

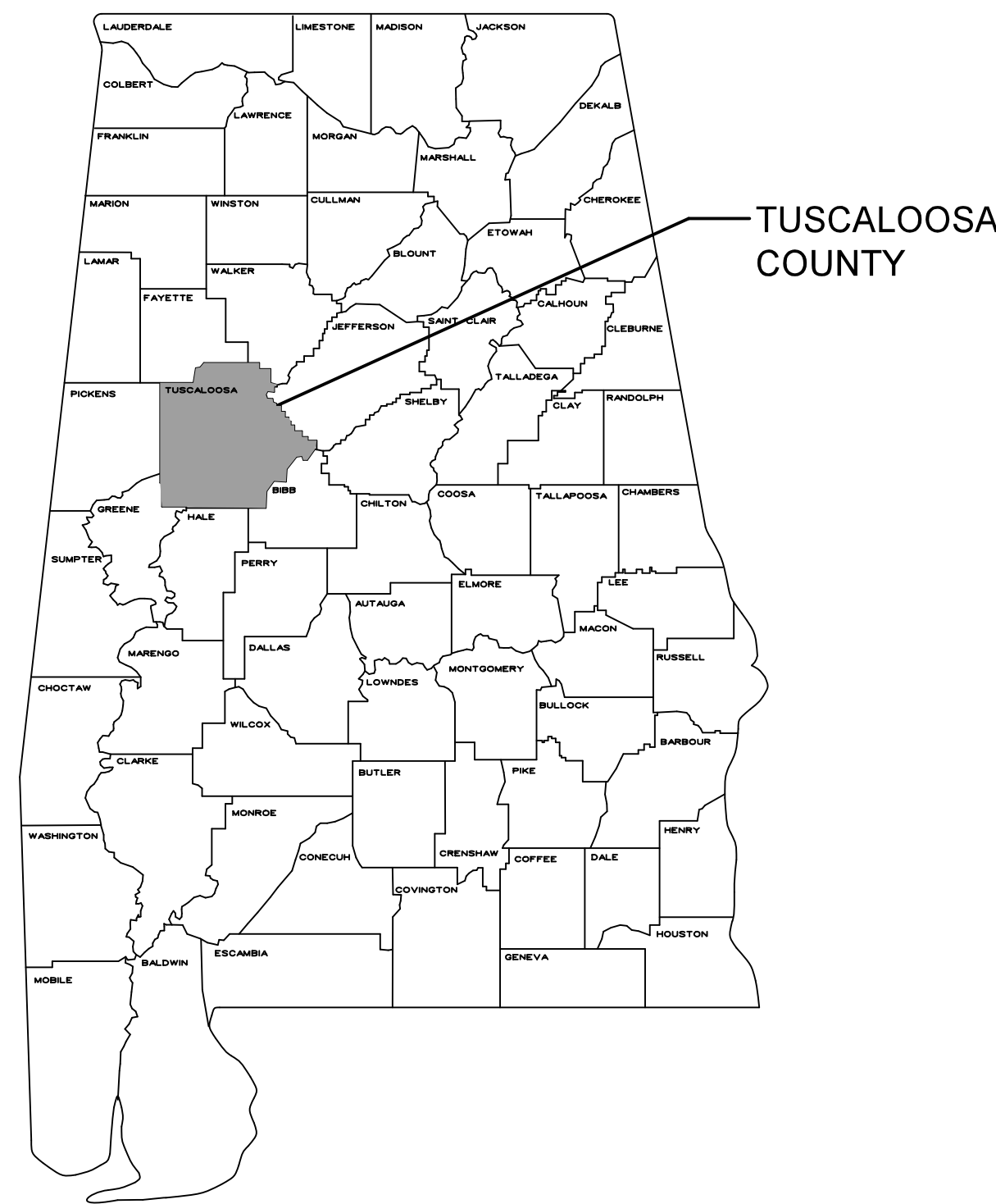
# BROOKWOOD

## SEU WWTP IMPROVEMENTS

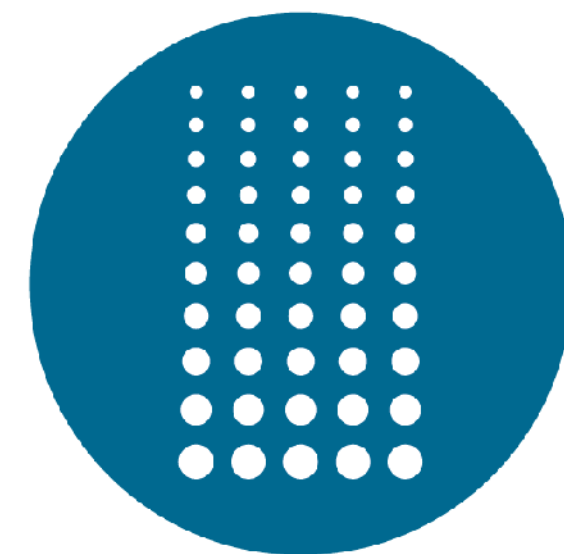
TUSCALOOSA COUNTY, ALABAMA

SW-20026

JUNE 2023

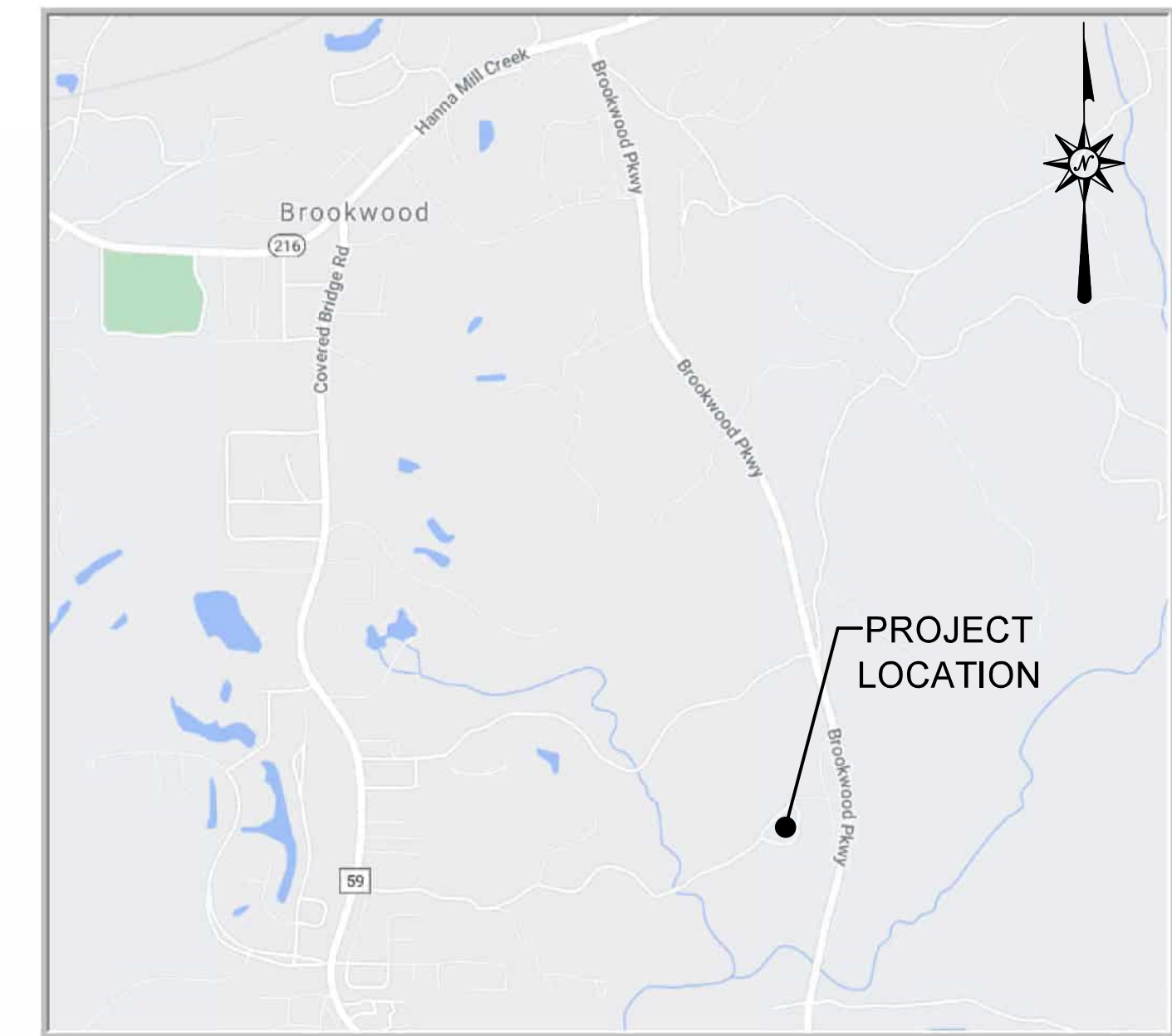


LOCATION MAP  
N.T.S.



### Alabama Water Utilities

A SouthWest Water Company



VICINITY MAP  
N.T.S.



