceed specified tolerances and include but are not limited to fins, form pop-outs, and other projections. At exposed concrete, defective areas also include texture irregularities, stains, and other color variations that cannot be removed by cleaning.
- D. Exposed Concrete: Concrete surface that can be seen inside or outside of structure regardless of whether concrete is above water, dry at all times, or can be seen when structure is drained.
- E. Hot Weather: As defined in ACI 305.1.
- F. Hydraulic Structure: Liquid containment structure.
- G. New Concrete: Concrete less than 60 days old.
- H. Top Bars: Horizontal bars placed such that 12 inches of fresh concrete is cast below in single placement.
- I. Exposure P2 (W2): Permeability classification for concrete in addition to the ones established by ACI 301 in order to meet the requirements of the ACI 350-06, Code Requirements for Environmental Engineering Concrete Structures. The following requirements apply:
 - 1. Maximum water-to-cementitious material ratio (W/Cm) in concrete mix design: 0.45.

2. Minimum 28-day compressive strength of concrete: 4,500 psi.
 3. Minimum cementitious materials content in mix design shall be as follows:
 - a. 515 pounds per cubic yard for concrete with 1 1/2-inch nominal maximum size aggregate.
 - b. 535 pounds per cubic yard for concrete with 1-inch nominal maximum size aggregate.
 - c. 560 pounds per cubic yard for concrete with 3/4-inch nominal maximum size aggregate.
 - d. 580 pounds per cubic yard for concrete with 1/2-inch nominal maximum size aggregate.
 - e. 600 pounds per cubic yard for concrete with 3/8-inch nominal maximum size aggregate.
- J. Slurry Mixture: Mixture of sand, 3/8 inch maximum nominal aggregate size, cement, and water for wall construction joints with waterstop.

1.04 Design Requirements

- A. Design formwork to provide specified concrete finishes.

1.05 Submittals

- A. Product Data: for proprietary materials and items, including steel reinforcement, forming accessories, admixtures, patching compounds, joint systems, and curing compounds.
- B. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315 "Details and Detailing of Concrete Reinforcement." Include material grade, bar schedules, bent bar diagrams, arrangement, and supports of concrete reinforcement.
- C. Concrete Mix Designs: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 1. Contain proportions of materials and admixtures to be used on Project, signed by mix designer.
 2. Documentation of average strength for each proposed mix design in accordance with ACI 301.
 3. Manufacturer's Certificate of Compliance for the following:
 - a. Portland cement.
 - b. Fly ash.
 - c. Slag cement.
 - d. Aggregates, including specified class designation for coarse aggregate.
 - e. Admixtures.

- f. Concrete producer has verified compatibility of constituent materials in design mix.
4. Test Reports:
- a. Cement: Chemical analysis report.
 - b. Supplementary Cementitious Materials: Chemical analysis report and report of other specified test analyses.
 - c. Water-Soluble Chloride-Ion Content in Hardened Concrete: Unless otherwise permitted, in accordance with ASTM C1218/C1218M at an age between 28 days and 42 days.
5. Aggregates:
- a. Percent of fine aggregate weight to total aggregate weight.
 - b. Deleterious substances in fine aggregate per ASTM C33/C33M, Table 2.
 - c. Deleterious substances in coarse aggregate per ASTM C33/C33M, Table 4.
 - d. Test Reports:
 - 1) Alkali Aggregate Reactivity: Aggregate shall be classified as nonpotentially reactive in accordance with Article Concrete Mix Design. Include documentation of test results per applicable standards.
 - 2) Admixtures: Manufacturer's product data sheets for each admixture used in proposed mix designs.
6. Admixtures:
- a. Provide certification from admixture manufacturers that chloride content complies with specification requirements. Material certification shall be signed by the manufacturer.
 - b. Manufacturer's product data sheets for each admixture used in proposed mix designs.
- D. Formwork Shop Drawings: Prepared in accordance with ACI 347 by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.
- 1. Unless otherwise specified, conform to requirements of ACI 301.
- E. Layout drawings for wall control joints, wall weakened plane joints, and wall expansion joints.
- F. Waterstop: Details of splices, method of securing and supporting waterstop in forms to maintain proper orientation and location during concrete placement.
- G. Samples: PVC waterstop splice, joint, and fabricated cross of each size, shape, and fitting of waterstop.

- H. Letter stating compatibility between liquids being contained and materials used for waterstops and joint fillers.
- I. Detailed plan for curing and protection of concrete placed and cured in cold weather. Details shall include, but not be limited to, the following:
 - 1. Procedures for protecting subgrade from frost and accumulation of ice or snow on reinforcement, other metallic embeds, and forms prior to placement.
 - 2. Procedures for measuring and recording temperatures of reinforcement and other embedded items prior to concrete placement.
 - 3. Methods for temperature protection during placement.
 - 4. Types of covering, insulation, housing, or heating to be provided.
 - 5. Curing methods to be used during and following protection period.
 - 6. Use of strength accelerating admixtures.
 - 7. Methods for verification of in-place strength.
 - 8. Documentation of embeds that must be at a temperature above freezing prior to placement of concrete.
 - 9. Procedures for measuring and recording concrete temperatures.
 - 10. Procedures for preventing drying during dry, windy conditions.
- J. Detailed plan for hot weather placements including curing and protection for concrete placed in ambient temperatures over 80 degrees F. Plan shall include, but not be limited to, the following:
 - 1. Procedures for measuring, and recording temperatures of reinforcement and other embedded items prior to concrete placement.
 - 2. Use of retarding admixture.
 - 3. Methods for controlling temperature of reinforcement and other embedded items and concrete materials before and during placement.
 - 4. Types of shading and wind protection to be provided.
 - 5. Curing methods, including use of evaporation retardant.
 - 6. Procedures for measuring and recording concrete temperatures.
 - 7. Procedures for preventing drying during dry, windy conditions.
- K. Concrete repair techniques.
- L. Preinstallation Conference minutes.
- M. Manufacturer's application instructions for bonding agent and bond breaker.

- N. Manufacturer's Certificate of Compliance to specified standards:
 - 1. Bonding agent.
 - 2. Bond breaker.
 - 3. Repair materials.
- O. Statement of Qualification:
 - 1. Batch Plant: Certification as specified herein.
 - 2. Mix designer.
 - 3. Installer.
 - 4. Mix designer.
 - 5. Testing agency.
- P. Manufacturer's written instructions for product shipment, storage, handling, installation/application, and repair for:
 - 1. Waterstop.
 - 2. Joint filler and primer.
 - 3. Prefomed control joint.
 - 4. Field Test Reports: Tightness test results.
- Q. Concrete Delivery Tickets:
 - 1. For each batch of concrete before unloading at Site.
 - 2. In accordance with ASTM C94/C94M, including requirements 14.2.1. through 14.2.10.
 - 3. Indicate amount of mixing water withheld and maximum amount that may be permitted to be added at Site.
- R. Mass Concrete: For additional submittal requirements, refer to Section 03700, Mass Concrete.

1.06 Quality Assurance

- A. Batch Plant: NRMCA Program for Certification of Ready-Mixed Concrete Production Facilities or approved equivalent program.
- B. Mix Designer: Person responsible for developing concrete mixture proportions certified as NRMCA Concrete Technologist Level 2 or DOT certified mix designer in jurisdiction of the Work. Requirement may be waived if individual is Contractor's Licensed Design Engineer.

- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated. A testing agency will be provided by the Owner to perform material evaluation tests.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technicians, Grade 1, according to ACI CP-1 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Materials and installed work may require testing and re-testing at any time during progress of Work. Tests, including re-testing of rejected materials for installed Work, shall be done at Contractor's expense.
- E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- F. Preinstallation Conference:
1. Required Meeting Attendees:
 - a. Contractor, including pumping, placing and finishing, and curing subcontractors.
 - b. Ready-mix producer.
 - c. Admixture representative.
 - d. Testing and sampling personnel.
 - e. Engineer who authored Statement of Special Inspection Plan or Engineer's designee.
 2. Schedule and conduct prior to incorporation of respective products into Project. Notify Engineer of location and time.
 3. Agenda shall include:
 - a. Admixture types, dosage, performance, and redosing at Site.
 - b. Mix designs, test of mixes, and Submittals.
 - c. Placement methods, techniques, equipment, consolidation, and form pressures.
 - d. Slump or slump flow and placement time to maintain slump and slump flow.
 - e. Finish, curing, and water retention.
 - f. Protection procedures for weather conditions.

g. Other specified requirements requiring coordination.

4. Conference minutes.

1.07 Delivery, Storage And Handling

A. Preparation for Shipment:

1. Package and clearly tag parts and assemblies that are of necessity shipped unassembled in a manner that will protect materials from damage and facilitate identification and final assembly in field.
2. Insofar as is practical, factory assemble items provided hereunder.

B. Storage and Handling:

1. In accordance with manufacturer's recommendations and in such a manner as to prevent damage of any kind, including overexposure to sunlight.
2. Unload, store, and handle bars in accordance with CRSI publication "Placing Reinforcing Bars."

Part 2 Products

2.01 Form Facing Materials

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Exterior grade plywood panels, suitable for concrete forms, complying with DOC PS1, and follows:
 - a. Structural 1, B-B, or better, mill oiled, and edge sealed.

B. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Formulate form release agent with rust inhibitor for steel form-facing materials.

C. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to resist lateral pressure of fresh concrete on forms, to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no corrodible metal closer than 1.5-inch to the plane of the exposed concrete surface.

1. Provide ties that, when removed, will leave holes not larger than 1-inch in diameter in the concrete surface.
2. Provide one of the following:

- a. Integral steel waterstop 0.103 inch thick and 0.625 inch diameter tightly and continuously welded to tie.
 - b. Neoprene waterstop 3/16 inch thick and 15/16 inch diameter whose center hole is one half diameter of tie, or molded plastic water stop of comparable size.
3. Orient waterstop perpendicular to tie and symmetrical about center of tie.
 4. Design ties to prevent rotation or disturbance of center portion of tie during removal of ends and to prevent water leaking along tie.

2.02 Steel Reinforcement

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed. Welding of reinforcing bars is not permitted.
- B. Welded Wire Reinforcement: ASTM A1064, plain, cold-drawn steel.

2.03 Reinforcement Accessories

- A. Tie Wire:
 1. Black, soft-annealed 16 gauge wire.
 2. Nylon , epoxy , or plastic-coated wire.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars. Manufacture bar supports according to CRSI's "Manual of Standard Practice" precast concrete or fiber-reinforced concrete of greater compressive strength than concrete.

2.04 Fiber Reinforcement

- A. Micro-Synthetic Fiber Reinforcement:
 1. 100 percent virgin polypropylene self-fibrillating fibers.
 2. Reprocessed olefin materials are not allowed.
 3. Fibrillated bundles to allow uniform distributed angular fibrils (fiber strands) when mixed into concrete.
 4. Multidesign gradation.
 5. Specific Gravity: 0.91 minimum.
 6. Minimum residual strength index of 50 psi.
 7. Type III fibers conforming to ASTM C1116, Part 4.1.3.
 8. Fiber Length: 0.50 inch to 1.0 inch

9. Manufacturers and Products:
 - a. Euclid Chemical Company, Cleveland OH; Fiberstrand F.
 - b. Propex Concrete Systems Corporation, Chattanooga, TN; Fibermesh 300.

2.05 Waterstops

A. Plastic Waterstop:

1. Extruded from elastomeric plastic compound of which basic resin shall be prime virgin polyvinyl chloride (PVC). Compound shall not contain scrapped material, reclaimed material, or pigment.
2. Specific Gravity: Approximately 1.37.
3. Shore Durometer Type A Hardness: Approximately 80.
4. Performance Requirements: COE Specification CRD C 572.
5. Type Required in Contraction and Control Joints: 6 inches wide and parallel longitudinal ribs or protrusions on each side of strip center, as indicated on Drawings.
6. Type Required in Construction Joints: Flat ribbed with same dimensional properties as described above.
7. Corrugated or tapered type waterstops are not acceptable.
8. Thickness: Constant from center bulb (or center of waterstop), to outside stop edge.
9. Waterstop Weight: 1.60 pounds for 3/8 inch by 6 inches, minimum per foot.
10. Factory Fabrications: Use only factory fabrications for intersections, transitions, and changes of direction.
11. Center Bulb Type: Available products subject to compliance with requirements that may be incorporated in the Work include the following:
 - a. Vinylex Corp., Knoxville, TN; Catalog No. 03250/VIN: No. RB6 38H (6 inches by 3/8 inch).
 - b. Greenstreak Plastic Products, St. Louis, MO; Catalog No. 03150/GRD: Style 732 (6 inches by 3/8 inch).
 - c. Four Seasons Industries Durajoint, Garrettsville, OH; Catalog No. CSP 162: Type 9 (6 inches by 3/8 inch).
 - d. BoMetals, Carrollton, GA; Catalog No. RCB-638LB (6 inches by 3/8 inch).
 - e. Dacon Plastics LLC, Portland, OR, (903) 245-0048; Catalog No. RCB17 (6 inches by 3/8 inch).

12. Flat Ribbed Profile: Use same manufacturers as bulb type.

B. Hydrophilic Waterstop:

1. For use at construction joints only, where new concrete is placed against existing concrete and as shown on Drawings.
2. Material shall be a nonbentonite hydrophilic rubber compound.
3. Available products subject to compliance with requirements that may be incorporated in the Work include the following:
 - a. Greenstreak Plastic Products, St. Louis, MO; Hydrotite CJ 1020 2K with Leakmaster LV 1 adhesive and sealant.
 - b. Adeka Ultra Seal, JLM Associates, Spearfish, SD; MC 2010M with 3M 2141 adhesive and P 201 sealant.

2.06 Concrete Materials

A. Portland Cement: ASTM C150, Type II.

1. Use one brand of cement throughout Project.
2. Tricalcium Aluminate Content of Total Cementitious Materials: Maximum 8 percent by weight.
3. Provide documentation of test results in accordance with ASTM C1012/C1012M, for combinations of cementitious materials providing sulfate resistance with expansion less than 0.10 percent at 6 months.

B. Fly Ash: ASTM C618, Type F, with Loss on Ignition of 3 percent maximum per Table 1.

C. Ground Granulated Blast Furnace Slag Cement: ASTM C989, Grade 120.

D. Normal-Weight Aggregates: ASTM C33, uniformly graded. Provide clean aggregates from a single source for exposed concrete, and as follows:

1. General:
 - a. Provide clean aggregates from a single source for exposed concrete.
 - b. Class Designation: 4M, unless otherwise specified.
 - c. Free of materials and aggregate types causing popouts, discoloration, staining, or other defects on surface of concrete.
 - d. Alkali Silica Reactivity: See Article Concrete Mix Design.
2. Coarse Aggregate:
3.
 - a. Natural gravels, combination of gravels and crushed gravels, crushed stone, or combination of these materials containing no more than 15

percent flat or elongated particles (long dimension more than five times the short dimension).

- b. Limit deleterious substances in accordance with ASTM C33/C33M, Table 4 for specified class designation.

4. Fine aggregates:

- a. Clean, sharp, natural sand.
 - 1) Manufactured sand may be used when it is from the same source and extraction location as the coarse aggregate.
- b. ASTM C33/C33M.
- c. Limit deleterious substances in accordance with ASTM C33/C33M, Table 2 and as follows:
 - 1) Limit material finer than 75- μm (No. 200) sieve to 3 percent mass of total sample.
 - 2) Limit coal and lignite to 0.5 percent.

- E. Water: Potable and complying with ASTM C94.

2.07 Admixtures

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C260
- C. Water-Reducing Admixture: ASTM C494, Type A or Type D.
- D. Retarding Admixture: ASTM C494, Type B.
- E. Accelerating Admixture: ASTM C494, Type C.
- F. High-Range, Water-Reducing Admixture: ASTM C494, Type or Type G.

2.08 Concrete Mix Design

- A. General:
 - 1. Prepare design mixtures for each type and strength of concrete, selecting and proportioning ingredients in accordance with requirements of ACI 301, unless otherwise specified.
 - 2. Selection of constituent materials and products in mix design are optional, unless specified otherwise.

3. Unless otherwise permitted, use water-reducing admixture or high-range, water-reducing admixture, or plasticizing admixture in pumped concrete, in concrete with a water-cementitious materials ratio below 0.50, and in concrete that is part of a liquid-containment structure.
 4. Unless otherwise permitted, use water-reducing admixture and high-range, water-reducing admixture, or plasticizing admixture in columns, piers, pilasters, and walls.
 5. Use water-reducing admixture or high-range, water-reducing admixture, or plasticizing admixture to achieve fresh properties that facilitate handling, placing, and consolidating of concrete, and specified hardened properties.
 6. Use water-reducing and retarding admixture when anticipated high temperatures, low humidity, or other adverse placement conditions can adversely affect fresh properties of concrete.
 7. Unless otherwise specified, desired fresh properties of concrete shall be determined by Contractor, and coordinated with concrete producer. Fresh properties of concrete shall remain stable to satisfaction of Contractor, for duration of placement and consolidation, and shall remain in conformance with requirements of Contract Documents.
- B. Potential alkali-aggregate reactivity of concrete:
1. Do not use aggregates known to be susceptible to alkali-carbonate reaction (ACR).
 2. Aggregates shall have been tested to determine potential alkali-aggregate reactivity in concrete in accordance with ASTM C1260/C1260M or ASTM C1567.
 - a. Aggregates that indicate expansion greater than 0.10 percent at 16 days after casting shall not be used unless they have been shown to be nondeleteriously reactive in accordance with ASTM C1293, with less than 0.04 percent expansion at 1 year for cement-aggregate combinations or less than 0.04 percent expansion at 2 years for combinations with pozzolan or slag.
 - b. Alkali content of cement used in proposed concrete mixture shall not be greater than alkali content of cement used in test for potential alkali-aggregate reactivity.
 3. Use low alkali cement and incorporate pozzolans into the concrete mixture as necessary to satisfy testing for potential alkali reactivity.
- C. Proportions:
1. Design mix to meet aesthetic, durability, and strength requirements.
 2. Where fly ash is included in mix, minimum fly ash content shall be a minimum of 15 percent of weight of total cementitious materials.
- D. Slump or Slump Flow:
1. Unless otherwise specified, Contractor shall select a target slump or slump flow at the point of delivery of concrete mixtures for each application.