**ENGINEERS**  
OF THE SOUTH



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

COVER SHEET,  
LOCATION MAP &  
VICINITY MAP

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 00-C-01

SHEET NUMBER **1**



# ABBREVIATIONS

@	AT
AFF	ABOVE FLOOR FINISH
AL, ALUM	ALUMINUM
APPROX	APPROXIMATE
ASPH	ASPHALT
ASSY	ASSEMBLY
BLDG	BUILDING
BLK	BLOCK
BM	BENCHMARK
BOT, BTM	BOTTOM
CCP	CONCRETE CULVERT PIPE
CI	CAST IRON
CJ	CONSTRUCTION JOINT
CL	CENTER LINE
CLASS	CLASS
CMU	CONCRETE MASONRY UNIT
CONC	CONCRETE
CONN	CONNECTION
CONT	CONTINUOUS
CP	CONTROL POINT
DIA	DIAMETER
DI	DUCTILE IRON
EA	EACH
EF	EACH FACE
EFF	EFFLUENT
ELEC	ELECTRICAL
EL	ELEVATION
EQ	EQUAL
EW	EACH WAY
EX	EXISTING
EXP	EXPANSION
FFE	FINISH FLOOR ELEVATION
FH	FIRE HYDRANT
FIN GR	FINISH GRADE
FL	FLOW LINE
FLG	FLANGED
FT	FOOT
FTG	FOOTING
GL	GAS LINE
GR	GRADE
GRVL	GRAVEL
GV	GATE VALVE
H, HGT, HT	HEIGHT
HORIZ	HORIZONTAL
HWY	HIGHWAY
ID	INSIDE DIAMETER
IN	INCHES
INF	INFLUENT
INV	INVERT
JT	JOINT
LEN	LENGTH
LG	LONG
LOC	LOCATION
LT	LEFT
MANUF	MANUFACTURER
MAX	MAXIMUM
MGD	MILLION GALLONS PER DAY
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
N	NORTH
NIC	NOT IN CONTRACT
NO.#	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
PE	PLAIN END
PI	POINT OF INTERSECTION
PL	PLATE
PLS	PLACES
PO	PUSH ON
PP	POWER POLE
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
R, RAD	RADIUS
RCP	REINFORCED CONC PIPE
RED	REDUCER
REINF	REINFORCING
REQD	REQUIRED
RFGs	RESTRAINING FOLLOWER GLANDS
RJ	RESTRAINED JOINT
ROW, RW	RIGHT-OF-WAY
RS	RESILIENT SEAT
RT	RIGHT
S	SOUTH
SCH	SCHEDULE
SECT	SECTION
SF	SQUARE FEET
SHT	SHEET
SPECS	SPECIFICATIONS
SQ	SQUARE
SS	STAINLESS STEEL
STA	STATION
STD	STANDARD
T&B	TOP AND BOTTOM
TBM	TEMPORARY BENCHMARK
TEMP	TEMPORARY
THK	THICKNESS
TOC	TOP OF CURB
TYP	TYPICAL
V	VALVE, VOLTS
VERT	VERTICAL
W	WEST, WIDTH, WATER
W/	WITH
W/O	WITHOUT
WL	WATER LINE
WS	WATERSTOP
WWF	WELDED WIRE FABRIC
WWTP	WASTEWATER TREATMENT PLANT
X	BY

# LEGEND

	PROPOSED FACILITIES, LINES, ETC
	EXISTING FACILITIES, LINES, ETC
	SANITARY SEWER
	SEWER FORCE MAIN
	WATER MAIN
	GAS MAIN
	OVERHEAD ELECTRIC
	STORM SEWER
	GRAVEL ROAD OR DRIVE
	RAILROAD
	FENCE
	WATER EDGE
	TREE LINE
	TREE OR SHRUB
	FIRE HYDRANT
	YARD HYDRANT
	WATER VALVE
	SEWER VALVE
	WATER METER
	SECTION MARK
	SECTION NUMBER SHEET NUMBER
	DETAIL NUMBER SHEET NUMBER
	NORTH ARROW
	AIR RELIEF VALVE
	SEWER MANHOLE
	CATCH BASIN
	SIGN
	RAILROAD CROSSING
	MAILBOX
	TELEPHONE PEDESTAL
	GAS VALVE
	STORM SEWER INLET
	BENCH MARK
	BORE
	UTILITY POLE
	STATION MARK
	GUIDE WIRE ANCHOR
	CONCRETE WING WALL
	PROPERTY PIN
	MONUMENT
	GAS REGULATOR
	CAP EXISTING LINE
	LIGHT POLE
	DEMOLISH OR REMOVE
	EXISTING ROADS & SIDEWALKS
	FUTURE ROADS
	FUTURE SIDEWALKS

# GENERAL NOTES

- SAFETY SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE ENGINEER SHALL NOT BE RESPONSIBLE FOR SAFETY, MEANS, NOR METHODS OF THE CONTRACTOR.
- THE LOCATIONS OF ALL UNDERGROUND UTILITIES ARE ASSUMED BASED ON AVAILABLE MAPS, GIS DATA, ETC. NO UTILITIES WERE LOCATED BY ALABAMA ONE CALL (811) PRIOR TO, OR FOLLOWING THE SURVEY. ALL UNDERGROUND UTILITIES MAY NOT BE SHOWN ON THE PLANS. FOR THIS REASON, THE CONTRACTOR SHOULD ANTICIPATE ADDITIONAL TIME WILL BE REQUIRED ON THE PROJECT TO:
  - HAVE UTILITIES LOCATED BY POTHOLING IN THE AREAS AHEAD OF THE WORK.
  - REVIEW ANY POTENTIAL CONFLICTS AND/OR REQUIRED CHANGES IN THE PIPELINE ROUTE WITH THE OWNER AND/OR ENGINEER.
  - SPOT DIG AND/OR RESEARCH WITH ALABAMA POWER TO DETERMINE DEPTHS OF CUT, PIPE MATERIALS, ETC.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING ALL APPROPRIATE AGENCIES BEFORE WORK COMMENCES TO VERIFY THE TYPE, LOCATION, PROTECTION REQUIREMENTS, DEPTH OF ALL EXISTING UTILITIES, DRAINAGE FACILITIES, AND OTHER OBSTRUCTIONS. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH REPAIRING AND/OR REPLACING ANY SUCH ITEMS DAMAGED DURING CONSTRUCTION.
- UTILITIES ON PLANS AND PROFILES ARE SHOWN IN APPROXIMATE LOCATIONS AND MAY BE AT ASSUMED ELEVATIONS. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING LOCATIONS OF EXISTING UTILITIES, OBSTRUCTIONS, AND DRAINAGE STRUCTURES. ALL EXISTING LINES SHALL REMAIN ACTIVE THROUGHOUT CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTION OF EXISTING UTILITIES DURING CONSTRUCTION AND SATISFACTORY REPAIR OR REPLACEMENT OF DAMAGED FACILITIES.
- CONTRACTOR SHALL LOCATE AND UNCOVER ALL POTENTIALLY CONFLICTING UTILITIES BEFORE CONSTRUCTION GRADES OR DEPTHS OF CUT ARE FINALIZED AND PIPE IS LAID.
- APPROXIMATE LOCATIONS OF OVERHEAD POWER LINES MAY OR MAY NOT BE SHOWN ON PLANS. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR VERIFYING ALL LOCATIONS IN THE FIELD AND PLAN WORK IN THESE AREAS ACCORDINGLY.
- EASEMENTS, PROPERTY BOUNDARIES, AND RIGHTS-OF-WAY INDICATED ON PLANS FOR GENERAL PURPOSE ONLY. CONTRACTOR TO VERIFY ALL IN THE FIELD AS REQ'D.
- CONTRACTOR SHALL BE RESPONSIBLE FOR SITE DRAINAGE, STORMWATER PERMITS, AND COMPLIANCE WITH ALL GOVERNMENTAL STORMWATER REGULATIONS.
- CONTRACTOR SHALL MAINTAIN TRAFFIC FLOW AROUND TREATMENT FACILITY WITH MINIMUM DISRUPTION OF ACCESS.
- ALL STREETS AND DRIVEWAYS SHALL BE OPEN CUT UNLESS NOTED OTHERWISE.
- ALL ASPHALT AND CONCRETE PAVING REMOVED AND REPLACED SHALL BE NEAT SAW CUT.
- ALL EXCAVATION BACKFILL IN NON-TRAFFIC OR NON-PAVED AREAS SHALL BE COMPACTED TO MIN 95% STANDARD PROCTOR DENSITY TO PREVENT SETTLEMENT.
- ROCK SHALL BE UNDERCUT A MINIMUM OF 4" AND PIPE BEDDED IN STONE.
- ALL DUCTILE IRON PIPE AND FITTINGS SHALL BE LINED PER SPECIFICATIONS. ALL TRENCHES TO BE COMPACTED PER THE DETAIL TO PREVENT SETTLEMENT.
- ALL CONNECTIONS TO EXISTING LINES TO BE COORDINATED WITH THE OWNER TO MINIMIZE INTERRUPTION OF WATER AND/OR SEWER SERVICE.
- ALL LANDSCAPED AREAS, FENCES, ETC. AFFECTED BY CONSTRUCTION SHALL BE REPLACED AND RESTORED IN-KIND (UNLESS SPECIFICALLY NOTED ON THE PLANS). ALL DISTURBED GRASSED AREAS SHALL BE RESODDED OR SEEDED.
- CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER DISPOSAL OF ANY EXCESS MATERIALS RESULTING FROM THE WORK.
- NO EXCAVATIONS SHALL BE LEFT UN-ATTENDED BY THE CONTRACTOR'S PERSONNEL.
- PILING, SHORING, ETC. WHERE INDICATED IN AREAS ON THE PLANS SHALL BE THE MINIMUM REQUIRED. ALL PILING, SHORING, ETC. SHALL BE TEMPORARY UNLESS INDICATED OTHERWISE IN THE PLANS. ALL PILING, SHORING, ETC. (SIZE, DEPTHS, LOCATIONS, TYPES, ETC.) SHALL BE DESIGNED, FURNISHED, AND MAINTAINED BY THE CONTRACTOR.
- UNLESS THE CONTRACTOR HAS MADE OTHER ARRANGEMENTS ON HIS OWN FOR TEMPORARY FACILITIES, ALL PIPE, FITTINGS, BORE PITS, MARKERS, ETC. SHALL BE INSTALLED ON STATE OR COUNTY ROW, PERMANENT OR CONSTRUCTION EASEMENTS.
- CLEARING LIMITS NOT SHOWN, CONTRACTOR SHALL VERIFY ALL REQUIREMENTS IN FIELD.