2. Selected target slump shall not exceed 9 inches.
 3. Selected target slump flow shall not exceed 30 inches.
 4. Concrete shall show no signs of visible segregation.
 5. The target slump or slump flow value shall be enforced for the duration of Project.
 6. Determine the slump by ASTM C143/C143M.
 7. Slump tolerances shall meet the requirements of ACI 117.
 8. Determine slump flow by ASTM C1611/C1611M.
 9. Slump flow tolerances shall meet the requirements of ASTM C94/C94M.
- E. Unless otherwise permitted, provide documentation from concrete tested in accordance with ASTM C1218 at an age between 28 days and 42 days.
- F. Design mixes to provide concrete for all locations with the following properties:
1. For all conditions unless otherwise indicated:

Property:	Limit / Condition
Minimum 28-Day Compressive Strength	4,500 psi
Maximum 28-Day Compressive Strength	6,500 psi
Exposure	F2, S1, P2 (W2), C1
Unit Weight (pounds per cubic foot)	145
Unit Weight Tolerance (pounds per cubic foot)	-3, +5
Maximum Water to Cementitious Material (W/Cm) Ratio	0.42
Air-Entrainment	Refer to Paragraph "Air Entrainment"
Minimum Cementitious Materials (pounds per cubic yard)	515 with 1-1/2 inch aggregate* 535 with 1 inch aggregate* 560 with 3/4 inch aggregate* 580 with 1/2 inch aggregate* 600 with 3/8 inch aggregate*
Maximum Water-Soluble Chloride-Ion Content in Hardened Concrete	0.10
Minimum quantity of fiber reinforcement (pounds per cubic yard)	Not Applicable
*Nominal maximum size aggregate.	

Slurry Mixture for wall construction joints with waterstop shall have similar mix design properties as listed above.

2. For concrete equipment pads, pavement, curbs and sidewalks:

Property:	Limit / Condition
Minimum 28-Day Compressive Strength	4,000 psi
Maximum 28-Day Compressive Strength	No limit
Exposure	F1, S1, P0 (W0), C1
Unit Weight (pounds per cubic foot)	145
Unit Weight Tolerance (pounds per cubic foot)	-3, +5
Maximum Water to Cementitious Material (W/Cm) Ratio	0.45
Air-Entrainment	Refer to Paragraph "Air Entrainment"
Minimum Cementitious Materials (pounds per cubic yard)	No limit
Maximum Water-Soluble Chloride-Ion Content in Hardened Concrete	0.30
Minimum quantity of fiber reinforcement (pounds per cubic yard)	Not Applicable

3. For pipe encasement and duct banks:

Property:	Limit / Condition
Minimum 28-Day Compressive Strength	3,500 psi
Maximum 28-Day Compressive Strength	No limit
Exposure	F0, S1, P0 (W0), C1
Unit Weight (pounds per cubic foot)	145
Unit Weight Tolerance (pounds per cubic foot)	-3, +5
Maximum Water to Cementitious Material (W/Cm) Ratio	0.50
Air-Entrainment	Refer to Paragraph "Air Entrainment"
Minimum Cementitious Materials (pounds per cubic yard)	No limit
Maximum Water-Soluble Chloride-Ion Content in Hardened Concrete	0.30
Minimum quantity of fiber reinforcement (pounds per cubic yard)	Not Applicable

4. For Concrete Fill:

Property:	Limit / Condition
Minimum 28-Day Compressive Strength	4,500 psi
Maximum 28-Day Compressive Strength	6,500 psi
Exposure	F1, S0, P0, C1
Unit Weight (pounds per cubic foot)	145

Property:	Limit / Condition
Unit Weight Tolerance (pounds per cubic foot)	-3, +5
Maximum Water to Cementitious Material (W/Cm) Ratio	0.45
Air-Entrainment	Refer to Paragraph "Air Entrainment"
Minimum Cementitious Materials (pounds per cubic yard)	No limit
Maximum Water-Soluble Chloride-Ion Content in Hardened Concrete	0.10
Minimum quantity of fiber reinforcement (pounds per cubic yard)	1.5

5. For Grout Topping in the Thickener:

Property:	Limit / Condition
Minimum 28-Day Compressive Strength	4,500 psi
Maximum 28-Day Compressive Strength	6,500 psi
Exposure	F1, S0, P0, C1
Unit Weight (pounds per cubic foot)	No limit
Unit Weight Tolerance (pounds per cubic foot)	Not applicable
Maximum Water to Cementitious Material (W/Cm) Ratio	0.45
Air-Entrainment	Refer to Paragraph "Air Entrainment"
Minimum Cementitious Materials (pounds per cubic yard)	No limit
Maximum Water-Soluble Chloride-Ion Content in Hardened Concrete	0.10
Minimum quantity of fiber reinforcement (pounds per cubic yard)	1.5

G. Air Entrainment:

1. Air-entraining admixtures are prohibited in concrete mixtures and total air content shall not be greater than 3 percent, for the following:
 - a. Slabs to receive hard-troweled finish.
 - b. Slabs to receive dry shake floor hardener.
 - c. Slabs to receive topping placed monolithically as a two-course floor on top of plastic concrete.
2. Unless otherwise specified, provide air content based on the nominal maximum size of aggregate, and the exposure class assigned in tables above:

Nominal Maximum Aggregate Size (in)*	Air Content (%)**	
	F1	F2 & F3
3/8	6.0	7.5
1/2	5.5	7.0
3/4	5.0	6.0
1	4.5	6.0
1-1/2	4.5	5.5
*See ASTM C33 for tolerance on oversize for various nominal maximum size designations.		
** Tolerance of air content is +1.5 percent.		

2.09 Admixtures

- A. Use water-reducing admixture in concrete, as required, for placement, and workability.
- B. Use a high-range water-reducing admixture in concrete used for all walls and as required for placement, consolidation and workability. An initial slump for this concrete shall be 1 to 2 inches prior to the addition of the admixture and 6 to 8-inches after the addition of the admixture.
- C. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg. F.
- D. Use air-entraining admixture for exterior exposed concrete that is directly exposed to freezing and thawing.

2.10 Concrete Mixing

- A. General: In accordance with ACI 301, except as modified herein.
- B. Ready-Mixed Concrete: Measure, batch and mix concrete materials and concrete according to ASTM C94, furnish batch ticket information indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.
 1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
 2. For every truck, test slump or slump flow of samples taken per ASTM C94/C94M, paragraph 12.5.1.
 3. Where specified slump is more than 4 inches, and if slump tests differ by more than 2 inches, discontinue use of truck mixer, unless causing condition is corrected and satisfactory performance is verified by additional slump tests.

2.11 Curing Materials

- A. Moisture-Retaining Cover: Comply with ASTM C171.

1. Polyethylene sheet not less than 4 mils thick, color – White.
- B. Use of liquid curing compounds is not permitted.

2.12 Related Materials

- A. Adhesive Dowels: Two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements. Epoxy adhesives shall only be used in temperatures greater than 41°F. See Section 05095, Post-Installed Anchors for additional specifications. Available products subject to compliance with requirements that may be incorporated in the Work include the following:
1. SET-XP High Strength Epoxy; Simpson Strong-Tie
 2. HIT RE 500-V3 Injection Adhesive; HILTI North America.
 3. AC200+ Epoxy; DeWalt/Powers.
- B. Premolded Joint Filler:
1. Bituminous Type: ASTM D1751 - Composed of cellular fibers securely bonded together and uniformly saturated with bituminous materials and non-extruding.
 2. Sponge Rubber Type: Neoprene, closed-cell, expanded; ASTM D1056, Type 2C5, with compression deflection, 25 percent deflection (limits), 119 kPa to 168 kPa (17 psi to 24 psi) minimum.
- C. Nonshrink Grout:
1. Nonmetallic, nongas-liberating.
 2. Prepackaged natural aggregate grout requiring only the addition of water.
 3. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures.
 4. Test in accordance with ASTM C1107/C1107M:
 - a. Fluid consistency 20 seconds to 30 seconds in accordance with ASTM C939.
 - b. Temperatures of 40 degrees F, 80 degrees F, and 100 degrees F.
 5. 1-hour after mixing, pass fluid grout through flow cone with continuous flow.
 6. Minimum strength of fluid grout, 3,500 psi at 1 day, 4,500 psi at 3 days, and 7,500 psi at 28 days.
 7. Maintain fluid consistency when mixed in 1 yard to 9 yard loads in ready-mix truck. Available products subject to compliance with requirements that may be incorporated in the Work include, but are not limited to, the following:

- a. BASF Building Systems, Inc., Shakopee, MN; MasterFlow 928.
- b. Five Star Products Inc., Fairfield, CT; Five Star Fluid Grout 100.
- c. Euclid Chemical Co., Cleveland, OH; Hi Flow Grout.
- d. Dayton Superior Corp., Miamisburg, OH; Sure Grip High Performance Grout.

D. Repair Material:

1. Contain only trace amounts of chlorides and other chemicals that can potentially cause steel to oxidize.
2. Where repairs of exposed concrete are required, prepare mockup using proposed repair materials and methods, for confirmation of appearance compatibility prior to use.
3. Obtain Manufacturer's Certificate of Compliance that products selected are appropriate for specific applications.
4. Repair mortar shall be Site mixed.
5. Prepare concrete substrate and mix, place, and cure repair material in accordance with manufacturer's written recommendations. Available products subject to compliance with requirements that may be incorporated in the Work include, but are not limited to, the following:
 - a. BASF Building Systems Inc., Shakopee, MN; MasterEmaco S-Series products.
 - b. Sika Chemical Corp., Lyndhurst, NJ; SikaTop-Series.

E. Crack Repair:

1. Obtain Letter of Certification from manufacturer's technical representative, that products selected are appropriate for the specific applications.
2. Prepare concrete substrate and mix, place, and cure repair material in accordance with manufacturer's written recommendations.
3. When crack repair is deemed by Engineer as requiring a structural repair, use part epoxy injection resin. Available products subject to compliance with requirements that may be incorporated in the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals, LLC-Building Systems Shakopee, MN; MasterInject series.
 - b. Euclid Chemical Co., Cleveland, OH.; Euco Series (#452).
 - c. Sika Chemical Corp., Lyndhurst, NJ.; Sikadur Series.
4. When leak repair is deemed by Engineer as requiring a non-structural repair, use hydrophilic polyurethane injection resin. Available products subject to compliance

with requirements that may be incorporated in the Work include, but are not limited to, the following:

- a. BASF Construction Chemicals, LLC-Building Systems Shakopee, MN; MasterInject 1210 IUG.
 - b. Euclid Chemical Co., Cleveland, OH.; Dural Aqua –Fil.
 - c. Sika Chemical Corp., Lyndhurst, NJ.; SikaFix HH Hydrophilic.
 - d. Prime Resins, Inc., Conyers, GA.; Prime Flex 900 XLV.
- F. Cement-Water Paste: For grout topping application, provide creamy cement-water paste, thick enough to be broomed into place and sustain approximate 1/4 inch thickness until topping is cast.

Part 3 Execution

3.01 General

- A. Coordinate the installation of joint materials, vapor barrier, and other related materials with placement of forms and reinforcing steel.

3.02 Forms

- A. General: Design, erect, shore, support, brace, and maintain formwork to support vertical, lateral, static, dynamic and construction loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position, within tolerance limits of ACI 117.
- B. Limit concrete surface irregularities designated by ACI 347 as abrupt or gradual.
 - 1. Provide Class A tolerances for concrete surfaces exposed to view.
 - 2. Provide Class C tolerances for other concrete surfaces.
- C. Construct forms to sizes, shapes, lines, and dimensions shown on the drawings and to obtain alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, moldings, blocking, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal. Do not use rust-stained steel form facing material.
- E. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Place and securely support items built into forms.
- F. Cleaning and Tightening: Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten

forms and bracing before placing concrete to prevent mortar leaks and maintain proper alignment.

- G. Provide a 3/4-inch chamfer on exterior corners and edges of permanently exposed concrete.

3.03 Removing And Reusing Forms

- A. General: Formwork, for sides of walls and similar parts of the Work, that do not support weight of concrete may be removed after cumulatively curing at not less than 50 deg. F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form removal operations and provided curing and protection operations are maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form release agent.
- C. When forms are reused for successive concrete placement, clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Engineer.

3.04 Placing Reinforcement

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.
- B. Bending Reinforcing Bars: Reinforcing bars shall never be bent more than once in the same location. Reinforcing bars shall never be heated for any purpose. Notify the Engineer if a reinforcing bar that has already been bent need to be bent again or straightened.
- C. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- D. Place reinforcement to maintain minimum coverage as shown on the drawings for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Position, support, and secure reinforcement against displacement.

3.05 Control, Expansion, Weakend-Plane And Construction Joints

- A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure.
- B. Provide wood keyways where shown at construction joints in footings, and walls. Nominal size: 2 inches by 4 inches for members 12-inches thick or less and 2 x 6 for members greater than 12-inches thick.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints and lap with reinforcing in the adjacent pour, unless otherwise noted.

- D. Locate and form vertical weakened plane joints in walls as indicated on the Drawings. Form weakened plane joints in walls 8-inches thick and less by forming a 1 1/2 inch deep vertical reveal in the interior face of walls. Discontinue or cut 1/2 of the horizontal reinforcing (every other continuous horizontal reinforcing bar) at the weakened plane joint.

3.06 Installing Embedded Items

- A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete.
- B. Waterstop Installation:
1. General
 - a. Continuous waterstop (as specified) shall be installed in all construction joints in walls and slabs of water holding basins and channels and in walls of belowgrade structures, unless specifically noted otherwise.
 - b. Join waterstop at intersections to provide continuous seal.
 - c. Center waterstop on joint.
 - d. Secure waterstop in correct position. Tie waterstop to reinforcing steel using grommets, "Hog Rings," or tie wire at maximum spacing of 12 inches. Do not displace waterstop during concrete placement.
 - e. Repair or replace damaged waterstop.
 - f. Place concrete and vibrate to obtain impervious concrete in vicinity of joints.
 - g. Joints in Footings and Slabs:
 - 1) Ensure that space beneath plastic waterstop is completely filled with concrete.
 - 2) During concrete placement, make visual inspection of waterstop area.
 - 3) Limit concrete placement to elevation of waterstop in first pass, vibrate concrete under waterstop, lift waterstop to confirm full consolidation without voids, then place remaining concrete to full height of slab.
 2. Plastic Waterstop:
 - a. Install in accordance with manufacturer's written instructions.
 - b. Splice in accordance with waterstop manufacturer's written instructions using Teflon-coated thermostatically controlled heating iron at approximately 380 degrees F.
 - 1) Allow at least 10 minutes before new splice is pulled or strained in any way.

- 2) Finished splices shall provide cross section that is dense and free of porosity with tensile strength of not less than 80 percent of unspliced materials.
 - 3) Use only factory made waterstop fabrications for all intersections, changes of directions and transitions.
 - 4) Field splice permitted only for straight butt welds.
- c. Wire looped plastic waterstop may be substituted for plastic waterstop.
3. Hydrophilic Waterstop:
- a. Install in accordance with manufacturer's written instructions.
 - b. Provide minimum of 2 1/2 inches of concrete cover over waterstop. When structure has two layers of steel reinforcement, locate centered between layers of steel or as shown.
 - c. Apply adhesive to concrete surface and allow to dry for specified time before applying waterstop strip.
 - d. Lap ends of waterstop strip together at splices and corners and join with sealant.
 - e. Verify that waterstop is anchored firmly in place before placing concrete. Do not allow vibrator to come into contact with waterstop.
 - f. Lap hydrophilic waterstop 2 feet minimum with intersecting plastic waterstops.

3.07 Preparing Surfaces Of Concrete Forms

- A. General: Coat contact surfaces of forms with non-residual, low-VOC, form release coating compound before placing reinforcement. For form liners use a form release coating recommended by the form liner manufacturer.
- B. Do not allow excess form release coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

3.08 Concrete Placement

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Rejection of High Slump Concrete: Concrete not containing a high range water reducing admixture arriving on site and having a slump equal to or greater than 6-inches shall be rejected and shall be prohibited from placing that batch. The truck number shall be recorded and that truck shall not be allowed on site for a minimum of 1 hour 45 minutes. Concrete containing a high-range water reducing admixture is exempt from this requirement.

- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location. Place concrete as close to its final position as possible to avoid segregation of aggregate. Use chutes for placing concrete in tall, narrow forms starting with the end of the chute near the bottom of the form and place concrete from the bottom up. Concrete shall not be placed such that the stream falls freely over rods, spacers, reinforcement, ties or other embedded materials which cause segregation of the concrete.
- D. **Placing Concrete in Forms:** Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
1. Consolidate fresh concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309. The vibrator head diameter shall be sized according to ACI 309. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
- E. **Cold-Weather Placement:** Comply with provisions of ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F, heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
 4. Do not place concrete on frozen ground or frozen water.
 5. Exterior exposed concrete shall be prevented from freezing for a minimum period of 7-days following placement. The Contractor shall provide a heated enclosure if freezing conditions are forecast.
- F. **Hot-Weather Placement:** When hot weather conditions exist, comply with provisions of ACI 305.1 and as follows:
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
 4. Use water-reducing retarding admixture during periods of high temperatures, low humidity, or other adverse placing conditions, as acceptable to Engineer.
- G. Minimum Time between Adjacent Placements:
1. Construction or Control Joints: 7 days.
 2. Construction joint between top of footing or slab, and column or wall: As soon as can safely be done without damaging previously cast concrete or interrupting curing thereof, but not less than 24 hours.
 3. Expansion or Contraction Joints: 1 day.
 4. For columns and walls with a height in excess of 10 feet, wait at least 2 hours before depositing concrete in beams, girders, or slabs supported thereon.
 5. For columns and walls 10 feet in height or less, wait at least 1 hour prior to depositing concrete in beams, girders, brackets, column capitals, or slabs supported thereon.
- H. Provide at least one standby vibrator in operable condition at placement Site prior to placing concrete.
- I. For wall construction joints with waterstop, place slurry mixture 4 inch maximum thickness, 2 inch minimum thickness in horizontal construction joints containing waterstops. Limit concrete placed immediately on top of slurry mixture to 12 inches thick. Thoroughly vibrate to mix concrete and slurry mixture together.

3.09 Concrete Fill and Grout As Toppings

- A. General:
1. Apply fiber reinforced concrete fill and fiber reinforced grout toppings where indicated on the Drawings.
 2. Provide fiber reinforced grout topping bonded to base slab and with surface compatible in regard to finish and location tolerance for Sludge Thickener mechanism on which to operate.
 3. Do not place grout topping on floor of Sludge Thickener tank until equipment for tank has been completely installed and is in working order.
- B. Surface Preparation:
1. Prepare concrete slab by high pressure water blasting machines capable of removing concrete surface.