PROJECT LOCATION MAP

# SHEET INDEX

CIVIL SHEETS	DWG#	DRAWING DESCRIPTION
00-GENERAL		
1	00-C-01	COVER SHEET
2	00-C-02	SHEET INDEX AND PROJECT NOTES
3	00-C-03	PROJECT NOTES
4	00-C-04	SANITARY SEWER PROJECT NOTES
5	00-C-05	CONCRETE NOTES
10-SITE		
6	10-C-01	EXISTING SITE PLAN
7	10-C-05	OVERALL SITE PLAN IMPROVEMENTS
8	10-C-06	WWTP SITE PLAN
20-SCREENING UNIT		
9	20-C-01	PARKSON HYCOR SCREENING UNIT PLAN
10	20-C-02	PARKSON HYCOR SCREENING UNIT SECTIONS
11	20-C-03	PARKSON HYCOR SCREENING UNIT MECHANICAL
12	20-C-04	PARKSON HYCOR SCREENING UNIT STAIRS DETAIL
13	20-C-07	SCREENING UNIT FORCE MAIN CONNECTION SECTION C
14	20-C-10	IPEC SCREENING UNIT PLAN
15	20-C-11	IPEC SCREENING UNIT SECTIONS
16	20-C-12	IPEC SCREENING UNIT MECHANICAL
17	20-C-13	IPEC SCREENING UNIT STAIRS DETAIL
18	20-C-14	GRINDER PUMP STATION AND TRENCH DRAIN DETAILS
30-FILTRATION AND DISINFECTION UNITS		
19	30-C-01	FILTRATION AND DISINFECTION UNITS LOWER PLAN
20	30-C-02	FILTRATION AND DISINFECTION UNITS UPPER PLAN
21	30-C-03	FILTRATION AND DISINFECTION UNITS EQUIPMENT PLAN
22	30-C-04	FILTRATION AND DISINFECTION UNITS SECTIONS A AND B
23	30-C-05	FILTRATION AND DISINFECTION UNITS SECTIONS C AND D
24	30-C-06	FILTRATION AND DISINFECTION UNITS SECTION E
25	30-C-07	FILTRATION AND DISINFECTION UNITS REUSE PUMP PLAN
26	30-C-08	FILTRATION AND DISINFECTION UNITS SECTIONS F AND G
27	30-C-09	FILTRATION AND DISINFECTION UNITS SECTION H
28	30-C-10	UV DISINFECTION UNIT PLAN AND SECTIONS
40-FLUIDYNE FILTER		
29	40-C-01	FLUIDYNE FILTER PLAN AND ANCHOR PLACEMENT
30	40-C-02	FLUIDYNE FILTER SECTIONS
31	40-C-03	FLUIDYNE FILTER HOIST DETAILS
95-DETAILS		
32	95-C-01	TYPICAL DETAILS THRUST RESTRAINT
33	95-C-02	TYPICAL DETAILS SITE SHT 1
34	95-C-03	TYPICAL DETAILS PIPE SUPPORT
35	95-C-04	TYPICAL DETAILS METALS
E-ELECTRICAL		
36	00-E-01	ELECTRICAL LEGEND
37	00-E-02	ELECTRICAL NOTES & LIGHTING FIXTURE SCHEDULE
38	00-E-03	ELECTRICAL SCHEDULES AND DIAGRAMS
39	10-E-01	OVERALL SITE ELECTRICAL DEMOLITION PLAN
40	10-E-02	OVERALL SITE ELECTRICAL PLAN
41	20-E-01	SCREENING UNIT ELECTRICAL PLAN
42	20-E-02	SCREENING UNIT SUPPLEMENTAL GROUNDING PLAN
43	30-E-01	FILTRATION AND DISINFECTION UNITS ELECTRICAL PLAN
44	30-E-02	FILTRATION AND DISINFECTION UNITS SUPPLEMENTAL GROUNDING PLAN
45	95-E-01	ELECTRICAL DETAILS
46	95-E-02	ELECTRICAL DETAILS
47	95-E-03	ELECTRICAL DETAILS



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Alabama Water Utilities**  
 BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
 SEU WWTP IMPROVEMENTS  
 TUSCALOOSA COUNTY, ALABAMA

SHEET INDEX AND PROJECT NOTES

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO:	SW-20026
DATE:	JUNE, 2023
DESIGNED BY:	WEC
DRAWN BY:	LEE
DWG:	00-C-02

SHEET NUMBER **2**



**PROJECT SPECIFIC NOTES**

- CONTRACTOR SHALL NOTIFY OWNER AND ENGINEER A MINIMUM OF 24 HOURS PRIOR TO BEGINNING ANY WORK
- ALL FEMA, USACE, COUNTY, CITY AND/OR STATE PERMITS SHALL BE IN HAND AND ON SITE DURING THE CONSTRUCTION OF THE PROJECT.
- ALL PERMITS, OTHER THAN THOSE LISTED IN THE SPECIFICATIONS, FOR THE DEVELOPMENT OF THESE PLANS ARE THE CONTRACTOR'S RESPONSIBILITY AND SHOULD BE OBTAINED PRIOR TO DISTURBING ANY AREAS OR BEGINNING ANY CONSTRUCTION.
- CONTRACTOR SHALL COORDINATE HIS WORK WITH ALL OTHER CONCURRENT WORK BEING PERFORMED IN THE AREA.
- A SIGNED AND SEALED COPY OF THE PLANS SHALL BE MAINTAINED ON SITE AND MADE READILY AVAILABLE FOR THE DURATION OF THE CONSTRUCTION.
- THE CONTRACTOR SHALL OBTAIN FROM THE ENGINEER ONE (1) SET OF BLUELINE PRINTS OF THE CONTRACT PLANS. THESE PLANS SHALL BE KEPT AND MAINTAINED IN GOOD CONDITION AT THE PROJECT SITE AND A QUALIFIED REPRESENTATIVE OF THE CONTRACTOR SHALL ENTER UPON THESE PRINTS, FROM DAY-TO-DAY, THE ACTUAL "AS-BUILT" RECORD OF THE CONSTRUCTION PROGRESS. ENTRIES AND NOTATIONS SHALL BE MADE IN A NEAT AND LEGIBLE MANNER AND THESE PRINTS SHALL BE DELIVERED TO THE ENGINEER UPON COMPLETION OF THE CONSTRUCTION. APPROVAL FOR FINAL PAYMENT WILL BE CONTINGENT UPON COMPLIANCE WITH THIS PROVISION.
- AFTER CONSTRUCTION BEGINS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR INFORMING AND/OR NOTIFYING THE ENGINEER AT LEAST FOURTY-EIGHT (48) HOURS IN ADVANCE OF THE FOLLOWING:
  - DAILY WORK SCHEDULE INCLUDING ANY CHANGES IN SCHEDULE.
  - IF WORK IS TO BE PERFORMED ON WEEKENDS AND/OR HOLIDAYS.
  - DATES TRENCHES WILL BE OPEN AND SEWERS WILL BE INSTALLED.
  - DATES STRUCTURES WILL BE INSTALLED.
  - DATE ALL APPLICABLE TESTS ARE TO BE PERFORMED.
  - DATE "AS-BUILT" VERIFICATION IS TO BE PERFORMED.
  - ANY OTHER INFORMATION DEEMED NECESSARY TO ASSURE TO SANITARY SEWER FACILITIES ARE PROPERLY CONSTRUCTED.
- ALL TESTING REQUIRED SHALL BE PERFORMED UNDER THE OBSERVATION OF THE ENGINEER, AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO SCHEDULE THE TESTING WITH THE APPROPRIATE PARTY. TEST RESULTS OBTAINED IN THE ABSENCE OF THE ENGINEER SHALL NOT BE ACCEPTED. PROVIDE A MINIMUM OF 48 HOURS NOTICE BEFORE COMMENCEMENT OF WORK AND TESTING.
- ANY PORTION OF THE SANITARY SEWER FACILITY NOT INSPECTED AS PRESCRIBED BY THIS SECTION MAY REQUIRE EXCAVATION TO THE EXTENT REQUIRED BY THE ENGINEER.
- ANY PORTION OF THE SANITARY SEWER FACILITY NOT PASSING THE TESTS SHALL BE REPAIRED OR REPLACED TO THE EXTENT REQUIRED BY THE ENGINEER AND RETESTED.

**SITE WORK NOTES**

- SUBMITTALS**
  - PROJECT DATA SHALL INCLUDE MANUFACTURERS' STANDARD SCHEMATIC DRAWINGS MODIFIED TO DELETE INFORMATION WHICH IS NOT APPLICABLE TO THE PROJECT, AND SHALL BE SUPPLEMENTED TO PROVIDE ADDITIONAL INFORMATION APPLICABLE TO THE PROJECT. EACH COPY OF DESCRIPTIVE LITERATURE SHALL BE CLEARLY MARKED TO IDENTIFY PERTINENT INFORMATION AS IT APPLIES TO THE PROJECT.
  - WHERE SAMPLES ARE REQUIRED, THEY SHALL BE ADEQUATE TO ILLUSTRATE MATERIALS, EQUIPMENT OR WORKMANSHIP, AND TO ESTABLISH STANDARDS BY WHICH COMPLETED WORK IS JUDGED. PROVIDE SUFFICIENT SIZE AND QUANTITY TO CLEARLY ILLUSTRATE FUNCTIONAL CHARACTERISTICS OF PRODUCT AND MATERIAL, WITH INTEGRALLY RELATED PARTS AND ATTACHMENT DEVICES.
  - ALL SUBMITTALS SHALL BE MARKED TO IDENTIFY THE PROJECT, CONTRACTOR, SUBCONTRACTOR, OR SUPPLIER; PERTINENT PLANS; AND SPECIFICATION SECTION IF APPLICABLE.
  - PRIOR TO SUBMITTAL TO THE ENGINEER, THE CONTRACTOR SHALL REVIEW AND CHECK SUBMITTALS, AND SHALL INDICATE REVIEW BY HIS STAMP, INITIALS, AND DATE.
  - IF THE SUBMITTALS INDICATE DEVIATIONS FROM THE PLANS AND/OR SPECIFICATIONS, THE CONTRACTOR SHALL ADVISE THE ENGINEER, IN THE LETTER OF TRANSMITTAL OF THE DEVIATION AND THE REASONS THEREFOR. ALL DEVIATIONS AND VARIANCES SHALL BE CLEARLY MARKED ON THE SUBMITTAL WITH A BOLD RED MARK. ALL ADDITIONAL COSTS RESULTING FROM MODIFICATIONS REQUESTED BY THE CONTRACTOR SHALL BE BORNE BY THE CONTRACTOR.
  - THE CONTRACTOR SHALL SUBMIT FIVE (5) COPIES OF SUBMITTAL DOCUMENTS UNLESS OTHERWISE SPECIFIED IN THE FOLLOWING PARAGRAPHS OR IN THE SPECIAL CONDITIONS.
  - CONTRACTOR'S STAMP: THE CONTRACTOR SHALL APPLY CONTRACTOR'S STAMP, INITIALS, AND DATE CERTIFYING THAT THE ITEMS HAVE BEEN REVIEWED IN DETAIL AND ARE CORRECT AND IN ACCORDANCE WITH CONTRACT DOCUMENTS, EXCEPT AS NOTED BY ANY REQUESTED VARIANCE.
- SCOPE OF WORK**

THIS PROJECT SHALL CONSIST OF FURNISHING OF ALL MATERIAL, EQUIPMENT, MACHINERY, LABOR, ETC., NECESSARY FOR THE CONSTRUCTION OF THE FACILITIES MORE PARTICULARLY DESCRIBED ON THE PLANS AND IN THESE SPECIFICATIONS. WORK SHALL INCLUDE ALL NECESSARY ITEMS OF CONSTRUCTION AND EQUIPMENT WITHIN THE LIMITS SHOWN ON THE PLANS IN ORDER TO PROVIDE FINISHED INSTALLATIONS COMPLETE IN EVERY RESPECT IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS.
- SPECIAL EQUIPMENT REQUIRED**

CONTRACTOR MUST PROVIDE ANY SPECIAL EQUIPMENT REQUIRED DURING CONSTRUCTION INCLUDING PIPE LOCATORS, PIPE CUTTERS, TAPPING MACHINES, ETC.
- WARRANTY**

THE GENERAL CONTRACTOR SHALL GUARANTEE ALL EQUIPMENT AND WORK FOR A PERIOD OF ONE (1) YEAR AFTER ACCEPTANCE BY THE OWNER UNLESS EXTENDED IN THE CONTRACT DOCUMENTS. THE OWNER RESERVES THE RIGHT TO NEGOTIATE DIRECTLY WITH SUB-CONTRACTORS, EQUIPMENT SUPPLIERS AND OTHERS CONCERNING WARRANTY MATTERS.
- WORK COMPLETION**

CLEAN-UP: UPON COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL REMOVE ALL BOXES, FORMS, LEFTOVER MATERIALS, ETC., AND SHALL LEAVE THE ENTIRE AREA IN A NEAT AND ORDERLY CONDITION. TESTING OF PIPING AND EQUIPMENT: BEFORE THE WORK UNDER THIS PROJECT IS ACCEPTED, THE CONTRACTOR MUST SUBJECT THE VARIOUS COMPONENTS OF THE SYSTEM TO THE TESTS AS REQUIRED TO PROVE THE SYSTEM. ALL TESTS MUST BE SCHEDULED IN ADVANCE, AND SHALL BE PERFORMED AT A TIME ACCEPTABLE TO THE HEALTH DEPARTMENT AND THE OWNER. THE TESTS MUST BE MADE IN A MANNER ACCEPTABLE TO THE OWNER, AND IN THE PRESENCE OF THE HEALTH DEPARTMENT AND OWNER.

ALL PIPING SHALL BE PRESSURE TESTED AS INDICATED ON THE PLANS. ALL OBVIOUS LEAKS SHALL BE REPAIRED BEFORE ACCEPTANCE.

ALL TANKS, BASINS, SUMPS, OR OTHER WATER CONTAINING STRUCTURES SHALL BE FIELD TESTED FOR WATERTIGHTNESS BY FILLING THE STRUCTURE WITH WATER TO A LEVEL TWO INCHES (2") ABOVE HIGH WATER LEVEL AND ALLOWING IT TO STAND FOR TWENTY FOUR (24) HOURS. ANY DROP IN LIQUID LEVEL SHALL BE TAKEN AS EVIDENCE THAT LEAKAGE EXISTS, AND SUCH LEAKAGE MUST BE ELIMINATED BEFORE THE STRUCTURE WILL BE ACCEPTED.

TESTS OF PUMPS, CONTROL SYSTEM, BLOWER, ETC., MUST BE MADE BY OR IN THE PRESENCE OF THE OWNER'S REPRESENTATIVE, AND ANY DEFECTS NOTED SHALL BE CORRECTED BEFORE ACCEPTANCE.