2. High pressure water blasting machines with 8,000 psi minimum pressure capable of rapidly removing surface of sound concrete.
 3. Remove slab surface material and leave rough surface with amplitude of 3/16 inch measured between high and low points with use of 3 foot long straightedge.
 4. Collect spent water and debris and dispose in location and manner acceptable to Owner.
 5. Square edges of removed concrete to avoid tapered shoulders.
 6. Do not use power-driven jackhammers, scabblers, or scarifiers.
 7. High pressure water blast areas to receive grout topping no more than 24 hours before placement of bonding agent.
 - a. Remove laitance and contamination from existing concrete.
 - b. Saturate existing concrete slab for 24 hours prior to topping placement.
 - c. Surface shall be damp but free of standing water at time of application of topping.
- C. Topping Application:
1. Hand scrub thick creamy cement-water paste coating into existing concrete surfaces with approximately 1/4 inch thickness, just ahead of placement of topping.
 2. Place topping before paste coating begins to dry .
 3. Work topping into place using conventional placing tools.
 4. Place grout within specified tolerances.
- D. Topping Application for Sludge Thickener:
1. Attach leveling guide board to rake arm as recommended by mechanism manufacturer.
 2. Hand scrub thick creamy cement-water paste coating into existing concrete surfaces with approximately 1/4 inch thickness, just ahead of placement of topping.
 3. Before paste coating begins to dry, place topping in front of the rake arm and leveling board.
 4. Work topping into place using conventional placing tools. Do not use leveling guide on rake arm to move grout topping.
 5. Check grout elevation by measuring to top of grout from leveling guide board on rake arm. Place grout within specified tolerances.

3.10 Finishing Concrete Surfaces

- A. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view. This is an as-cast concrete surface obtained with selected form-facing

- material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch form tie holes, air pockets, honeycomb, rock pockets and defective areas with a repair mortar. Remove fins and other projections exceeding 1/8 inch in height.
- B. Smooth Rubbed finish: Provide a smooth rubbed finish on vertical surfaces no later than 24-hours after form removal, but no later than 48-hours if forms are left in place. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process. Smooth Rubbed finish shall extend below grade at least 8-inches. Provide a Smooth Rubbed Finish on the following concrete surfaces:
1. Exposed faces of walls, outside and inside face.
 2. Exposed vertical edge of concrete pads.
 3. Exposed vertical edge of concrete slabs.
- C. Finish Tops of Concrete Walls: At tops of walls strike-off smooth at the proper elevation and provide a steel trowel finish to produce a hard and dense surface.
- D. Slab Finishes:
1. Finish Slabs and Toppings: Unless otherwise specified, finish the top of floor slabs first by a float finish using a long straight edge such as a "highway" straight edge followed by a light steel trowel finish (two trowelings). Immediately following the steel trowel finish provide a broom finish to impart a "non-slip" surface finish.
 2. Finish Slabs to receive Toppings: Wood float and screed with straight edges. Prepare surface for concrete fill and grout toppings as specified.
 3. Finish Topping in Sludge Thickener: After working topping into place, perform a light steel-troweled finish (two trowelings).
- E. Finish Tops of Octagonal Tank Pads: Finish the top of concrete tank pads first by a float finish using a long straight edge such as a "highway" straight edge followed by a hard steel trowel finish.
- F. Slab Tolerances:
1. Exposed Slab Surfaces: Comprise of flat planes as required within tolerances specified.
 2. Slab Finish Tolerances and Slope Tolerances: Crowns on floor surface not too high as to prevent 10 foot straightedge from resting on end blocks, nor low spots that allow block of twice the tolerance in thickness to pass under supported 10 foot straightedge.
 3. Steel gauge block 5/16 inch thick.
 4. Finish Slab Elevation: Slope slabs to floor drain and gutter, and shall adequately drain regardless of tolerances.

5. Thickness: Maximum 1/4 inch minus or 1/2 inch plus from thickness shown. Where thickness tolerance will not affect slope, drainage, or slab elevation, thickness tolerance may exceed 1/2 inch plus.
- G. Repair defective areas of concrete.
1. Cut edges perpendicular to surface at least 1/2 inch deep. Do not feather edges. Soak area with water for 24 hours.
 2. Patch with specified repair material.
 3. Repair concrete surfaces using specified materials. Select system, submit for review, and obtain approval from Engineer prior to use.
 4. Develop repair techniques with material manufacturer on surface that will not be visible in final construction prior to starting actual repair work and show how finish color will blend with adjacent surfaces. Obtain approval from Engineer.
 5. Obtain quantities of repair material and manufacturer's detailed instructions for use to provide repair with finish to match adjacent surface or apply sufficient repair material adjacent to repair to blend finish appearance.
 6. Repair of concrete shall provide structurally sound surface finish, uniform in appearance or upgrade finish by other means until acceptable to Engineer.
- H. Inject cracks that leak.
- I. Exposed Metal Objects:
1. Remove metal objects not intended to be exposed in as-built condition of structure including wire, nails, and bolts, by chipping back concrete to depth of 1 inch and then cutting or removing metal object.
 2. Repair area of chipped-out concrete as specified for defective areas.

3.11 Concrete Curing And Protection

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and comply with ACI 305.1 for hot-weather protection during curing. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations by misting concrete surfaces with water.
- B. Protect and cure concrete in accordance with requirements of ACI 301, ACI 308.1.
- C. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.
- D. Curing Methods: Cure formed concrete by 1) leaving the concrete enclosed in formwork for at least 7 consecutive days, or by 2) covering surfaces with a moisture-retaining cover. Ensure that concrete surfaces are maintained in a moist condition until they can be properly cured. Do not allow concrete surfaces to dry prior to beginning curing operations.
 1. Curing by moisture-retaining cover: Cover concrete surfaces with moisture-retaining cover placed in widest practicable width with sides and ends lapped at

least 6-inches and sealed continuously by waterproof tape or adhesive. Repair any holes or tears in the cover using waterproof tape. Secure moisture-retaining cover to prevent wind from blowing the cover off of the surface of the concrete and prevent the cover from billowing in the wind. Secure the cover by placing lumber, piles of earth and sand or other suitable materials on top of the cover to keep it close to or against the surface of the concrete. If cover is blown off or removed from the concrete surface before curing is complete, wet concrete slab surface and replace cover. Inspect covering daily during the curing period and spray the surface with water if the concrete surface appears dry.

- E. Repair areas damaged by construction, using specified repair materials and approved repair methods.

3.12 Miscellaneous Concrete Items

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction.

3.13 Nonshrink Grout

- A. General: Mix, place, and cure nonshrink grout in accordance with grout manufacturer's written instructions.
- B. Grouting Machinery Foundations:
 1. Block out original concrete or finish off at distance shown below bottom of machinery base with grout. Prepare concrete surface by sandblasting, chipping, or by mechanical means to remove any soft material. Surface roughness in accordance with manufacturer's written instructions.
 2. Clean metal surfaces of all paint, oil, grease, loose rust and other foreign material that will be in contact with grout.
 3. Set machinery in position and wedge to elevation with steel wedges, or use cast-in leveling bolts. Remove wedges after grout is set and pack void with grout.
 4. Form with watertight forms at least 2 inches higher than bottom of plate.
 5. Fill space between bottom of machinery base and original concrete in accordance with manufacturer's written instructions.

3.14 Field Quality Assurance And Quality Control

- A. General: The Owner will employ a testing agency to perform tests and to submit test reports.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 2 cubic yards, but not less than 15 cubic yards, plus one set for each additional 100 cubic yards or fraction thereof, or not less than 5,000 square feet of walls or slabs placed.

2. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 3. Slump: ASTM C143; one test at point of placement for each composite sample, but not less than one test for each day's pour or of each concrete mix. Perform additional tests when consistency of concrete appears to change. If any water is added to the concrete mix at the site, slump shall be measured after the water has been added and mixed thoroughly. Concrete not containing a high-range water reducing admixture having measured slump that is 6-inches or greater shall be rejected from the worksite and that truck shall not be allowed back on site for at least two hours.
 4. Temporary Field Storage of Cylinders: During the summer, newly made concrete test cylinders should be moved to a location that is permanently shaded for temporary storage away from construction operations that can vibrate or disturb the test cylinders immediately after sampling until the time they are transported to the testing laboratory for proper curing and testing. During the winter or in times of cold weather, newly made concrete test cylinders shall be temporarily stored at the site in an insulated wooden box that has at least a 100 watt light bulb inside the box to maintain temperatures above freezing until the time they are transported to the testing laboratory for proper curing and testing.
 5. Air Content: ASTM C231, pressure method for normal weight concrete; one for each composite sample, but not less than one test for each day's pour of each concrete mix.
 6. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 deg F and below, when 80 deg F and above, and one test for each composite sample.
 7. Unit Weight: ASTM C567, fresh unit weight of concrete. One test for each concrete mix for each day's pour.
 8. Compression Test Specimen: ASTM C31; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 - a. Test one specimen at 7-days for early strength determination, test two specimens at 28-days for the recorded design compressive strength and test one specimen at 56-days if required for late strength determination. Should the 56-day specimen not be used it may be discarded after 56-days.
 - b. The recorded compressive strength shall be the average compressive strength from the two 28-day test specimens.
- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
- D. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

- E. Test results shall be reported in writing to the Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, accurate concrete placement location in the structure, concrete mix proportions and materials.
- F. Slab Finish Tolerances and Slope Tolerances:
1. Support 10 foot long straightedge at each end with steel gauge blocks of thicknesses equal to specified tolerance.
 2. Compliance with designated limits in four of five consecutive measurements is satisfactory, unless defective conditions are observed.
- G. Liquid Tightness Tests:
1. Purpose: To determine integrity and liquid-tightness of finished exterior and interior concrete surfaces of liquid containment structures.
 2. Water for initial tightness test shall be provided by Contractor.
 3. Provide means to transport water to structure to be tested.
 4. If additional tightness tests are required because of failure to meet criteria, provide water for subsequent tests.
 5. After testing has been completed, dispose of test water in a manner approved by Owner.
 6. Liquid-Tightness Test Requirement:
 - a. Perform tightness tests in accordance with ACI 350.1 and as specified herein.
 - b. Do not place backfill or install brick facing, grout topping slab, coatings, or other work that will cover concrete surfaces until tightness testing has been completed and approved.
 - c. Measure evaporation, precipitation, and temperature as specified.
 - d. Measure water surface at two points 180 degrees apart when possible where attachments, such as ladders exist, at 24 hour intervals.
 - e. Acceptance Criteria:
 - 1) Volume loss shall not exceed 0.050 percent of contained liquid volume per 24 hour period, adjusted for evaporation, precipitation, and temperature.
 - 2) Acceptance that structure has passed tightness test shall be based on total volume loss at end of specified test period.
 - f. Repairs When Test Fails:
 - 1) Dewater structure; repair leaking cracks.

- 2) Patch areas of damp spots previously recorded, and repeat water leakage test in its entirety until structure successfully passes test.

3.15 Manufacturer's Services

- A. Provide representative at Site for installation assistance, inspection, and certification of proper installation for concrete ingredients, mix design, mixing, and placement.
- B. Concrete Producer Representative:
 1. Assist with concrete mix design, performance, placement, weather problems, and problems as may occur with concrete mix throughout Project, including instructions for redosing.
 2. Establish control limits on concrete mix designs.
 3. Provide equipment for control of concrete redosing for air entrainment or high-range, water-reducing admixture, superplasticizers, at Site to maintain proper slump or slump flow, and air content when specified.
- C. Admixture Manufacturer's Representative: Available for consultations as required to ensure proper installation and performance of specified products.
- D. Fiber Reinforcement's Representative: Provide the services of a technical representative to instruct the concrete supplier in proper batching and mixing of materials

END OF SECTION

SECTION 03700 – MASS CONCRETE

Part 1 GENERAL

1.01 SCOPE

- A. Furnish all labor, materials, equipment, and incidentals required to furnish and install mass concrete as shown on the Drawings and as specified herein.
- B. This Section is a supplement to Section 03310, Cast-in-Place Concrete. This Section specifies additional requirements to furnish and install mass concrete. All requirements to furnish and install cast-in-place concrete work under Section 03310, Cast-in-Place Concrete apply herein.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. American Society for Testing and Materials International (ASTM):
 - a. C150, Standard Specification for Portland Cement.
 - b. C1074, Standard Practice for Estimating Concrete Strength by the Maturity Method.

1.03 DEFINITIONS

- A. Mass Concrete: Concrete sections with a minimum specified dimension that is equal to or greater than 30 inches.

1.04 SUBMITTALS

- A. Submittals shall be included with submittals required in Section 03310, Cast-in-Place Concrete.
- B. Thermal Control Plan.
- C. Mix design, tests results, reports, product data, certificates, manufacturer's information and other documents as specified in Section 03310, Cast-in-Place Concrete.

1.05 QUALITY ASSURANCE

- A. Thermal Control Plan: Include the following minimum requirements:
 - 1. Calculated or measured adiabatic temperature rise of concrete.
 - 2. Upper limit for concrete temperature at time of placement.
 - 3. Description of specific measures and equipment that will be used to ensure maximum temperature in placement will not exceed specified maximum temperature limit.
 - 4. Calculated maximum temperature in placement based on expected conditions at time of placement and use of proposed measures to control temperatures.

5. Description of specific measures and equipment that will be used to ensure temperature difference will not exceed specified temperature difference limit.
6. Calculated maximum temperature difference in placement based on expected conditions at time of placement and use of proposed measures to control temperature differences.
7. Description of equipment and procedures that will be used to monitor and log temperatures and temperature differences.
8. Drawing showing locations for temperature sensors in placement.
9. Description of format and frequency of providing temperature data to Engineer.
10. Description of measures to address and reduce excessive temperatures and temperature differences, if they occur.
11. Description of curing procedures, including materials and methods, and curing duration.
12. Description of formwork removal procedures to ensure temperature difference at temporarily exposed surface will not exceed temperature difference limit, and how curing will be maintained.
13. Alternate temperature limits when permitted by Engineer.
 - a. Determination of alternate temperature limits shall be based on detailed thermal and crack analyses.
 - b. Analyses shall be stamped by Contractor's Licensed Design Engineer.
14. If concrete design mixture is changed, thermal control plan must be updated.

Part 2 PRODUCTS

2.01 MATERIALS

- A. Refer to Section 03310, Cast-in-Place Concrete, unless otherwise specified herein.

2.02 TEMPERATURE LIMITS

- A. Provide documentation that maximum concrete temperature in structure will not exceed 158 degrees Fahrenheit, and maximum temperature differential between center of section and external surfaces of concrete will not exceed 35 degrees Fahrenheit.

Part 3 EXECUTION

3.01 INSTALLATION

- A. Refer to Section 03310, Cast-in-Place Concrete, unless otherwise specified herein.
- B. Cure and protect concrete in accordance with the requirements of Section 03310, Cast-in-Place Concrete; with accepted thermal control plan; and as follow:

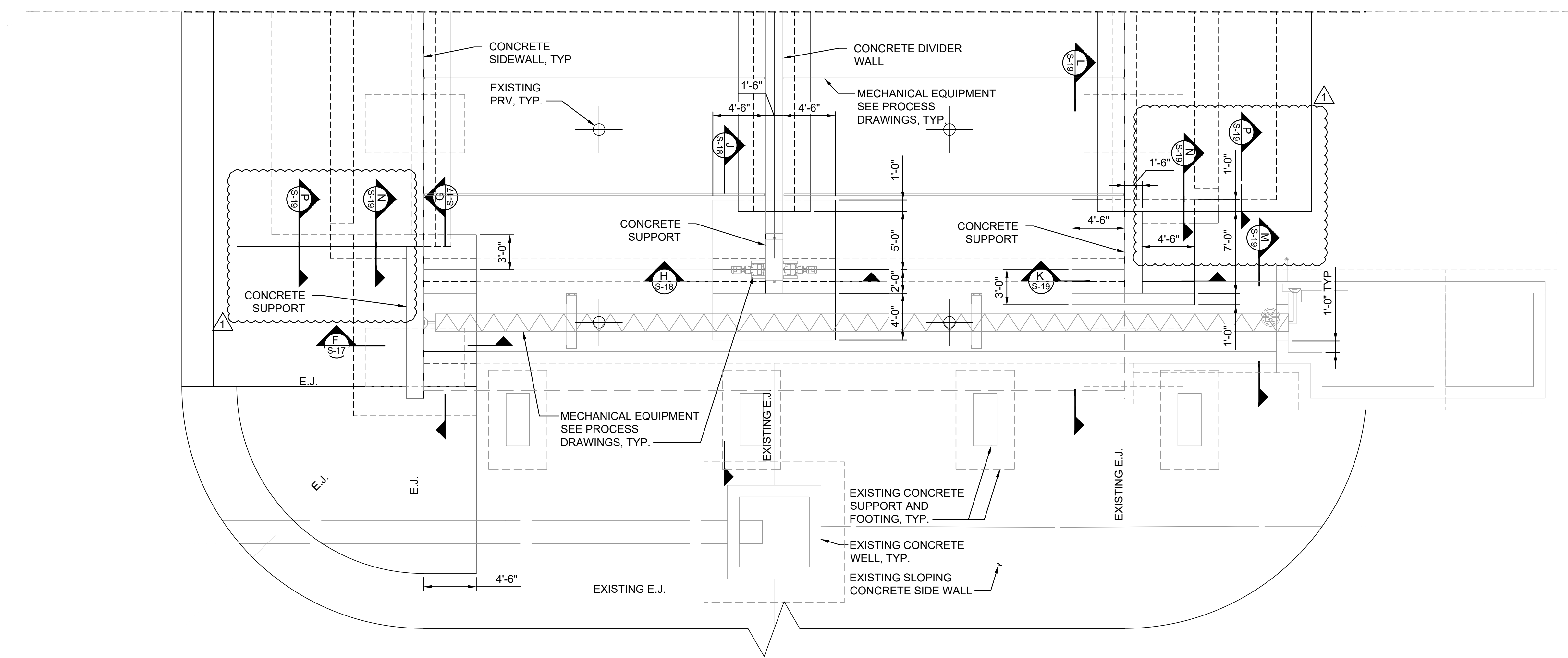
1. Do not use liquid curing compound.
 2. Minimum curing period shall be 14 days.
 3. Unless otherwise permitted, preserve moisture by maintaining forms in place.
- C. Evaluate compressive strength with the requirements of Section 03310, Cast-in-Place Concrete and as follows:
1. Strength measurement shall be representative of in-place concrete within 2 inches of concrete surface.
 2. Concrete strength shall be verified through correlation of concrete temperature and compressive strengths established by cylinder compressive tests and in accordance with ASTM C1074.
- D. Unless otherwise specified, control concrete temperatures to within specified limits from time concrete is placed until time internal temperature has cooled from its maximum, such that difference between average daily ambient and maximum internal concrete temperature at time of protection removal, is less than specified temperature difference limit.
- E. Unless otherwise specified, place one temperature sensor at center of mass of placement and one temperature sensor at a depth 2 inches from center of nearest exterior surface. Place additional sensor at each location to serve as a backup in event that other temperature sensor fails. In addition, provide temperature sensor in shaded location for monitoring ambient onsite temperature.
1. Unless otherwise specified, monitor temperatures hourly using electronic sensors capable of measuring temperature from 32 degrees F to 212 degrees F to an accuracy of 2 degrees F.
 2. Ensure temperature sensors are operational before placing concrete.
 3. Unless otherwise specified, provide data from sensors to Engineer on a daily basis, until requirements are met.
 4. Compare temperatures and temperature differences with maximum limits specified in Article, Temperature Limits every twelve (12) hours, unless otherwise permitted. If either exceeds specified limits, take immediate action as described in accepted thermal control plan to remedy situation. Do not place additional mass concrete until cause of excessive temperature or temperature difference has been identified and corrections are accepted.

END OF SECTION

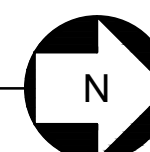
REVISED DRAWINGS

NOTES

1. FOR ADDITIONAL INFORMATION, SEE DRAWING S-13.



ENLARGED BOTTOM PLAN
SCALE: 3/16" = 1'-0"



REV	DATE	DESCRIPTION
1	11/30/18	INITIAL ISSUE
2	3/26/19	ADDENDUM NO. 1

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CLIENT:



CLAYTON COUNTY
Water
AUTHORITY

PROJECT:

**W.J. HOOPER
WATER PRODUCTION PLANT
RESIDUALS HANDLING
IMPROVEMENTS**

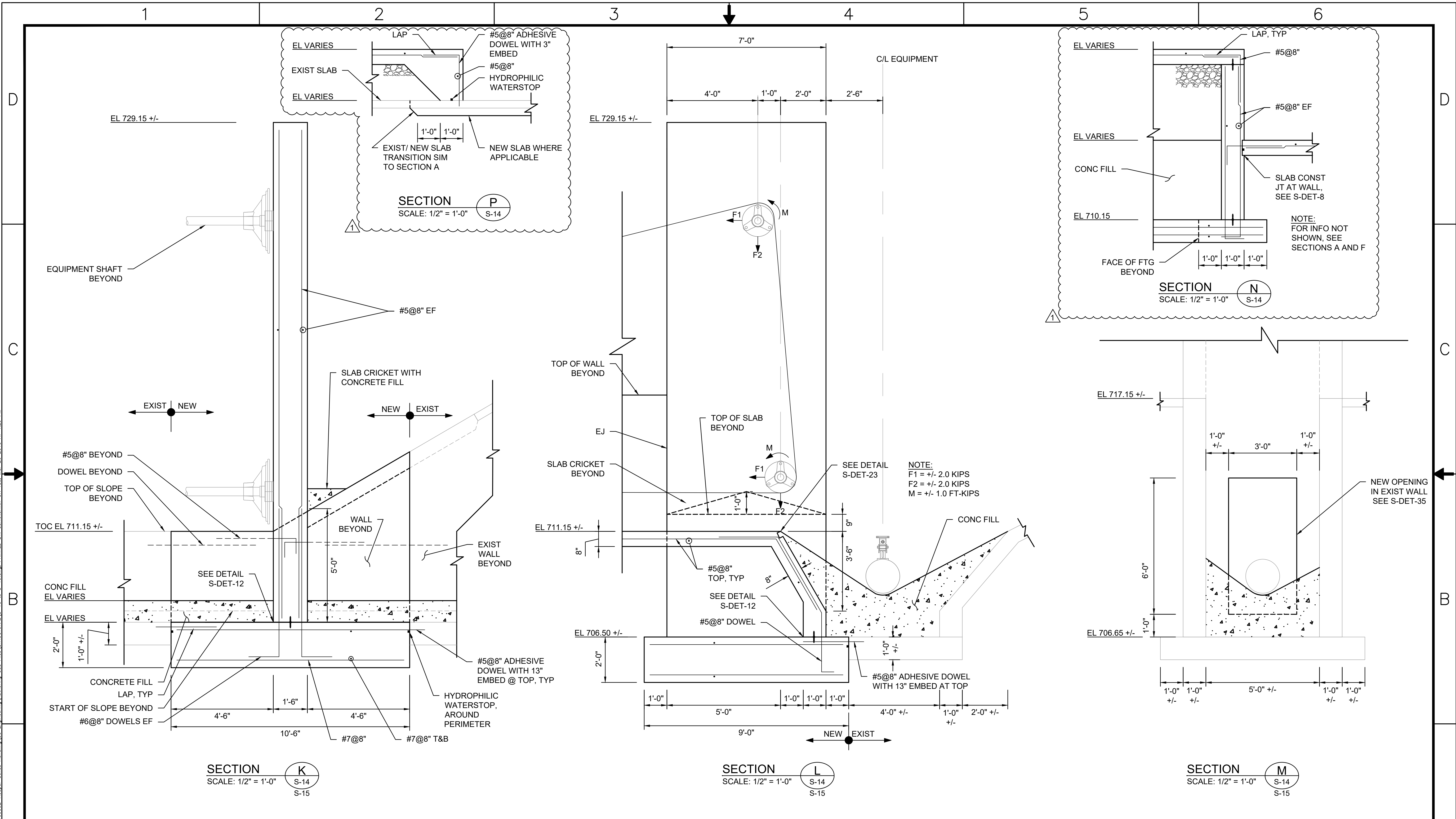
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SHEET TITLE:			
WASH WATER HOLDING BASIN ENLARGED BOTTOM PLAN			
ISSUED:	DESIGNED BY: D.P.		
PROJECT NO. RT-RE-17-03	DRAWN BY: R.C.		
DWG NO. S-14	CHK BY: D.P.		
SCALE: AS NOTED	CURRENT REVISION: 0	SHEET NUMBER:	37

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CLAYTON COUNTY
Water
AUTHORITY

PROJECT:

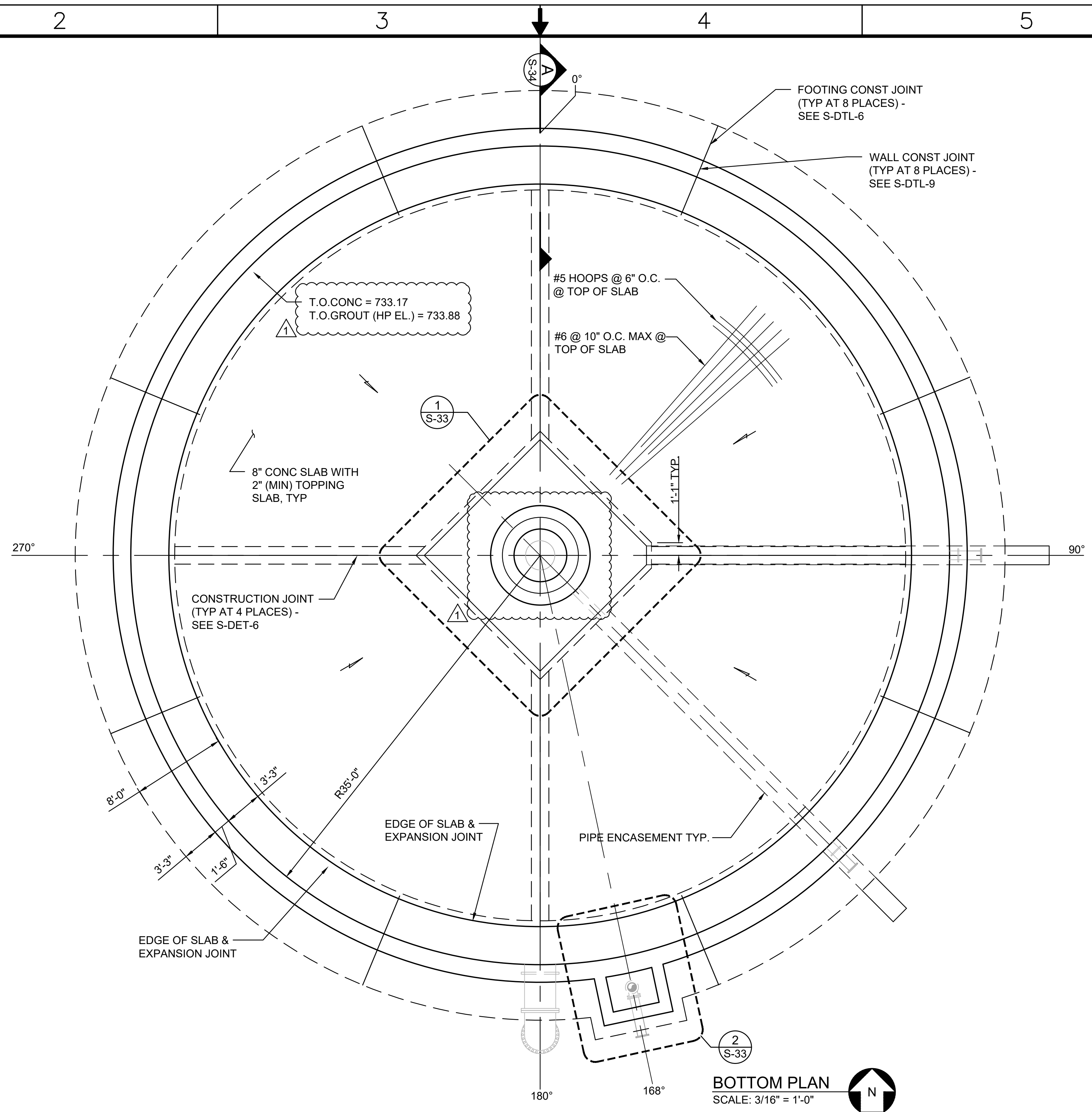
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WATER PRODUCTION PLANT
RESIDUALS HANDLING
IMPROVEMENTS**

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SHEET TITLE:			
WASH WATER HOLDING BASIN MODIFICATIONS - SECTIONS			
ISSUED:	DESIGNED BY: B.P.		
PROJECT NO. RT-RE-17-03	DRAWN BY: O.G.		
DWG NO. S-19	CHK BY: D.P.		
SCALE: NONE	CURRENT REVISION:	0	SHEET NUMBER: 42

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- NOTES**
- FOR STRUCTURAL GENERAL NOTES, SEE DRAWING S-01.
 - FOR STANDARD DETAILS SEE DRAWINGS S-DTL-01 THROUGH S-DTL-08.
 - 4'-6" DIA. NON-SLOPED TOP SURFACE OF CENTER PIER FOUNDATION.
 - ENCASE PIPES BELOW FOUNDATION AND AREA EXTENDING MINIMUM 5'-0" (UNO) BEYOND LIMITS OF FOUNDATION. SEE STANDARD ENCASEMENT DETAILS ON SHEET S-DTL-03.
 - STRUCTURE SPECIFIC DESIGN CRITERIA (SERVICE LOAD VALUES, UNO)
 - A. DEAD LOADS: SELF-WEIGHT
 - B. BRIDGE LIVE LOADS: 60 PSF
 - STAIR LIVE LOADS: 100 PSF
 - C. WIND:
 - TANK: SEE SHEET S-01
 - EQUIPMENT: DESIGN PRESSURES IN ACCORDANCE WITH "OTHER STRUCTURES AND BUILDING APPURTENANCES" OF ASCE 7-10
 - D. SEISMIC: LATERAL FORCE RESISTING SYSTEM: FLAT-BOTTOM GROUND-SUPPORTED TANK, REINFORCED CONCRETE, REINFORCED NONSLIDING BASE
 - R = 2.0
 - C_s (EFFECTIVE) = 0.03
 - V = 192 KIPS
 - E. HYDRAULIC LOAD: DESIGN WATER SURFACE ELEVATION: 750.88
 - DESIGN SLUDGE SURFACE ELEVATION: 748.63
 - F. SOIL DESIGN ALLOWABLE BEARING PRESSURE 2,000 PSF
 - CENTER PIER LOADING (ASSUMED)
 - A. DEAD LOAD: 25 KIPS
 - B. MOMENT LOAD: 30 K-FT
 - C. TORQUE LOAD: 50 K-FT
- VERIFY LOADS WITH APPROVED SUBMITTAL PRIOR TO CONSTRUCTION AND FABRICATION.


BOTTOM PLAN
SCALE: 3/16" = 1'-0"

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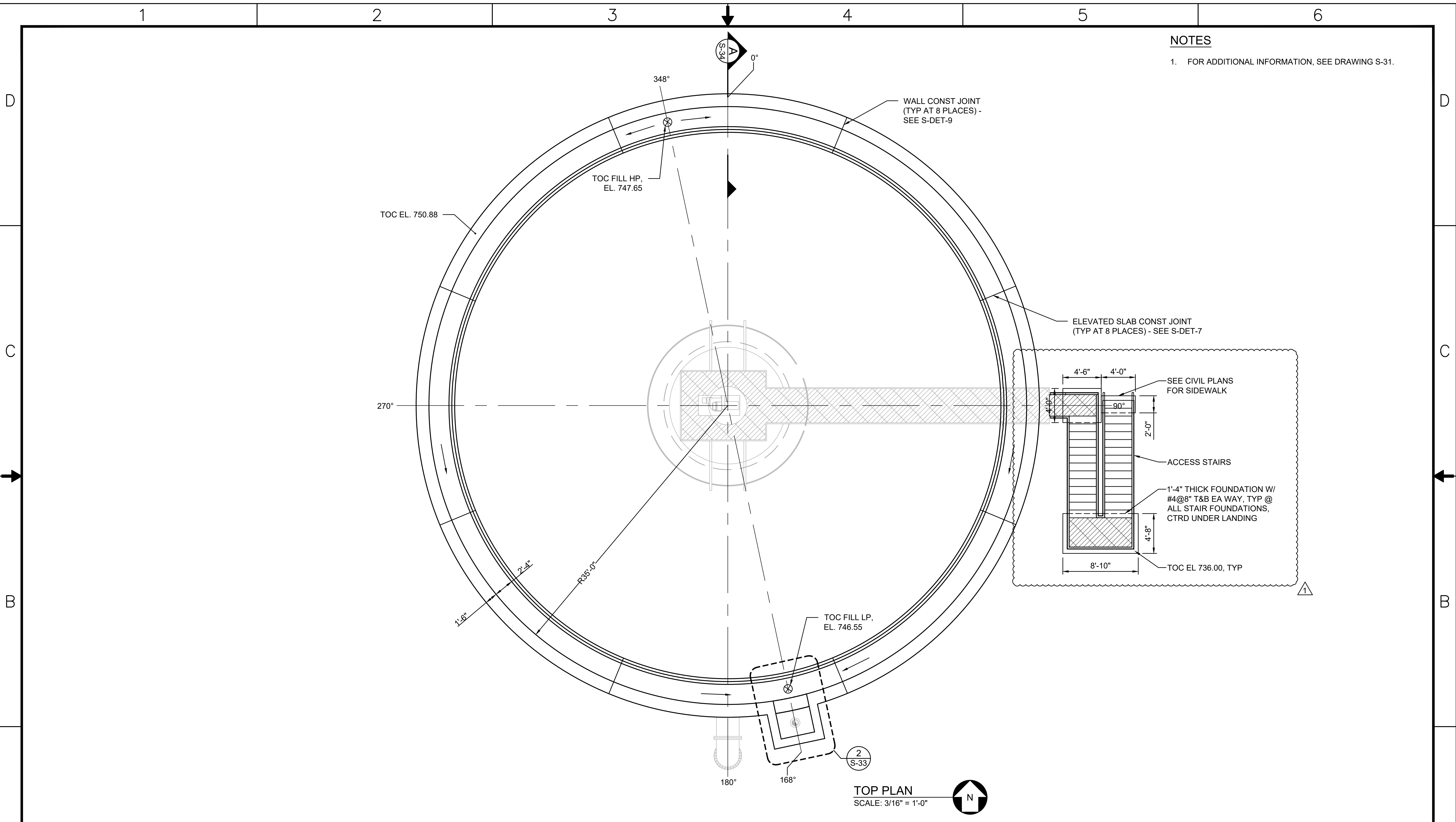
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SLUDGE THICKENER BOTTOM PLAN			
ISSUED:	DESIGNED BY: B.P.		
PROJECT NO. RT-RE-17-03	DRAWN BY: O.G.		
DWG NO. S-31	CHK BY: D.P.		
SCALE: AS NOTED	CURRENT REVISION: 0	SHEET NUMBER: 43	

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NOTES
 1. FOR ADDITIONAL INFORMATION, SEE DRAWING S-31.