**SITE WORK NOTES (CONTINUED)**

- SOIL BEARING CAPACITY SHALL BE VERIFIED BY A REGISTERED GEOTECHNICAL SOILS ENGINEER AT THE TIME OF EXCAVATION. SUBMIT TEST REPORTS TO ENGINEER AND OWNER.
- IF, AFTER EXCAVATION, THE CONDITION OF THE SOIL INDICATES A SAFE BEARING CAPACITY OF LESS THAN 1500 PSI ON SOIL, THE ENGINEER SHALL BE NOTIFIED AND NEW COMPACTED FILL INSTALLED BY CONTRACTOR. COLUMN FOOTINGS AND WALL FOOTINGS SHALL BE POURED MONOLITHIC WITH THE TOPS OF ADJACENT FOOTINGS AT THE SAME ELEVATION. ALL FOOTINGS SHALL BEAR ON ORIGINAL UNDISTURBED SOIL, WHERE POSSIBLE. COMPACTION TESTS SHALL BE PERFORMED TO CONFIRM THAT THE ALLOWABLE BEARING CAPACITY OF SOIL TO A DEPTH OF ONE FOOT BELOW BEARING ARE COMPACTED TO AT LEAST 95% OF THE MAXIMUM STANDARD PROCTOR DRY DENSITY. TOP 12 INCHES BELOW BEARING SHALL BE COMPACTED TO 98% OF THE STANDARD PROCTOR DRY DENSITY NOTE NO GEOTECHNICAL INVESTIGATION REPORT WAS AVAILABLE DURING DESIGN OF THIS PROJECT.
- PROVIDE POSITIVE DRAINAGE AWAY FROM THE BUILDING AREA, BOTH DURING CONSTRUCTION AND PERMANENTLY.
- MAINTAIN STABILITY OF EXCAVATIONS UNTIL PROPERLY BACKFILLED, KEEP EXCAVATIONS FREE OF ANY LOOSE MATERIAL, DEWATER EXCAVATIONS AND REMOVE ANY WET MATERIAL PRIOR TO THE PLACING OF CONCRETE WORK.
- FILLING AND BACKFILLING**
  - GENERAL: FILL AND BACKFILL WITH SATISFACTORY BORROW MATERIAL EXCEPT WHERE OTHERWISE NOTED.
  - GROUND SURFACE PREPARATION: REMOVE VEGETATION, DEBRIS, UNSATISFACTORY SOIL MATERIALS, OBSTRUCTIONS AND DELETERIOUS MATERIALS FROM GROUND SURFACE PRIOR TO PLACEMENT OF FILLS. WHEN EXISTING GROUND SURFACE HAS A DENSITY LESS THAN THAT SPECIFIED, BREAK UP THE GROUND SURFACE, PULVERIZE MOISTURE CONDITION TO +/- 3% OF OPTIMUM MOISTURE CONTENT, AND COMPACT TO REQUIRED DEPTH AND PERCENTAGE OF MAXIMUM DENSITY. SHOULD IT BECOME NECESSARY TO MODIFY EXISTING SOIL TO AN ACCEPTABLE PLASTICITY INDEX AND DENSITY, IT SHALL BE MECHANICALLY MIXED WITH STABILIZATION MATERIAL AND COMPACTED UNTIL ACCEPTABLE TESTS ARE OBTAINED.
  - PLACEMENT AND COMPACTION: PLACE BACKFILL AND FILL MATERIALS IN LAYERS NOT MORE THAN 8 INCHES IN LOOSE DEPTH FOR MATERIAL COMPACTED BY HEAVY COMPACTION EQUIPMENT, AND NOT MORE THAN FOUR INCH IN LOOSE DEPTH FOR MATERIAL BY HAND-OPERATED TAMPERS. BEFORE COMPACTION, MOISTEN OR AERATE EACH LAYER AS NECESSARY TO +/- 2 % OF OPTIMUM MOISTURE CONTENT. COMPACT EACH LAYER TO REQUIRED PERCENTAGE. DO NOT BACKFILL OR FILL MATERIAL ON SURFACES THAT ARE MUDDY, FROZEN, OR CONTAIN FROST OR ICE. PROTECT EXCAVATIONS FOR BUILDING AGAINST SURFACE WATER OR RAINWATER UNTIL BACKFILL IS PLACED.
  - POROUS FILL: INSTALL POROUS FILL MATERIAL ON THE COMPACTED SUBGRADE BELOW CONCRETE SLABS AND OTHER LOCATIONS INDICATED AND COMPACT. DEPTH BELOW SLABS AFTER COMPACTION TO BE 4 INCHES.
- FIELD QUALITY CONTROL**
  - PROVIDE TESTING SERVICE TO INSPECT AND APPROVE SUBGRADES AND FILL LAYERS BEFORE FURTHER CONSTRUCTION WORK IS PERFORMED.
  - IF TESTING SERVICE REPORTS AND INSPECTIONS INDICATE SUBGRADES OR FILL PLACED ARE BELOW SPECIFIED DENSITY, PROVIDE ADDITIONAL COMPACTION AT NO ADDITIONAL EXPENSE.
  - IF TESTING SERVICE REPORTS AND INSPECTIONS INDICATE AREAS TO RECEIVE LANDSCAPING ARE ABOVE SPECIFIED DENSITY, REWORK SUBGRADED TO PROVIDE SPECIFIED DENSITY.
  - PROVIDE ENGINEERING AND SURVEYING AS REQUIRED BY A SURVEYOR (LICENSED IN THE STATE OF ALABAMA), TO STAKE OUT AND CONTROL WORK. ESTABLISH AND MAINTAIN BUILDING LAYOUT REFERENCE MARKS AND ESTABLISH AND MAINTAIN AN ALTERNATE BENCHMARK CLOSE TO THE BUILDING AREA.
- FILL LOCATION, TYPE AND COMPACTION**
  - 825B CRUSHED STONE: POROUS FILL LAYER, MINIMUM 4 INCH THICK, BELOW BUILDING SLAB COMPACT TO 98% OF MODIFIED PROCTER PER ASTM D1557. PROVIDE UNDER SLABS ON GRADE TO THICKNESS NOTED AND IN TRENCHES.
  - STRUCTURAL FILL: SOILS WITH PLASTICITY INDEX LESS THAN 25 AND MAXIMUM DRY DENSITY GREATER THAN 100 PCF. COMPACT AS DESCRIBED.
  - COMPACTED SUBGRADE: FILL WITHIN THE BUILDING AREA AND EXTENDING 6 FOOT OUTSIDE EACH EXTERIOR BUILDING OR FUTURE BUILDING LINE SHALL MEET THE FOLLOWING REQUIREMENTS:
    - PLASTICITY INDEX LESS THAN 25.
    - MAXIMUM SIZE STONE 4 INCH.
    - SOIL SHALL BE FREE OF ORGANIC MATERIAL.
    - PLACE IN EIGHT INCH LOOSE LIFTS.
    - COMPACT PER B. ABOVE.
    - FIELD DENSITY TEST REQUIRED FOR EACH 5000 SQUARE FEET PER 8 INCH OF FILL.
  - COMPACTED SUBGRADE: REQUIREMENTS FOR FILL UNDER PAVED AREAS AND DRIVEWAYS:
    - PLASTICITY INDEX LESS THAN 25.
    - MAXIMUM SIZE STONE 4 INCH.
    - SOIL SHALL BE FREE OF ORGANIC MATERIAL.
    - PLACE IN EIGHT INCH LOOSE LIFTS.
    - FIELD DENSITY TEST REQUIRED FOR EACH 5000 SQUARE FEET PER 8 INCH OF FILL.
  - COMPACTED SUBGRADE, LANDSCAPE AREAS ONLY:
    - OCCURS BENEATH AREAS TO RECEIVE LANDSCAPING.
    - PLACE IN EIGHT INCH LOOSE LIFTS.
    - TOP OF FILL TO BE 6 INCH BELOW FINISHED GRADE.
    - DO NOT PLACE FILL ON SURFACES THAT ARE MUDDY OR FROZEN.
- EXCAVATION FOR TRENCHES**
  - DIG TRENCHES TO UNIFORM WIDTH REQUIRED FOR ITEM TO BE INSTALLED, INCLUDING WORKING ROOM.
  - EXCAVATE TRENCHES TO DEPTH INDICATED OR REQUIRED. CARRY DEPTH OF TRENCH FOR PIPING TO ESTABLISH REQUIRED LINE AND GRADE.
  - WHERE ROCK IS ENCOUNTERED, CARRY EXCAVATION MINIMUM 6 INCHES BELOW REQUIRED ELEVATION. BACKFILL WITH A 6 INCH LAYER OF CRUSHED STONE OR GRAVEL BEFORE INSTALLING PIPE.
  - NOTCH UNDER PIPE BELLS TO PROVIDE SOLID BEARING FOR ENTIRE BODY OF PIPE.
  - BACKFILL TRENCH WITH CONCRETE WHEN WITHIN 18" OF FOOTINGS AND WHERE PASSING UNDER FOOTINGS. PLACE CONCRETE LEVEL WITH THE BOTTOM OF THE ADJACENT FOOTING.
  - DO NOT BACKFILL TRENCHES UNTIL TESTS AND INSPECTIONS HAVE BEEN MADE. USE CARE TO AVOID DAMAGE OR DISPLACEMENT OF PIPE.
  - BACKFILL TRENCHES IN 6 INCH LIFTS AND COMPACT WITH MECHANICAL PISTON TAMPERS TO COMPACTION REQUIREMENTS. INCLUDE PROVISION FOR MOISTURE CONDITIONING AND COMPACTION OF TRENCH FILL, IF NEEDED.
  - THE CONTRACTOR SHALL REPLACE ALL SURFACE MATERIAL AND SHALL RESTORE PAVING, CURBING, SIDEWALKS, GUTTERS, AND OTHER SURFACES DISTURBED TO A CONDITION EQUAL TO THAT BEFORE THE WORK BEGAN, FURNISHING ALL LABOR AND MATERIAL INCIDENT THERETO.