TOP PLAN
 SCALE: 3/16" = 1'-0"

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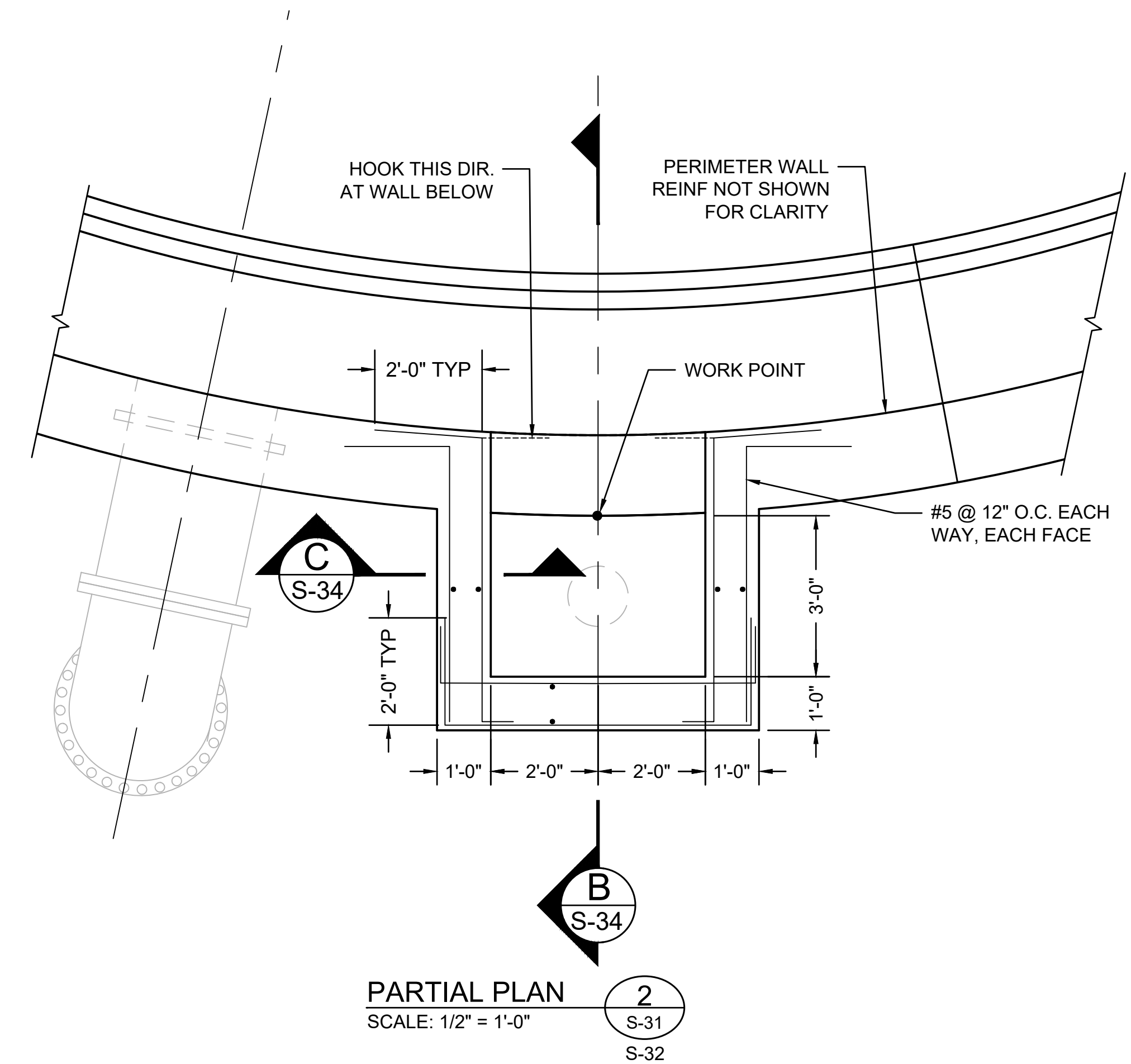
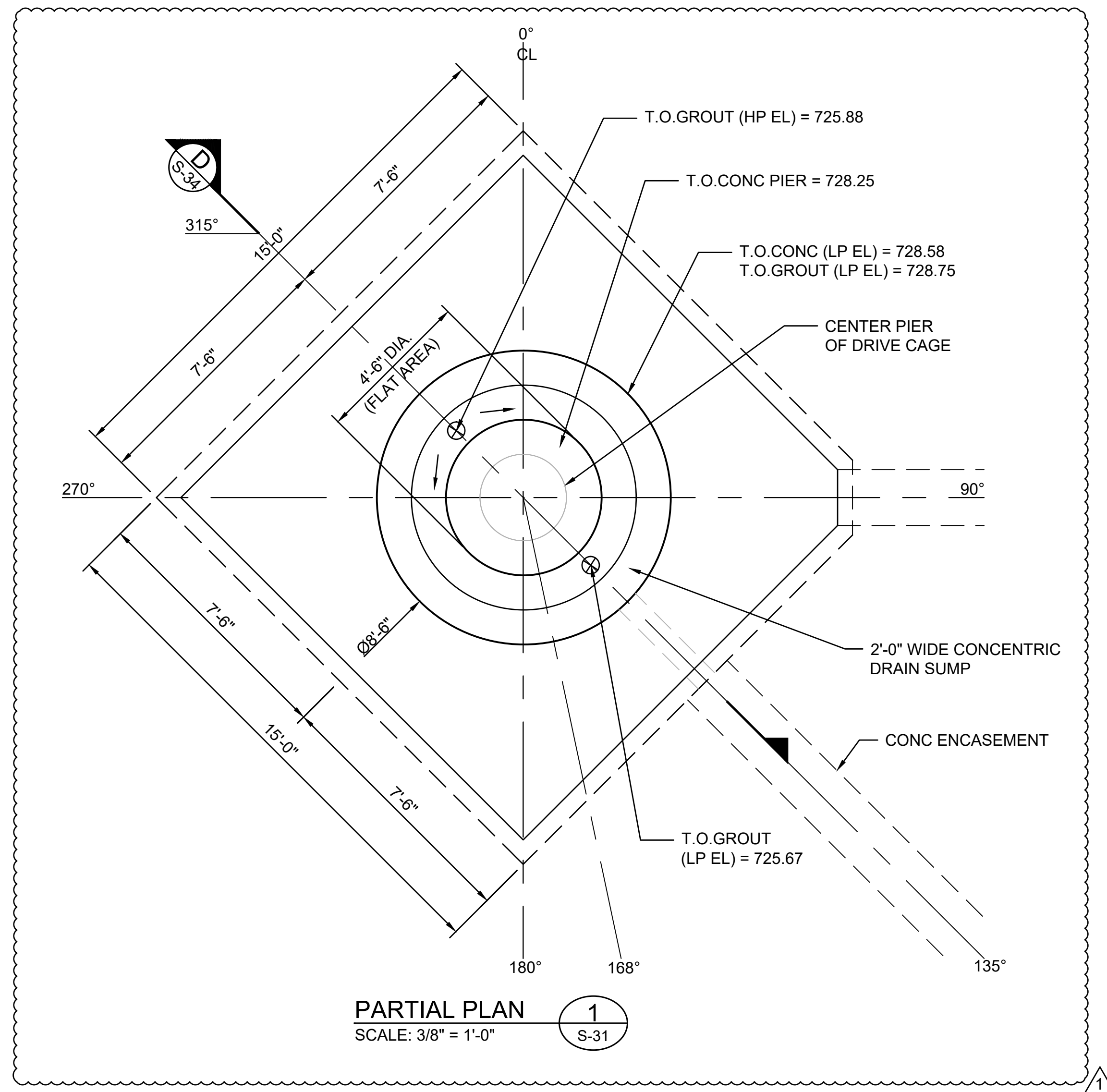
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SLUDGE THICKENER TOP PLAN			
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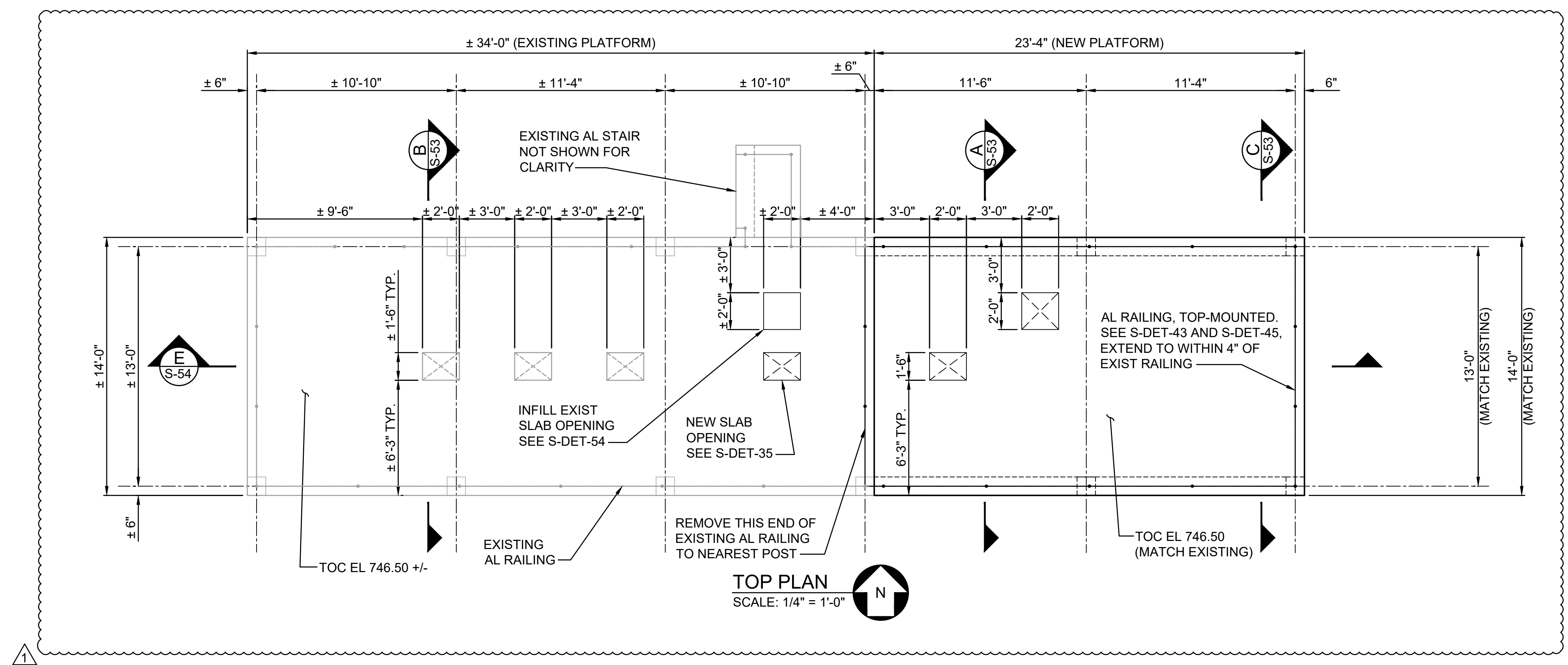
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SLUDGE THICKENER PARTIAL PLANS			
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DWG NO. S-33	CHK BY: D.P.		
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NOTES

- FOR STRUCTURAL GENERAL NOTES, SEE DRAWING S-01.
- FOR STANDARD DETAILS SEE DRAWINGS S-DTL-01 THROUGH S-DTL-05.
- FIELD VERIFY EXISTING CONDITIONS.
- PRIOR TO SUBMITTING REBAR SHOP DRAWINGS AND PLACING TOP SLAB CONCRETE, COORDINATE SLAB OPENINGS WITH APPROVED CONVEYOR SUBMITTAL.
- TOP SLAB LIVE LOAD: 250 PSF.



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SHEET TITLE:

**SLUDGE LOADING PLATFORM
PLANS**

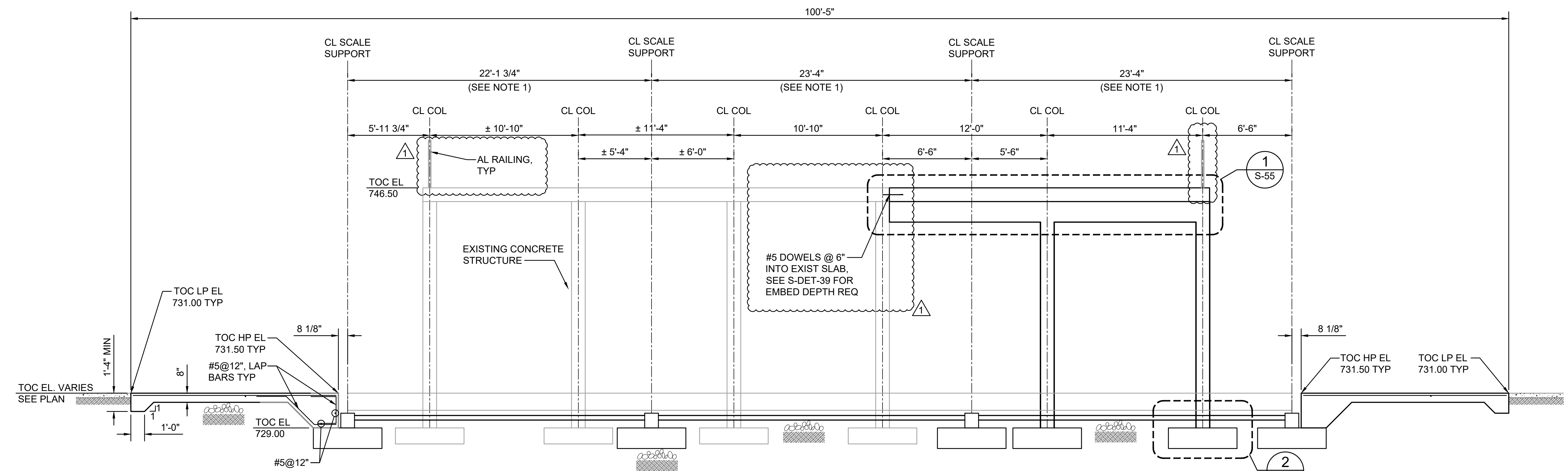
ISSUED:	DESIGNED BY: D.S.
PROJECT NO. RT-RE-17-03	DRAWN BY: J.P.
DWG NO. S-52	CHK BY: D.P.
SCALE: AS NOTED	CURRENT REVISION: 0
	SHEET NUMBER: 51

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1 2 3 4 5 6

NOTES

- 1. COORDINATE FINAL DIMENSION WITH APPROVED EQUIPMENT SUBMITTAL



SECTION E
SCALE: 1/4" = 1'-0"


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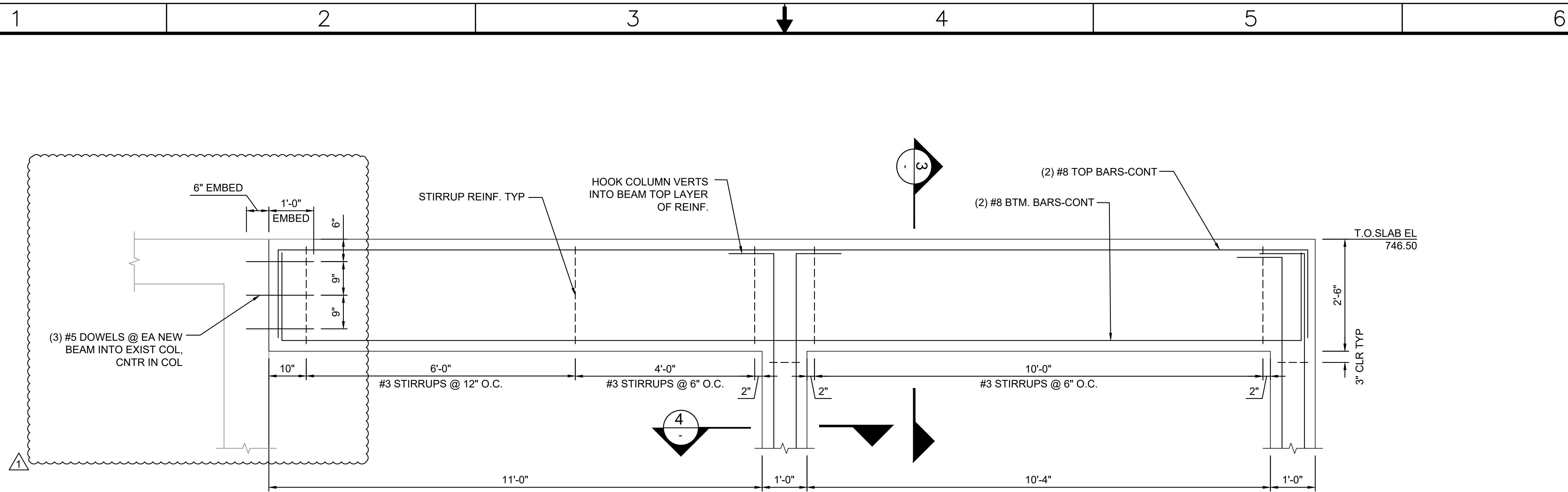
SHEET TITLE:

SLUDGE LOADING PLATFORM SECTIONS

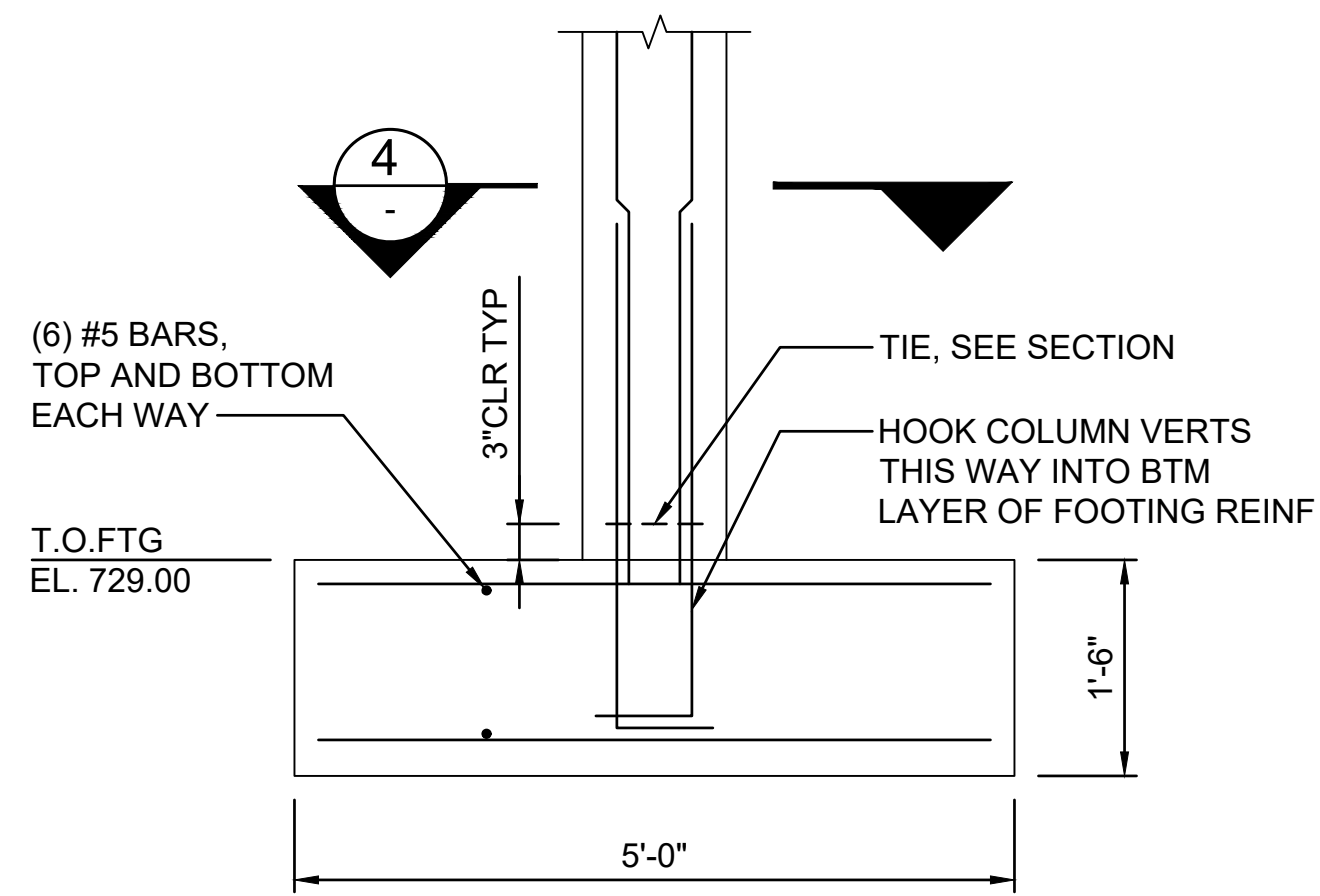
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PROJECT NO. RT-RE-17-03	DRAWN BY: J.P.
DWG NO. S-54	CHK BY: D.P.
SCALE: AS NOTED	CURRENT REVISION: 0
	SHEET NUMBER: 53