**CONCRETE IN MINOR STRUCTURES**

- CLASS "B" CONCRETE SHALL BE REINFORCED OR NON-REINFORCED CONCRETE HAVING A 28-DAY MINIMUM COMPRESSIVE STRENGTH OF 3,000 POUNDS PER SQUARE INCH. CLASS B CONCRETE SHALL BE USED FOR TRENCH BOTTOM STABILIZATION, PIPE PROTECTION ENCASEMENT, PIPE COLLARS, ANCHORS, MASSIVE SECTIONS, SIDEWALKS AND SIMILAR WORK.
- CONCRETE SHALL BE MANUFACTURED AND DELIVERED TO THE PROJECT SITE BY A READY-MIX MANUFACTURER EXPERIENCED IN READY-MIX CONCRETE.
- READY-MIX CONCRETE SHALL COMPLY WITH REQUIREMENTS OF ASTM C-94, AND AS SPECIFIED.
- MIX CONCRETE ONLY IN QUANTITIES FOR IMMEDIATE USE.
- CONCRETE MIX DESIGN FOR PARTICULAR APPLICATIONS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
- REINFORCING MATERIAL FOR CAST IN PLACE CONCRETE:
  - REINFORCING BARS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A-615, A-616, OR A-617. REINFORCING BARS SHALL BE GRADE 60 DEFORMED BARS, OR AS SPECIFIED ON THE PLANS.
  - WELDED WIRE FABRIC OR COLD-DRAWN WIRE FOR CONCRETE REINFORCEMENT SHALL CONFORM TO THE REQUIREMENTS OF ASTM A-185 OR ASTM A-82, RESPECTIVELY.
  - THE CONTRACTOR SHALL MAINTAIN REINFORCING IN PROPER POSITION DURING CONCRETE PLACEMENT.
- CONCRETE PLACEMENT:
  - PRIOR TO PLACING ORDER FOR CONCRETE, THE CONTRACTOR SHALL INSPECT AND COMPLETE FORM WORK INSTALLATION, REINFORCING STEEL, AND ITEMS TO BE EMBEDDED OR CAST IN. THE CONTRACTOR SHALL NOTIFY OTHER CRAFTS TO PERMIT INSTALLATION OF THEIR WORK; AND COOPERATE WITH OTHER TRADES IN SETTING SUCH WORK. IN ADDITION TO OTHER EQUIPMENT REQUIRED FOR PLACEMENT, THE CONTRACTOR SHALL PROVIDE STANDBY VIBRATORS (MINIMUM OF TWO (2) UNITS) DURING ALL CONCRETE PLACEMENT.
  - THE CONTRACTOR SHALL COMPLY WITH ACI 304, "RECOMMENDED PRACTICE FOR MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE", AND AS HEREIN SPECIFIED.
  - FRESHLY PLACED CONCRETE SHALL BE PROTECTED FROM WASHY RAIN, FLOWING WATER, OR OTHER INJURIOUS CONDITIONS, AND SHALL NOT BE ALLOWED TO BECOME DRY FROM THE TIME IT IS PLACED UNTIL THE EXPIRATION OF THE 7-DAY CURING PERIOD.
  - THE CONTRACTOR SHALL CONSOLIDATE PLACED CONCRETE BY HAND HELD MECHANICAL VIBRATING EQUIPMENT SUPPLEMENTED BY HAND-SPADING, RODDING, OR TAMPING. THE CONTRACTOR SHALL USE EQUIPMENT AND PROCEDURES FOR CONSOLIDATION OF CONCRETE IN ACCORDANCE WITH ACI 309.
  - THE CONTRACTOR SHALL CONSOLIDATE CONCRETE DURING PLACING OPERATIONS SO THAT CONCRETE IS THOROUGHLY WORKED AROUND REINFORCEMENT AND OTHER EMBEDDED ITEMS AND INTO CORNERS.
  - THE CONTRACTOR SHALL PROTECT CONCRETE WORK FROM PHYSICAL DAMAGE OR REDUCED STRENGTH THAT COULD BE CAUSED BY FROST, FREEZING ACTIONS, OR LOW TEMPERATURES IN ACCORDANCE WITH PROVISIONS OF ACI 306.
  - THE CONTRACTOR SHALL MAINTAIN THE CONCRETE AT A TEMPERATURE OF NOT LESS THAN 50° F AND NOT MORE THAN 90° F FOR A PERIOD NOT LESS THAN 72 HOURS.
- CONCRETE MATERIALS:
  - PORTLAND CEMENT SHALL CONFORM TO THE FOLLOWING: ALL WATER BEARING STRUCTURES SHALL CONFORM TO TYPE II-V ASTM C-150, NON- WATER BEARING STRUCTURES SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-150, TYPE I.
  - THE CONTRACTOR SHALL USE ONE BRAND OF CEMENT THROUGHOUT THE PROJECT UNLESS OTHERWISE ACCEPTABLE TO THE ENGINEER.
  - FLY ASH SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-618, TYPE F.
  - FINE AGGREGATES SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-33. THE CONTENT OF MATERIAL PASSING A NUMBER 200 SIEVE SHALL NOT EXCEED 4 PERCENT. THE CONTRACTOR SHALL USE ONLY CLEAN, SHARP, NATURAL SAND.
  - COARSE AGGREGATES SHALL BE CRUSHED LIMESTONE CONFORMING TO THE REQUIREMENTS OF ASTM C- 33. CRUSHED LIMESTONE FOR COARSE AGGREGATE SHALL CONSIST OF UNCOATED PARTICLES OF SOUND, DURABLE ROCK OF UNIFORM QUALITY CONTAINING NO MORE THAN 15 PERCENT FLAT OR ELONGATED PARTICLES (LONG DIMENSION MORE THAN FIVE TIMES THE SHORT DIMENSION), CONTENT OF MATERIAL PASSING A NUMBER 200 SIEVE SHALL NOT EXCEED 0.5 PERCENT. NO SURFACE, YELLOW OR SOFT STONE SHALL BE PERMITTED. THE SPECIFIC GRAVITY OF THE STONE SHALL NOT BE LESS THAN 2.56.
  - WATER SHALL BE CLEAN AND POTABLE.
  - THE CONTRACTOR SHALL PROVIDE CONCRETE ADMIXTURES WHICH CONTAIN NOT MORE THAN 0.1 PERCENT CHLORIDE IONS.

SEE 00-C-05 FOR STRUCTURAL CONCRETE SPECIFICATIONS



REVISIONS		DESCRIPTION	NO	DATE	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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**Alabama Water Utilities**  
 BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
**SEU WWTP IMPROVEMENTS**  
 TUSCALOOSA COUNTY, ALABAMA

**PROJECT NOTES**

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 00-C-03

SHEET NUMBER **3**



**SANITARY SEWER STANDARD NOTES**

- ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS OF ALABAMA WATER UTILITIES AND/OR THE STATE HIGHWAY DEPARTMENT, AND APPLICABLE O.S.H.A. REGULATIONS, AS APPLICABLE.
- THE CONTRACTOR WILL BE RESPONSIBLE FOR THE COST ASSOCIATED WITH ANY FINES OR DAMAGES CAUSED BY THE DISCHARGE OF SEDIMENTS OR ANY OTHER VIOLATION UNDER THIS PERMIT
- PVC PIPE SHALL BE AWWA C900, CAST IRON (CI) STANDARD DIMENSIONS. DIMENSION RATIO (DR) 18. PRESSURE CLASS (PC) 150 PSI OR BETTER OR SDR-26 FOR MAIN SEWERS.
- IN EARTH TRENCH, FOUR INCHES OF CRUSHED STONE SHALL BE PLACED UNDER SEWER LINES OF 12 INCHES IN DIAMETER OR SMALLER AND SIX INCHES OF CRUSHED STONE SHALL BE PLACED UNDER SEWER LINES LARGER THAN 12 INCHES IN DIAMETER. IN ROCK TRENCHES, SIX INCHES OF CRUSHED STONE SHALL BE PLACED UNDER ALL SEWERS. THE DITCH SHALL BE BACKFILLED WITH CRUSHED STONE TO A DEPTH OF 12 INCHES ABOVE THE TOP OF THE PIPE. WHEN CROSSING EXISTING ROADS AND STREETS, THE TOTAL BACKFILL SHALL BE CRUSHED STONE AND PROPERLY CHOKED.
- AT THE DIRECTION OF THE ENGINEER, A CONNECTION OF SANITARY SEWER PIPES (8 INCH THROUGH 16 INCH) OF DISSIMILAR SIZES OR FOR REPAIR OF SANITARY SEWER PIPES OF SIMILAR MATERIALS MAY BE MADE BY MEANS OF AN APPROVED MECHANICAL SEAL TYPE ADJUSTABLE COUPLING. COUPLINGS WITH ANY REQUIRED ADAPTING BUSHINGS SHALL BE MANUFACTURED OF AN APPROVED PREFORMED ELASTOMERIC MATERIAL SPECIFICALLY FOR DIMENSIONS OF THE PIPE MATERIALS TO BE CONNECTED. COUPLINGS OF THE MECHANICAL SEAL TYPE SHALL HAVE NUT AND BOLT TIGHTENING CLAMPS OR DEVICES MADE OF 316 STAINLESS STEEL, WITH AN ADJUSTABLE STAINLESS STEEL SHEAR RING, AND STAINLESS STEEL HARDWARE. A CONCRETE COLLAR IS REQUIRED.
- MANHOLES SHALL MEET ASTM SPECIFICATION C-478. JOINTS BETWEEN THE MANHOLE SECTIONS SHALL BE OFFSET TONGUE AND GROOVE "PUSH ON" TYPE, SUPPLIED WITH TYLOX SUPER SEAL PRE-LUBRICATED GASKET AS MANUFACTURED BY HAMILTON KENT MEETING THE REQUIREMENTS OF ASTM C443. EACH JOINT SHALL ALSO BE SUPPLIED WITH CONSEAL CS-231 WATERSTOP SEALANT AS MANUFACTURED BY CONCRETE SEALANTS. IN WIDTHS AS RECOMMENDED BY THE MANUFACTURER. MANHOLES SHALL HAVE A MINIMUM DIAMETER OF 48 INCHES AND A MINIMUM THICKNESS OF 5 INCHES. ALL MANHOLE CONES SHALL BE OF THE CONCENTRIC TYPE. MANHOLES MAY BE FINISHED TO STREET GRADE WITH BRICK AND MORTAR. THIS ADJUSTMENT HEIGHT SHALL NOT EXCEED 16 INCHES.
- CONTRACTOR WILL BE RESPONSIBLE FOR THE CONTINUOUS AND PROPER OPERATION OF ALL EXISTING UTILITIES LOCATED ON OR ADJACENT TO THE PROJECT SITE AND WITHIN THE CONSTRUCTION LIMITS OF THIS PROJECT.
- ALL EMBANKMENT FILL AREAS SHALL BE FILLED AND COMPACTED PRIOR TO EXCAVATION OF SEWER.
- CONTRACTOR WILL BE RESPONSIBLE FOR THE CONSTRUCTION AND MAINTENANCE OF EROSION AND SEDIMENTATION CONTROLS AND FOR ACQUISITION OF ALL PERMITS DURING CONSTRUCTION TO INSURE THAT DAMAGE DOES NOT OCCUR TO ADJACENT PROPERTIES, PUBLIC ROADS AND/OR DITCHES (CREEKS, STREAMS).
- UPON COMPLETION OF ALL OR ANY PART OF A SANITARY SEWER LINE, THE CONTRACTOR WILL BE REQUIRED TO TEST SAID SEWER FOR ACCEPTABILITY. GRAVITY SEWERS WILL BE PRESSURE TESTED WITH AIR. FORCE MAIN SEWERS WILL BE PRESSURE TESTED WITH WATER. MANHOLES WILL BE VACUUM TESTED. ALL TESTS WILL BE CONDUCTED IN THE PRESENCE OF THE ENGINEER IN ACCORDANCE WITH THE SPECIFICATIONS. GRAVITY SANITARY SEWERS MAY BE TELEVISION INSPECTED FOLLOWING AIR TESTING WITH THE FINAL VIDEO TAPE AND LOG FURNISHED TO THE ENGINEER FOR RECORD INFORMATION.
- ROCK SHALL BE UNDERCUT A MINIMUM OF 4" AND PIPE BEDDED IN STONE. NO SEPARATE PAY ITEM EXISTS FOR ROCK EXCAVATION. ALL EXCAVATION SHALL BE CONSIDERED TO BE UN-CLASSIFIED EXCAVATION AND SUBSIDIARY TO OTHER BID ITEMS.
- CONTRACTOR SHALL BE RESPONSIBLE FOR ANY BACKUPS OR OVERFLOWS RESULTING FROM HIS WORK AND ALL SUBSEQUENT DAMAGES, FINES, PENALTIES, OR OTHER COSTS INCURRED.