1 2 3 4 5 6

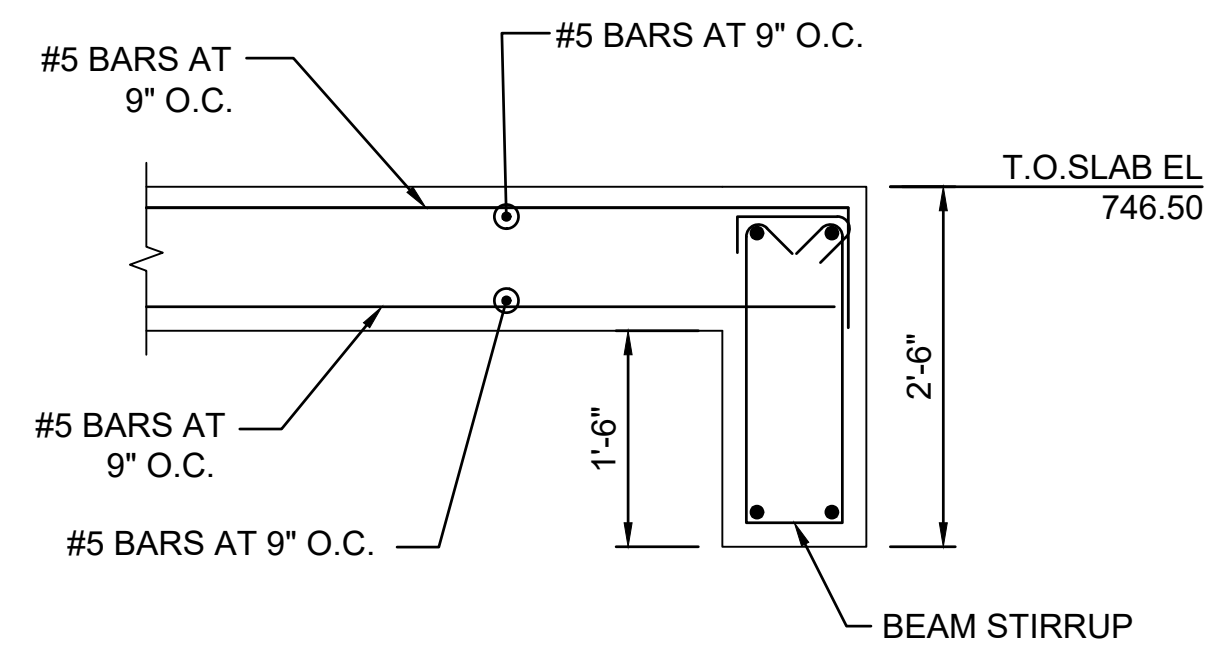
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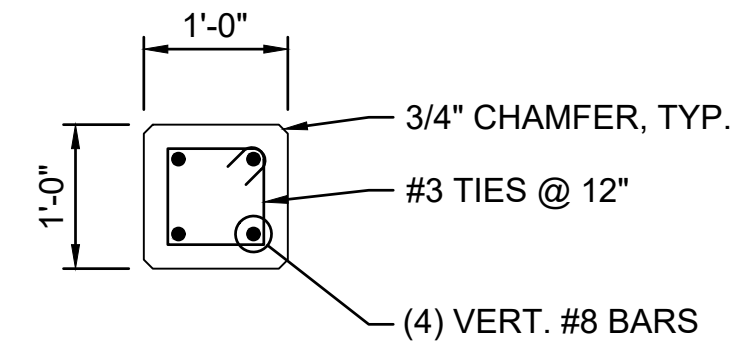
DETAIL 1
 SCALE: 3/4" = 1'-0" S-54



DETAIL 2
 SCALE: 3/4" = 1'-0" S-54



DETAIL 3
 SCALE: 3/4" = 1'-0" S-53



DETAIL 4
 SCALE: 3/4" = 1'-0"

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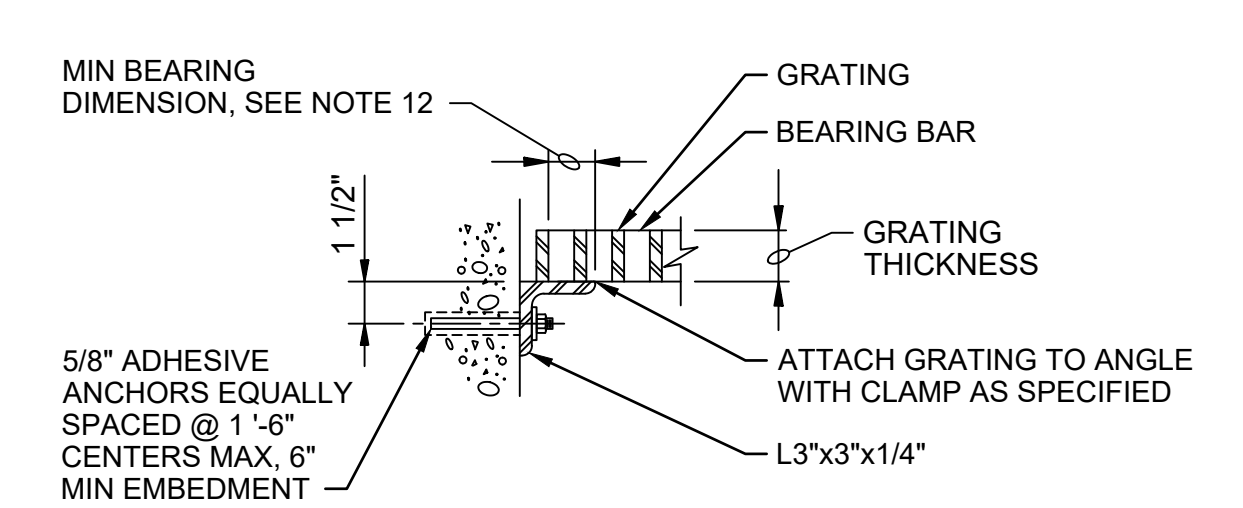
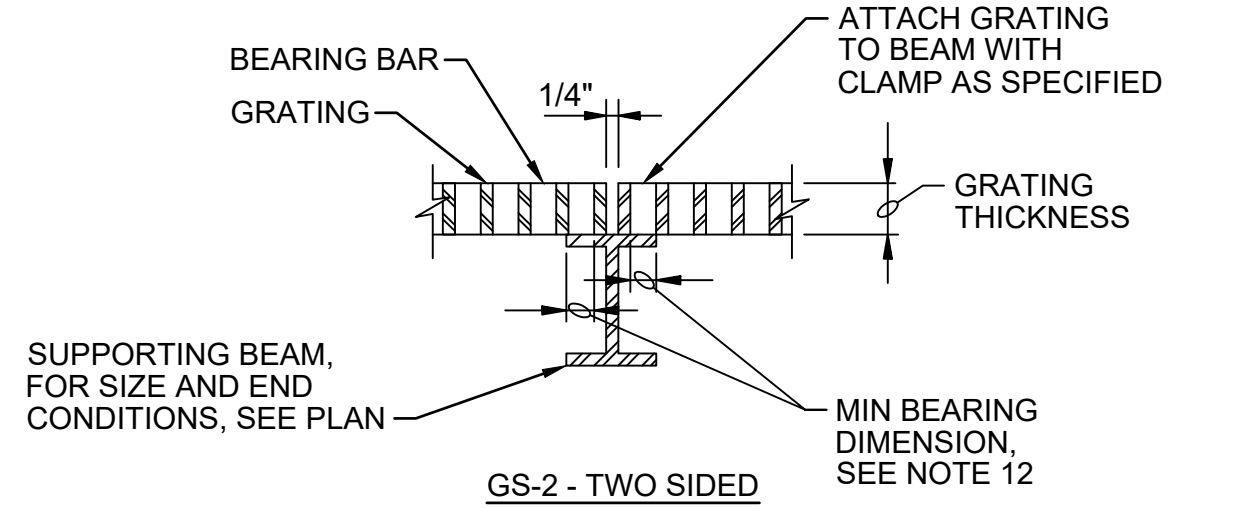
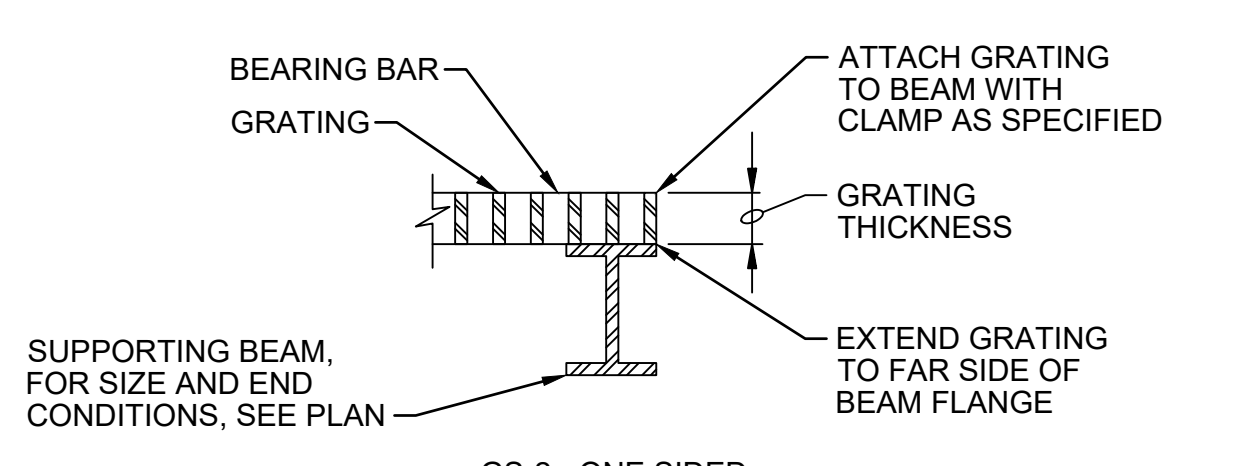
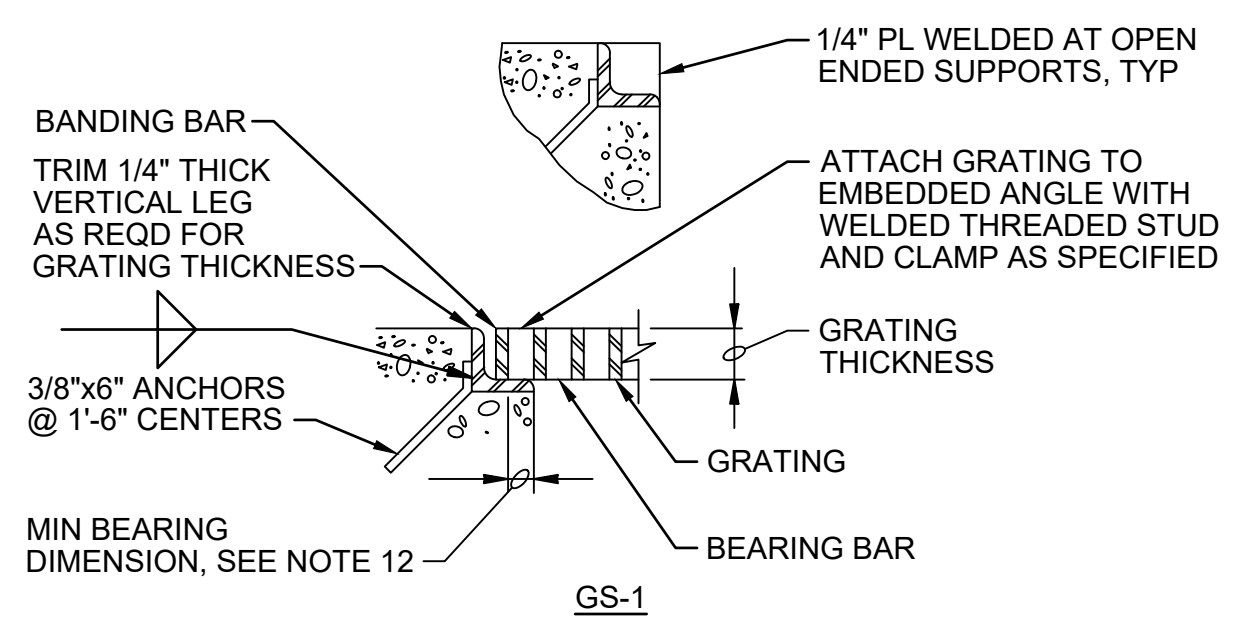
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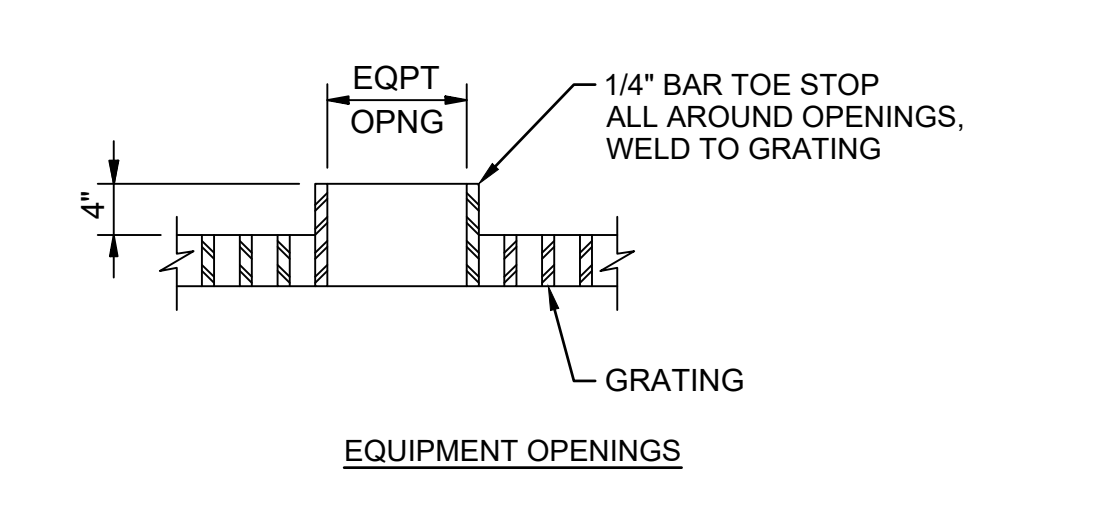
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PROJECT NO. RT-RE-17-03	DRAWN BY: J.P.		
DWG NO. S-55	CHK BY: D.P.		
SCALE: AS NOTED	CURRENT REVISION: 0	SHEET NUMBER:	54



NOTES:
 1. USE GS-3 ONLY FOR LIGHT DUTY GRATING, TYPE 'A'.
 2. INSTALL ANCHORS MAXIMUM 4" FROM EACH END.
 3. WHEN ANCHOR IS WITHIN 4" OF A CONCRETE EDGE, UTILIZE MANUFACTURER'S LOW-TORQUE INSTALLATION PROCEDURES.



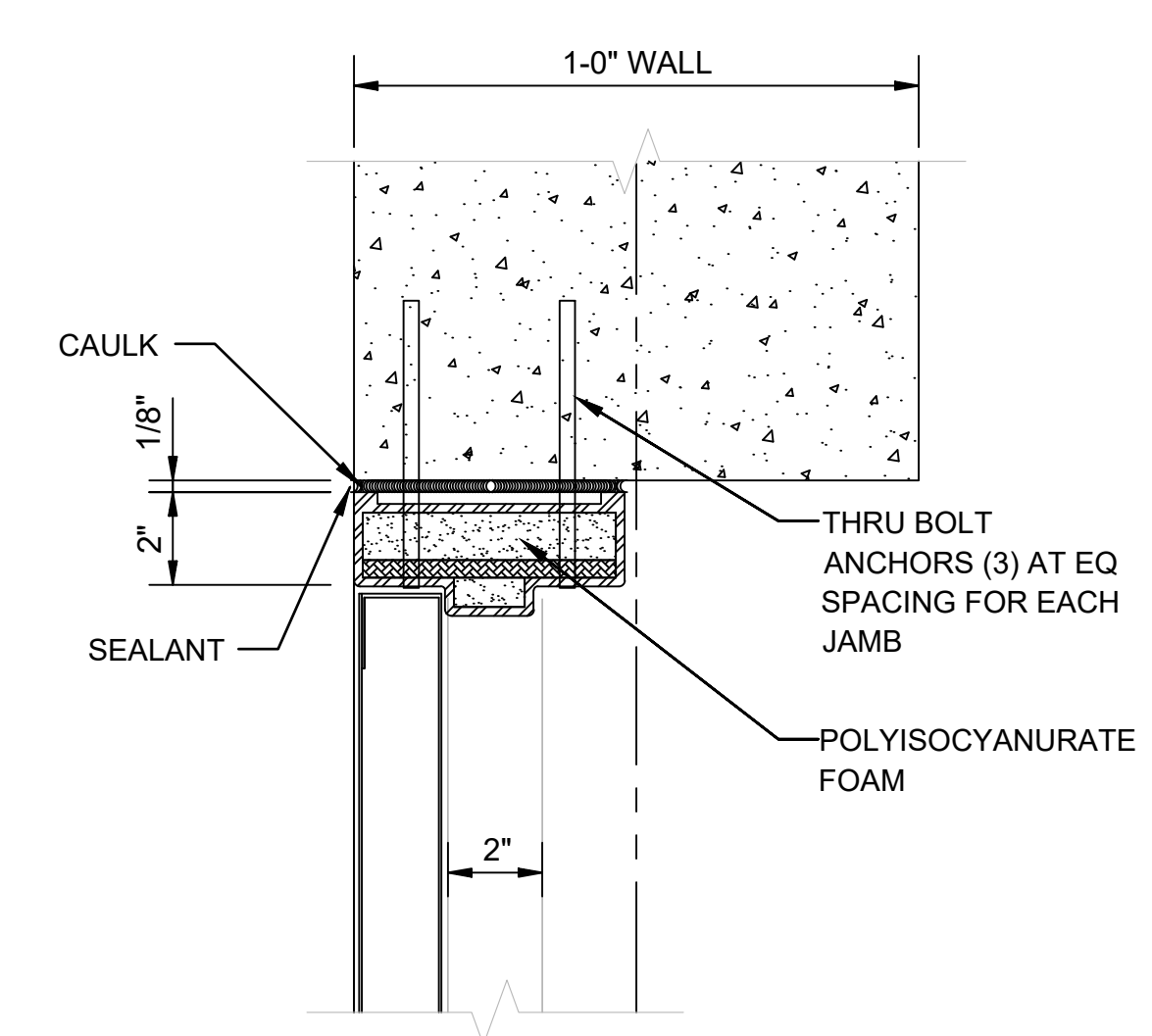
50 STANDARD GRATING
- NTS

- GENERAL NOTES:**
- GRATING SHALL BE LIGHT DUTY GRATING UNLESS OTHERWISE NOTED ON DRAWINGS.
 - GRATING SPAN IS INDICATED BY ← SEE PLAN.
 - INDIVIDUAL GRATING SECTIONS SHALL NOT EXCEED 3'-0" IN WIDTH OR WEIGH MORE THAN 150 POUNDS, UNLESS INDICATED OTHERWISE, FOR TYPES 'A' & 'B' GRATING. TYPE 'C' GRATING SHALL HAVE A MINIMUM WIDTH OF 2'-0" REGARDLESS OF WEIGHT.
 - SHOP DRAWINGS BASED ON FIELD DIMENSIONS SHALL BE SUBMITTED TO THE ENGINEER PRIOR TO FABRICATION.
 - MATERIAL FOR SUPPORTS OF STEEL AND ALUMINUM GRATING TO BE SAME AS GRATING, EXCEPT METAL SUPPORTS THAT ARE TO BE EMBEDDED IN CONCRETE SHALL BE TYPE 316 STAINLESS STEEL.
 - UNLESS NOTED OTHERWISE ON PLANS, GRATING THICKNESS SHALL BE AS TABULATED IN "GRATING THICKNESS TABLE" FOR APPLICABLE GRATING TYPE.
 - FOR SERRATED BEARING BARS, INCREASE GRATING THICKNESSES SHOWN IN TABLES BY 1/4".
 - BEARING BAR THICKNESS FOR GRATING TO BE 3/16" MINIMUM. SEE SPECIFICATIONS FOR SPACING OF BEARING AND CROSS BARS.
 - BAND ALL EDGES. MATCH DEPTH OF BEARING BAR.
 - TYPE OF MATERIAL USED SHALL BE AS SHOWN ON PLANS OR AS SPECIFIED. THIS STANDARD DETAIL INCLUDES 2 TYPES, ALTHOUGH BOTH MAY NOT BE INCLUDED IN PROJECT.
 - THE HORIZONTAL CLEARANCE BETWEEN THE GRATING AND GRATING SUPPORTS SHALL NOT BE LESS THAN 1/4" NOR GREATER THAN 1/2" AND AS SPECIFIED.
 - MINIMUM BEARING HORIZONTAL DIMENSION= 1" FOR GRATING DEPTH 2 1/4" OR LESS. MINIMUM BEARING HORIZONTAL DIMENSION= 2" FOR GRATING DEPTH GREATER THAN 2 1/4"

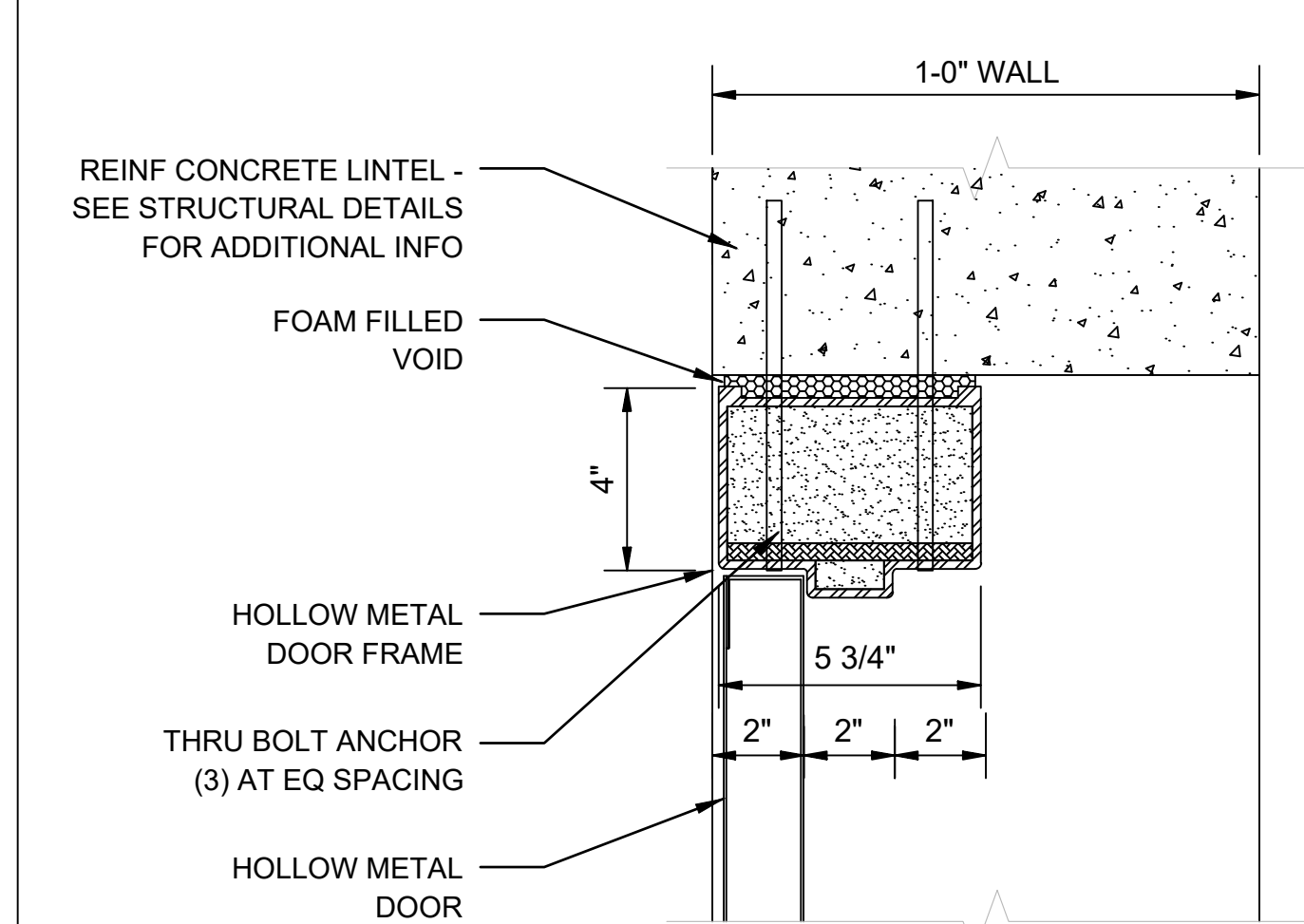
LIGHT DUTY GRATING TYPE 'A' (100 PSF)		
GRATING THICKNESS TABLE		
MAXIMUM SPAN	STEEL	ALUMINUM
3'-6"	1"	1 1/4"
4'-0"	1"	1 1/2"
4'-6"	1"	1 3/4"
5'-0"	1 1/4"	1 3/4"
5'-6"	1 1/4"	2"
6'-0"	1 1/2"	2 1/4"
6'-6"	1 1/2"	2 1/4"
7'-0"	1 3/4"	2 1/2"

MEDIUM DUTY GRATING TYPE 'B' (500 PSF)		
GRATING THICKNESS TABLE		
MAXIMUM SPAN	STEEL	ALUMINUM
< 2'-0"	1"	1"
2'-6"	1"	1 1/4"
3'-0"	1 1/4"	1 1/2"
3'-6"	1 1/4"	1 3/4"
4'-0"	1 1/2"	2"
4'-6"	1 3/4"	2 1/4"
5'-0"	1 3/4"	2 1/2"
5'-6"	2"	DO NOT USE ALUMINUM GRATING
6'-0"	2 1/4"	
6'-6"	2 1/2"	

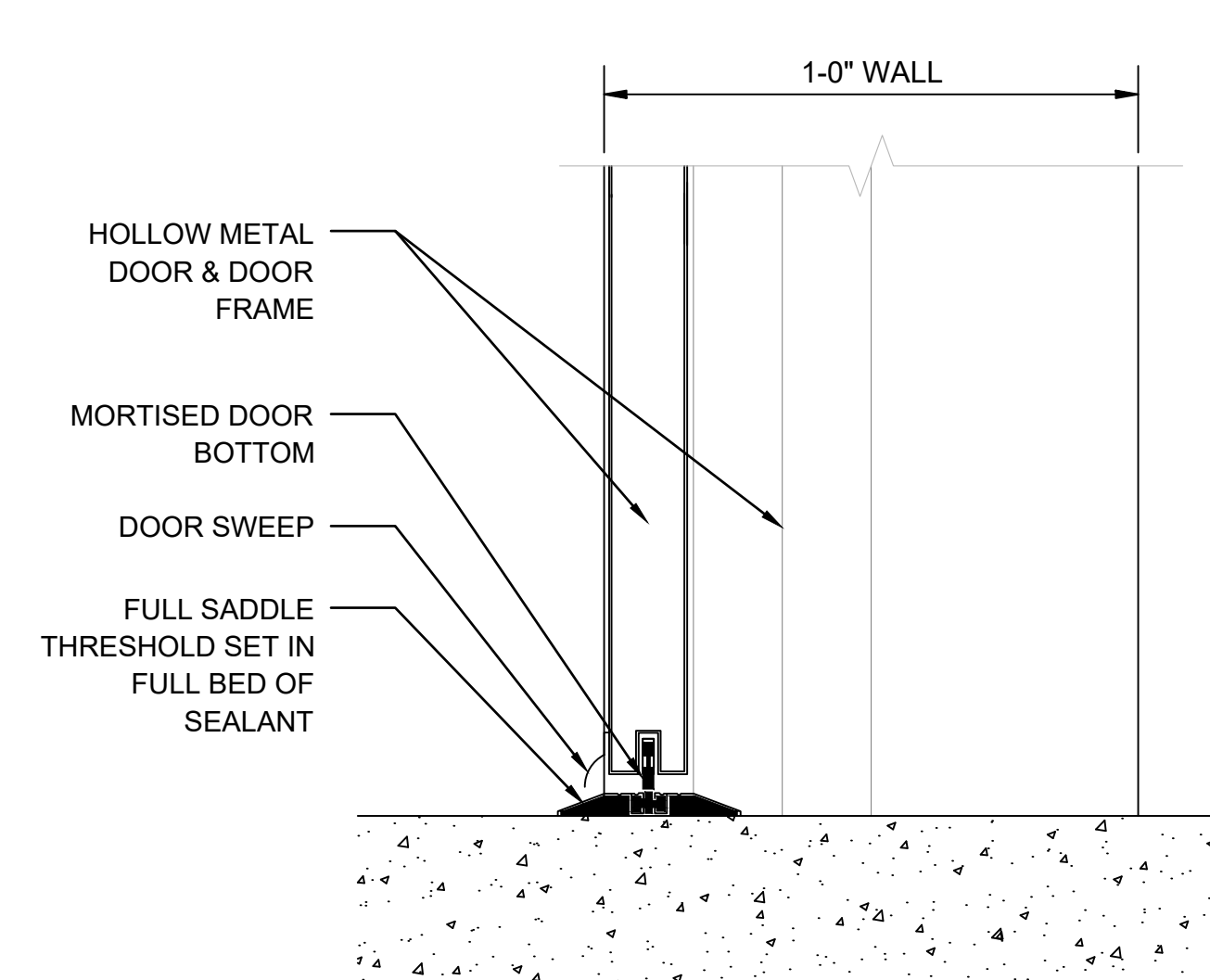
HEAVY DUTY GRATING TYPE 'C' (H 20 WHEEL LOAD)		
GRATING THICKNESS TABLE		
MAXIMUM SPAN	STEEL	ALUMINUM
1'-0"	2"x3/16"	
1'-8"	2 1/2"x1/4"	
2'-0"	2 1/2"x3/8" OR 3"x1/4"	
2'-6"	3"x3/8" OR 4"x1/4"	DO NOT USE ALUMINUM GRATING
3'-3"	3 1/2"x3/8"	
4'-0"	4"x3/8"	
5'-0"	4 1/2"x3/8"	