**EXISTING SEWER CONNECTION NOTES**

- CONTRACTOR SHALL HAND DIG TO LOCATE AND EXPOSE EXISTING FORCE MAIN AND VERIFY PIPE MATERIAL AND CONDITION PRIOR TO ORDERING MATERIALS.
- SOUTHWEST WATER WILL PROVIDE SHUTDOWN OF LIFT STATIONS USING THE FORCE MAIN TO ALLOW FOR A 2 HOUR TIME FRAME FOR THE NEW CONNECTION. CONTRACTOR SHALL HAVE ALL MATERIALS AND EQUIPMENT AT THE SITE TO PROVIDE THE CONNECTION.
- THE CONNECTION SHALL BE COORDINATED AT LEAST 72 HOURS IN ADVANCE. SOUTHWEST WATER MAY REQUIRE CONNECTION TO OCCUR DURING NON-PEAK HOURS AT THEIR DISCRETION.

**SANITARY SEWER PIPE NOTES**

- GENERAL:
- PIPE, MANUFACTURER'S NAME AND PRESSURE RATING MARKED ON PIPE.
  - DO NOT INSTALL UNDERGROUND PIPING WHEN BEDDING ARE WET OR FROZEN.
  - ALL PIPE, FITTINGS, AND APPURTENANCES SHALL BE AS SHOWN ON THE DRAWINGS AND SPECIFIED IN THIS SECTION.
  - ALL PIPE, FITTINGS, AND APPURTENANCES SHALL BE NEW AND UNUSED.
- DUCTILE IRON PIPE AND FITTINGS:
- A. APPROVED MANUFACTURER'S
- ACIPCO
  - US PIPE
  - MCWANE PIPE
  - NO SUBSTITUTIONS ALLOWED.
- B. BURIED PIPE AND FITTINGS
- DUCTILE IRON PIPE SHALL MEET THE REQUIREMENTS OF ANSIAWWA C151/A21.5L. DESIGN AND MANUFACTURE PIPE FOR A WORKING PRESSURE OF 350 PSI PLUS 100 PSI SURGE AND A SAFETY FACTOR OF 2 AND A DEPTH OF COVER INDICATED ON THE DRAWINGS AND SPECIFIED IN THIS SECTION. MINIMUM THICKNESS CLASS SHALL BE AS FOLLOWS:
- | SIZE RANGE | CLASS          |
|------------|----------------|
| ALL SIZES  | 52 OR AS NOTED |
- PIPE JOINTS SHALL BE PUSH-ON TYPE. JOINTS SHALL MEET THE REQUIREMENTS OF ANSIAWWA C111/A21.11. RESTRAINED JOINTS SHALL BE LOK-RING, TR-FLEX, SUPER LOCK, FLEX-RING, ONE BOLT, OR EQUAL.
    - ALL DUCTILE IRON PIPE SHALL HAVE A 2'-0" JOINTS OUTSIDE THE WALL PIPES UNLESS OTHERWISE SHOWN ON THE DRAWINGS.
    - ALL FITTINGS AND PIPE JOINTS BENEATH STRUCTURES SHALL BE RESTRAINED JOINTS.
- C. FITTINGS
- FITTINGS SHALL BE DUCTILE IRON. FITTINGS SHALL MEET THE REQUIREMENTS OF ANSIAWWA C110/21.10. DESIGN AND MANUFACTURE FITTING FOR A PRESSURE RATING OF 250 PSI.
  - FITTING JOINTS SHALL BE MECHANICAL JOINTS, D.I. COMPACT FITTINGS OR RESTRAINED PUSH-ON JOINTS. JOINTS SHALL MEET THE REQUIREMENTS OF ANSIAWWA C111/A21.11, AND/OR A21-53 RESTRAINED JOINTS SHALL BE USED INSTEAD OF MECHANICAL JOINTS AND THRUST BLOCKING. RESTRAINED JOINTS SHALL BE LOK-RING, TR-FLEX, SUPER-LOCK, ONE BOLT, OR EQUAL. PIPE CONNECTING TO RESTRAINED JOINT FITTINGS SHALL ALSO HAVE RESTRAINED JOINTS AS INDICATED ON THE DRAWINGS AND SPECIFIED IN THIS SECTION.
- D. GASKETS
- NEOPRENE GASKETS FOR MECHANICAL JOINTS AND PUSH-ON JOINTS SHALL BE USED FOR SEWAGE AND SLUDGE LINES AND MEET THE REQUIREMENTS OF ANSIAWWA C111/A21.11.
  - VITON GASKETS FOR MECHANICAL JOINTS AND PUSH-ON JOINTS SHALL BE USED FOR AIR LINES AND MEET THE REQUIREMENTS OF ANSIAWWA C111/A21.11.
- E. NUTS AND BOLTS
- NUTS AND BOLTS FOR MECHANICAL JOINTS SHALL BE HIGH STRENGTH, HEAT TREATED, CAST IRON. NUTS SHALL BE HEXAGON NUTS. BOLTS SHALL BE TEE HEAD BOLTS. NUTS AND BOLTS SHALL MEET THE REQUIREMENTS OF ANSIAWWA C111/A21.11.
  - NUTS AND BOLTS FOR RESTRAINED PUSH-ON JOINTS SHALL MEET THE REQUIREMENTS OF THE JOINT MANUFACTURER.
- F. EXPOSED PIPE AND FITTINGS
- PIPE AND FITTINGS
- PIPE SHALL MEET THE REQUIREMENTS OF ANSIAWWA C151/A21.5L.
  - THICKNESS OF PIPE SHALL BE A MINIMUM OF CLASS 52.
  - JOINTS SHALL BE FLANGE JOINTS WITH SCREWED ON DUCTILE IRON FLANGES OR SHOULDERED TYPE JOINTS. FLANGES SHALL MEET THE REQUIREMENTS OF ANSIAWWA C115/A21.15. SHOULDERED TYPE JOINTS SHALL MEET THE REQUIREMENTS OF ANSIAWWA C606. FIELD MAKE-UP FLANGES WILL NOT BE ALLOWED, UNLESS APPROVED IN WRITING BY THE ENGINEER. FIELD MAKE-UP FLANGES SHALL MEET THE REQUIREMENTS OF ANSIAWWA C115/A21.15 WITH FACING DONE AFTER TURNING PIPE THROUGH FLANGE.
  - FITTINGS
    - FITTINGS SHALL MEET THE REQUIREMENTS OF ANSIAWWA C110/A21.10. DESIGN AND MANUFACTURE FITTINGS FOR A PRESSURE RATING OF 250 PSI.
    - FITTINGS SHALL HAVE FLANGE JOINTS OR SHOULDERED TYPE JOINTS. FLANGE JOINTS SHALL MEET THE REQUIREMENTS OF ANSIAWWA C606.
  - FLANGE JOINT ACCESSORIES
    - GASKETS FOR FLANGE JOINTS SHALL MEET THE REQUIREMENTS OF ANSIAWWA C110/A21.10. GASKETS SHALL BE FULL FACE. GASKETS SHALL BE NEOPRENE, EXCEPT FOR AIR LINES WHICH HAVE VITON GASKETS. THE GASKETS SHALL BE TORUSEAL, FLANGE-TYPE GASKETS OR EQUIVALENT, GASKETS ARE 1/8" IN THICKNESS.
    - NUT AND BOLTS SHALL MEET THE REQUIREMENTS OF ANSIAWWA C110/A21.10. NUTS AND BOLTS SHALL BE ZINC PLATED.
  - SHOULDERED JOINT ACCESSORIES
    - SHOULDERED JOINT ACCESSORIES SHALL MEET THE REQUIREMENTS OF ANSIAWWA C606.
  - GROOVED JOINT ACCESSORIES
    - GROOVED JOINT ACCESSORIES SHALL MEET THE REQUIREMENTS OF ANSIAWWA C606.
  - LININGS AND COATINGS FOR DUCTILE IRON PIPE
    - LINING AND COATING FOR SEWAGE AND SLUDGE