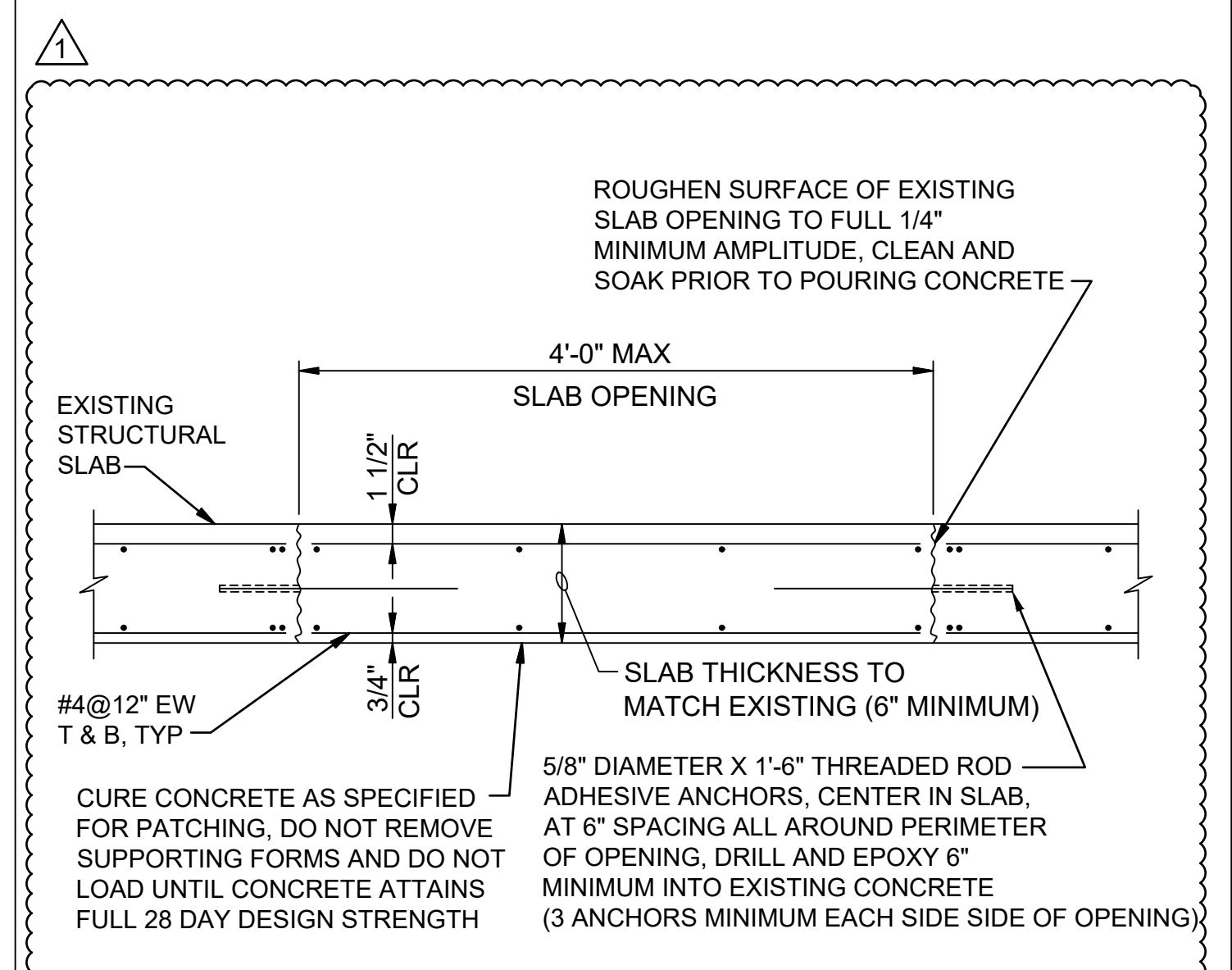
51 JAMB DETAIL
- NTS



52 HEAD DETAIL
- NTS



53 SILL DETAIL
- NTS



54 EXISTING SLAB OPENING REPAIR
- NTS

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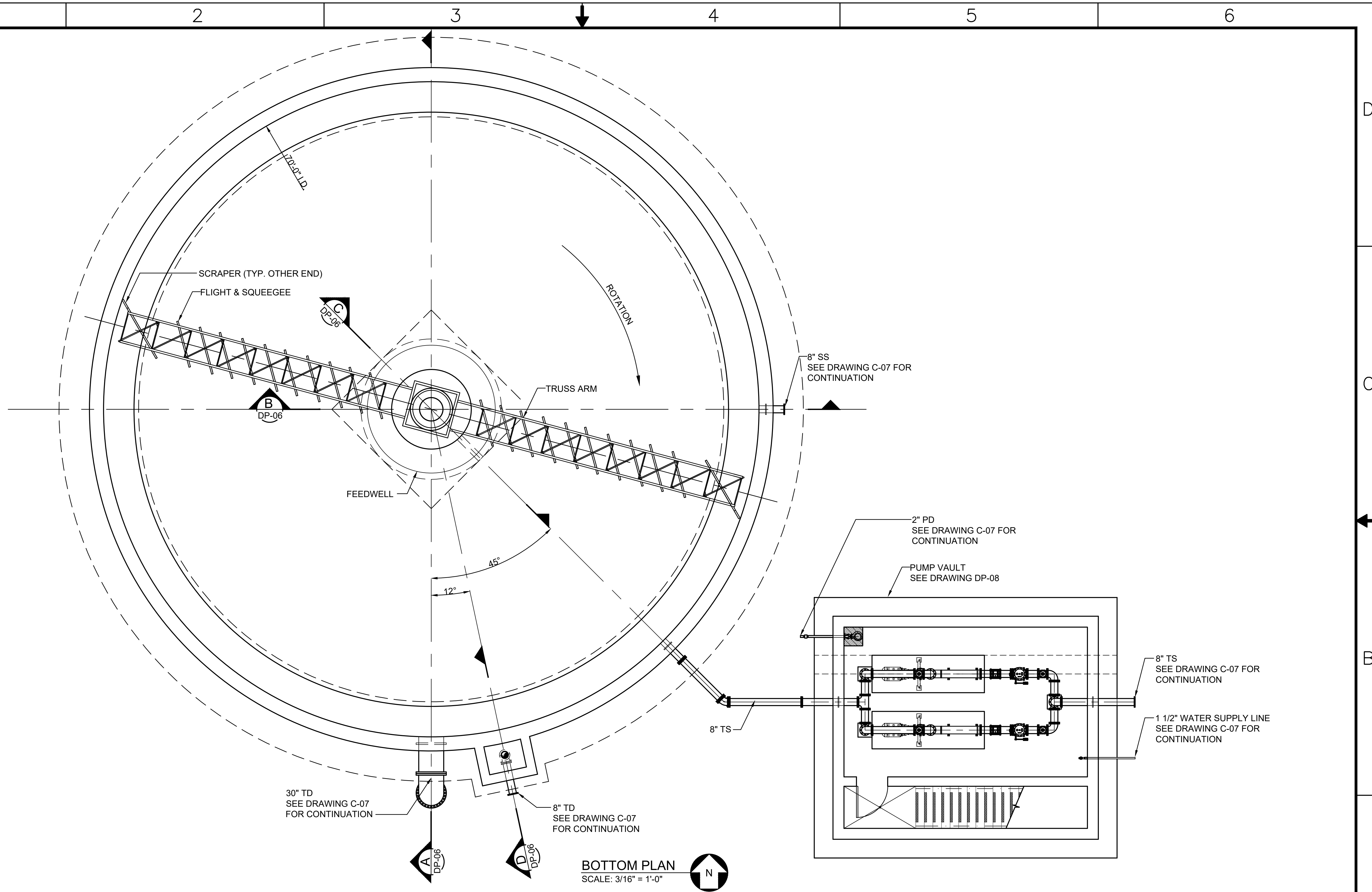
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SHEET TITLE: STRUCTURAL STANDARD DETAILS			
ISSUED:	DESIGNED BY: D.P.		
PROJECT NO. RT-RE-17-03	DRAWN BY: R.C.		
DWG NO. S-DTL-08	CHK BY: D.P.		
SCALE: NONE	CURRENT REVISION: 0	SHEET NUMBER: 62	


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BOTTOM PLAN
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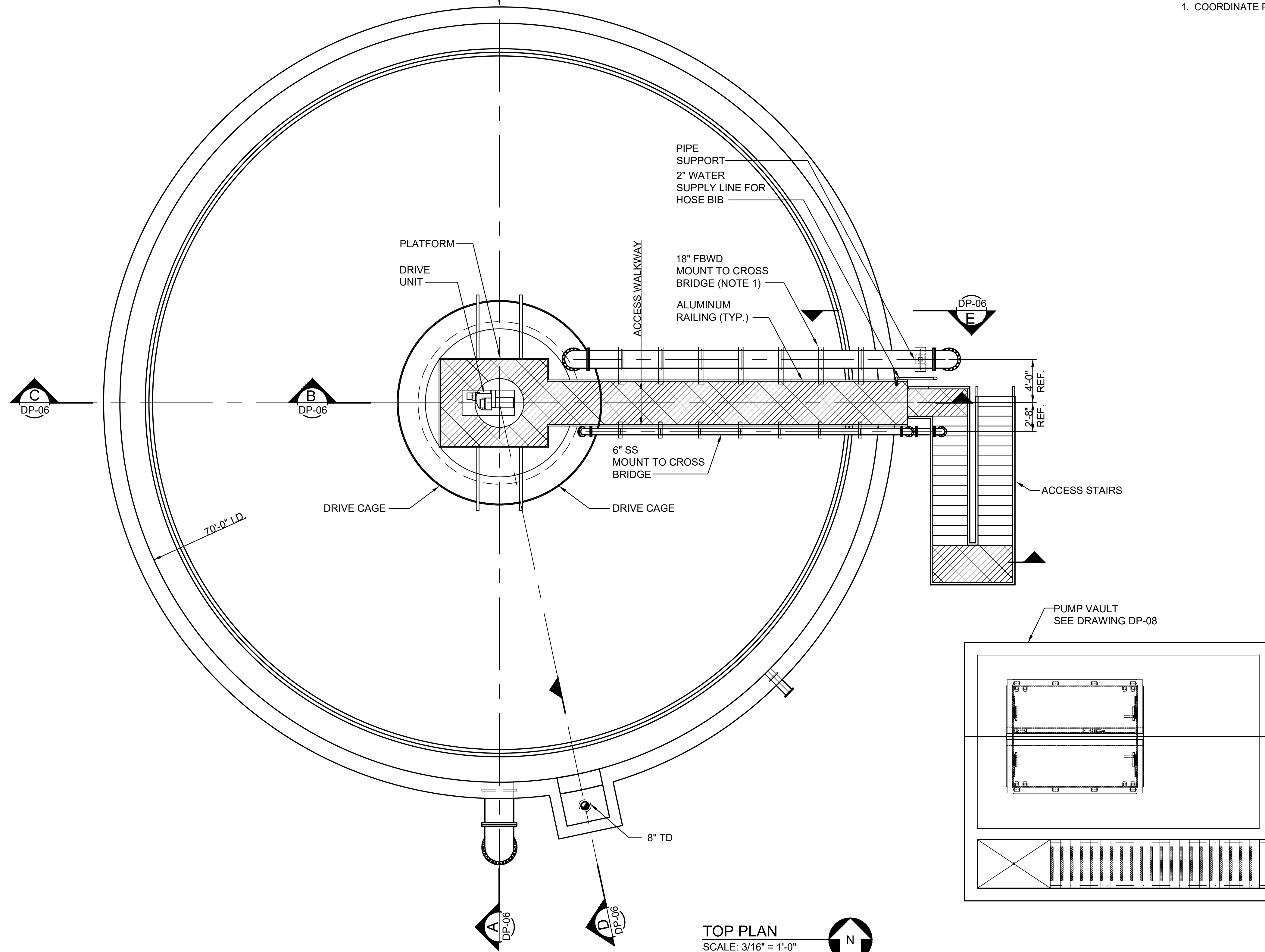
PROJECT:
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IMPROVEMENTS

STAMP:


SHEET TITLE:			
SLUDGE THICKENER BOTTOM PLAN			
ISSUED:	DESIGNED BY: K.S.		
PROJECT NO. RT-RE-17-03	DRAWN BY: O.G.		
DWG NO. DP-04	CHK BY: A.R.		
SCALE: AS NOTED	CURRENT REVISION: 0	SHEET NUMBER: 67	

P:\01 Active Projects\015 - Clayton County\0150022 - Hooper Solids Handling\3D Engineering\Authoring - Civil Files\PROCESS\DP-04 05 06.dwg, PRINTED BY: Dhiren Gajjaran ON: Tue, Mar 26 2019 At 4:58 PM


NOTES
 1. COORDINATE PIPE SUPPORTS WITH BRIDGE MANUFACTURER.



TOP PLAN
 SCALE: 3/16" = 1'-0"

REV	DATE	DESCRIPTION
1	11/30/18	INITIAL ISSUE
2	3/26/19	ADDENDUM NO. 1

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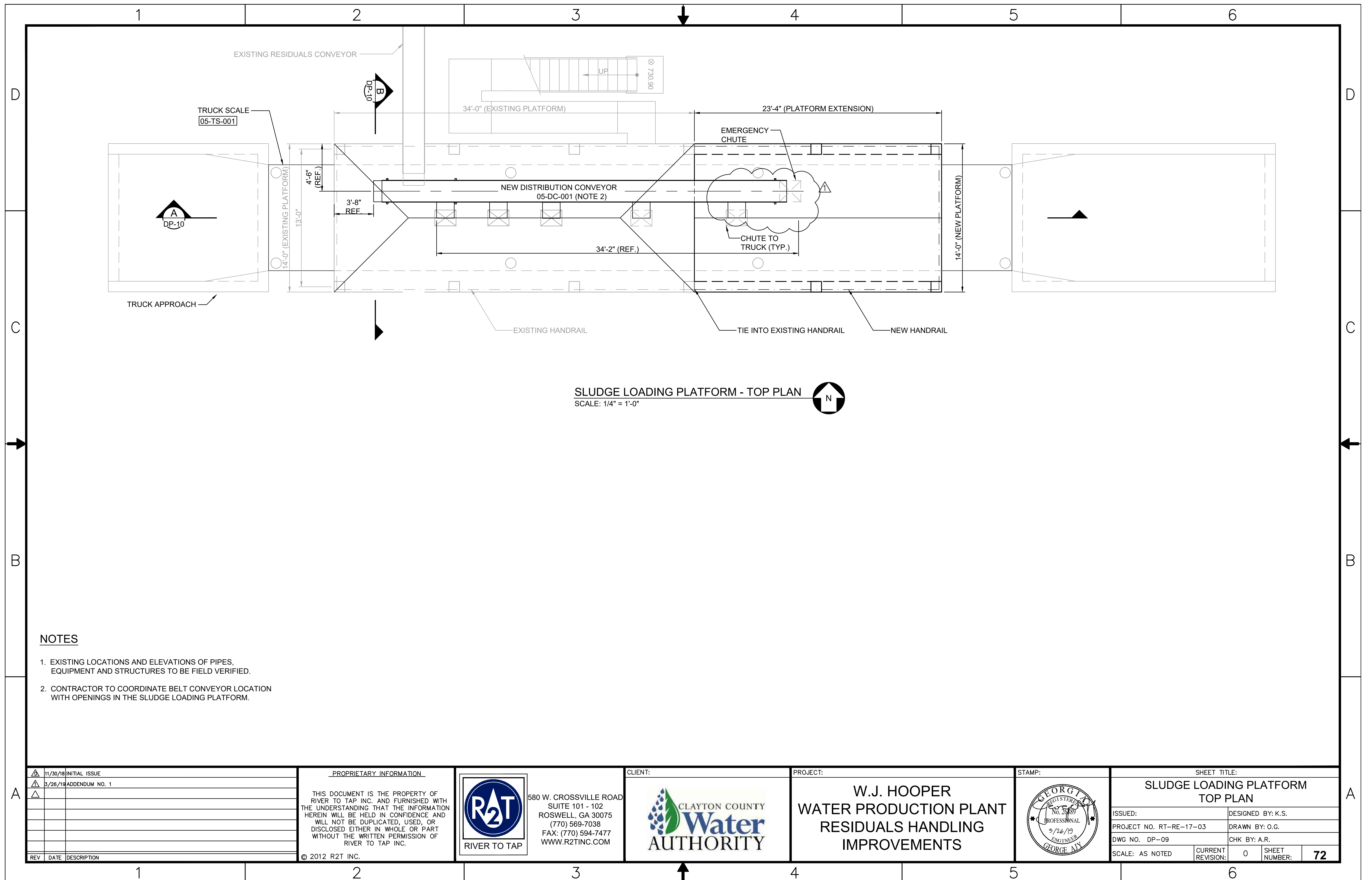
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Water
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PROJECT:
**W.J. HOOPER
 WATER PRODUCTION PLANT
 RESIDUALS HANDLING
 IMPROVEMENTS**

STAMP:


SHEET TITLE:
**SLUDGE THICKENER
 TOP PLAN**

ISSUED:	DESIGNED BY: K.S.
PROJECT NO. RT-RE-17-03	DRAWN BY: O.G.
DWG NO. DP-05	CHK BY: A.R.
SCALE: AS NOTED	CURRENT REVISION: 0
	SHEET NUMBER: 68



SLUDGE LOADING PLATFORM - TOP PLAN
SCALE: 1/4" = 1'-0"

NOTES

1. EXISTING LOCATIONS AND ELEVATIONS OF PIPES, EQUIPMENT AND STRUCTURES TO BE FIELD VERIFIED.
2. CONTRACTOR TO COORDINATE BELT CONVEYOR LOCATION WITH OPENINGS IN THE SLUDGE LOADING PLATFORM.

REV	DATE	DESCRIPTION
1	11/30/18	INITIAL ISSUE
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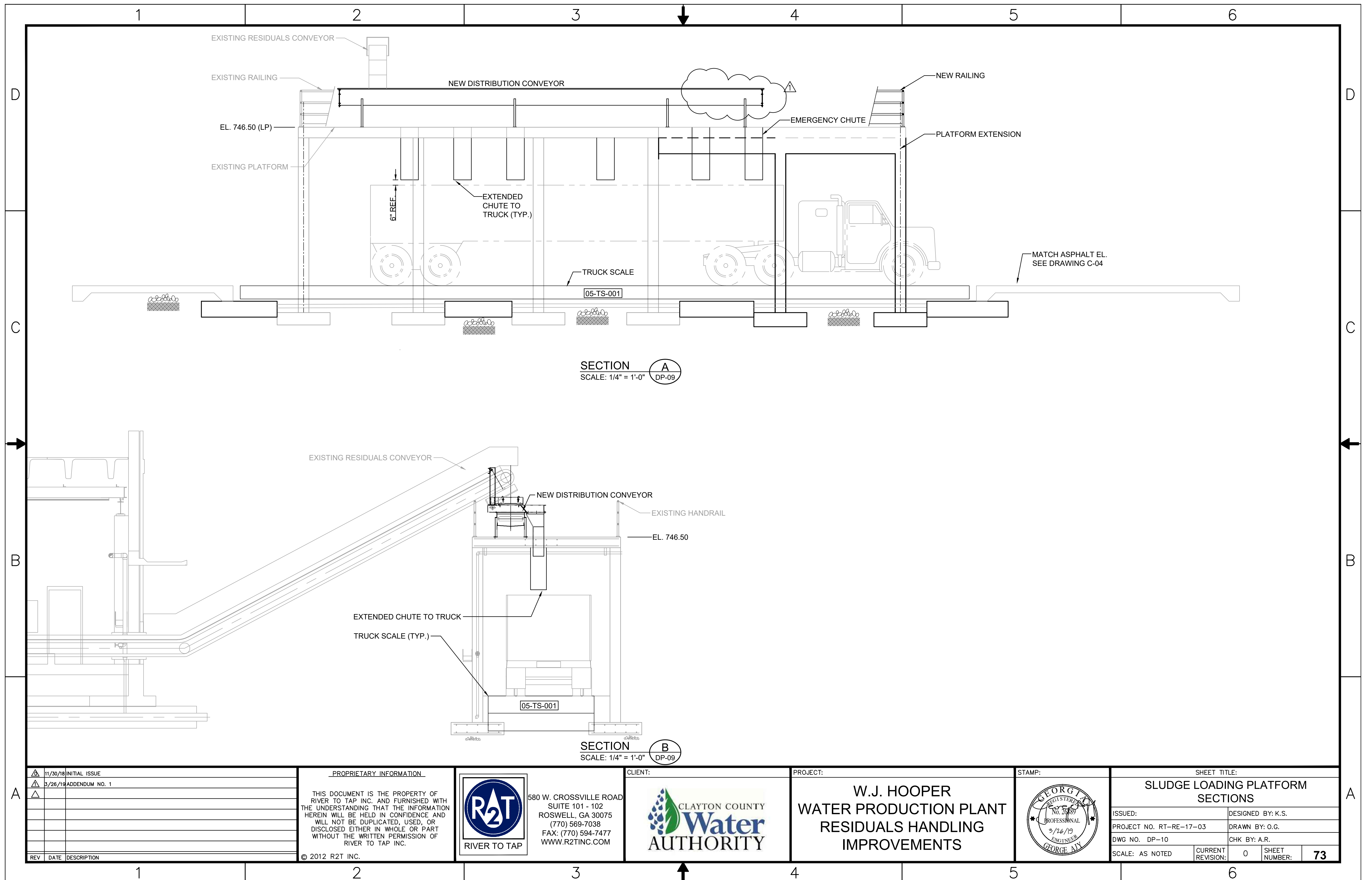
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RESIDUALS HANDLING
IMPROVEMENTS**

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SHEET TITLE:			
SLUDGE LOADING PLATFORM TOP PLAN			
ISSUED:	DESIGNED BY: K.S.		
PROJECT NO. RT-RE-17-03	DRAWN BY: O.G.		
DWG NO. DP-09	CHK BY: A.R.		
SCALE: AS NOTED	CURRENT REVISION: 0	SHEET NUMBER:	72



SECTION A
SCALE: 1/4" = 1'-0" DP-09

SECTION B
SCALE: 1/4" = 1'-0" DP-09

REV	DATE	DESCRIPTION
1	11/30/18	INITIAL ISSUE
2	3/26/19	ADDENDUM NO. 1

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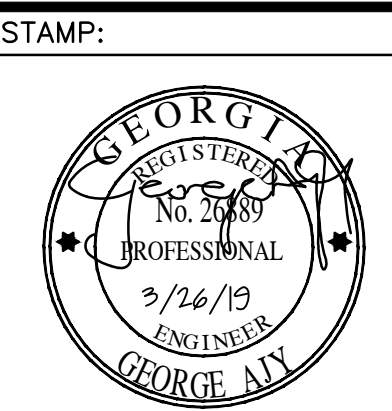
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CLIENT: PROJECT:
**W.J. HOOPER
WATER PRODUCTION PLANT
RESIDUALS HANDLING
IMPROVEMENTS**



SHEET TITLE:			
SLUDGE LOADING PLATFORM SECTIONS			
ISSUED:	DESIGNED BY: K.S.		
PROJECT NO. RT-RE-17-03	DRAWN BY: O.G.		
DWG NO. DP-10	CHK BY: A.R.		
SCALE: AS NOTED	CURRENT REVISION: 0	SHEET NUMBER:	73