      - THE INTERIOR OF THE PIPE SHALL BE BLASTED AND CLEANED TO REMOVE ALL LOOSE OXIDES AND RUST. AFTER CLEANING, THE LINING MATERIAL SHALL BE APPLIED TO YIELD 40 MILS FOR THE COMPLETE SYSTEM. THE LINING MATERIAL SHALL BE STANDARD CEMENT LINING.
  - ADAPTERS
    - ADAPTERS FROM DUCTILE IRON PIPE TO FLANGE JOINT VALVES OR FITTINGS SHALL BE DUCTILE IRON. ADAPTERS SHALL MEET THE REQUIREMENTS OF ANSIAWWA C110/A21.10. DESIGN AND MANUFACTURE ADAPTERS FOR A PRESSURE RATING OF 350 PSI.
    - ADAPTER ENDS CONNECTING TO DUCTILE IRON PIPE SHALL HAVE PLAIN ENDS, PUSH-ON JOINTS, MECHANICAL JOINTS, OR RESTRAINED PUSH-ON JOINTS. MECHANICAL JOINTS AND PUSH-ON JOINTS SHALL MEET THE REQUIREMENTS OF ANSIAWWA C111/A21.11. RESTRAINED JOINT SHALL BE LOK-RING, FLEX RING, OR EQUAL.
    - ADAPTER ENDS CONNECTING TO FLANGE JOINT VALVES OR FITTINGS SHALL HAVE JOINTS COMPLYING WITH THE SPECIFICATIONS FOR THE APPLICABLE VALVES OR FITTINGS.
- POLYVINYL CHLORIDE PIPE AND FITTINGS:
- A. PIPE AND FITTINGS
- PIPE AND FITTINGS SHALL BE MANUFACTURED FROM UNPLASTICIZED, POLYVINYL CHLORIDE WHICH MEETS THE REQUIREMENTS OF ASTM D1784. POLYVINYL CHLORIDE SHALL BE CLASS 12454-B.
  - POLYVINYL CHLORIDE PIPE SHALL MEET THE REQUIREMENTS OF ASTM C1785.
  - PIPE AND FITTINGS SHALL BE SCHEDULE 80 OR AS INDICATED IN INDIVIDUAL SPECIFICATION SECTIONS. PIPE AND FITTING JOINTS SHALL BE SOCKET SOLVENT WELD, THREADED OR FLANGED.
  - SOCKET SOLVENT WELD FITTINGS SHALL MEET THE REQUIREMENTS OF ASTM D2467.
  - THREADED FITTINGS SHALL MEET THE REQUIREMENTS OF ASTM D2464.
  - FLANGES SHALL BE POLYVINYL CHLORIDE. FLANGES SHALL BE 150 PSI LBS., FLAT FACE, WITH ANSI DRILLING.
  - PIPE AND FITTINGS SHALL BE BY THE SAME MANUFACTURER.
  - PRIMER SHALL BE STABILIZED TETRAHYDROFURAN, OR EQUAL PRIMER SUPPLIED BY PIPE AND FITTING MANUFACTURER, FOR HOT, WINDY CONDITIONS.
  - SOLVENT JOINT CEMENT:
    - SOLVENT JOINT CEMENT SHALL MEET THE REQUIREMENTS OF ASTM D2564. CEMENT CONTAINERS SHALL B NO LARGER THAN ONE PINT AND SHALL HAVE A DAUBER SECURED TO THE CONTAINER LID.
  - THREADED JOINT SEALANT:
    - THREADED JOINT SEALANT SHALL BE 1/2 INCH WIDE TEFLON TAPE IN THICKNESS RECOMMENDED BY MANUFACTURER OF THREADED FITTINGS.
  - GASKETS
    - GASKETS FOR FLANGE JOINTS SHALL BE ETHYLENEPROPYLENE TERPOLYMER RUBBER, 1/8 INCH THICK, AND FULL FACE WITH A DUROMETER HARDNESS OF 80.
    - GASKETS IN POLYVINYL CHLORIDE UNIONS AND STRAINERS SHALL BE VITON.
  - BOLTS AND NUTS
    - BOLTS AND NUTS USED IN WATER PIPING SHALL BE AS FOLLOWS:
      - " BOLTS SHALL BE SEMI-FINISHED REGULAR HEX HEAD CAP SCREWS, TYPE 304 STAINLESS STEEL, ASTM A193, GRADE B8, NC THREADS;
      - " NUTS SHALL BE SEMI-FINISHED REGULAR HEX HEAD NUTS, TYPE 303 STAINLESS STEEL, ASTM A194, GRADE 3F, NC THREADS.
      - " BOLTS AND NUTS USED IN CHEMICAL PIPING SHALL BE MONEL METAL, HEX HEAD, NC THREADS.

**SANITARY SEWER PIPE NOTES (CONTINUED)**

- EXPANSION JOINT:
- THE RUBBER EXPANSION JOINTS SHALL BE CLASS 125 LB. FLANGE, PRESSURE RATING OF 250 PSI AND OF THE SIZE AS SHOWN ON THE DRAWINGS. THE TUBE AND COVER SHALL BE MADE OF NEOPRENE RUBBER. THE JOINT SHALL INCLUDE SPLIT RETAINING RINGS MADE OF DUCTILE IRON, CONTROL RODS AND BACK-UP RINGS AND SHALL BE AS MANUFACTURED BY MERCER RUBBER COMPANY, OR EQUIVALENT.
- INSPECTION:
- A. GENERAL
- THE QUALITY OF ALL MATERIALS, THE PROCESS OF MANUFACTURE, AND THE FINISHED PRODUCTS SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY THE ENGINEER. SUCH INSPECTIONS MAY BE MADE AT THE PLACE OF MANUFACTURE OR ON THE WORK AFTER DELIVERY, OR AT BOTH PLACES; AND THE PRODUCTS SHALL BE SUBJECT TO REJECTION AT ANY TIME ON ACCOUNT OF FAILURE TO MEET ANY OF THE SPECIFICATIONS' REQUIREMENTS EVEN THOUGH SAMPLE PRODUCTS HAVE BEEN ACCEPTED AS SATISFACTORY AT THE PLACE OF MANUFACTURE. PRIOR TO BEING INSTALLED, EACH PIPE, FITTING, VALVE, AND HYDRANT SHALL BE CAREFULLY INSPECTED, AND THOSE NOT MEETING THE SPECIFICATIONS SHALL BE REJECTED AND AT ONCE REMOVED FROM THE WORK.
- B. CAST IRON AND DUCTILE IRON PIPE
- IN ANY PIPE SHOWING A DISTINCT CRACK AND WHICH IT IS BELIEVED THERE IN NO INCIPIENT FRACTURE BEYOND THE LIMITS OF THE VISIBLE CRACK, THE CRACKED PORTION, IF SO APPROVED, MAY BE CUT OFF BY AND AT THE EXPENSE OF THE CONTRACTOR BEFORE THE PIPE IS INSTALLED SO THE PIPE USED MAY BE PERFECTLY SOUND. THE CUT SHALL BE MADE IN THE SOUND BARREL AT A POINT AT LEAST 12 INCHES FROM THE VISIBLE LIMITS OF THE CRACK.
  - ALL CUTTING SHALL BE DONE WITH A MACHINE HAVING STEEL CUTTERS OR KNIVES ADAPTED TO THE PURPOSE. ALL CUT ENDS SHALL BE EXAMINED FOR POSSIBLE CRACKS CAUSED BY CUTTING.
- INSTALLATION OF BURIED PIPE:
- A. LAYING PIPING
- THE CONTRACTOR SHALL PROVIDE PROPER IMPLEMENTS, TOOLS, AND FACILITIES FOR THE SAFE AND EXPEDITIOUS PROSECUTION OF THE WORK.
  - EVERY PIPE, FITTING, AND VALVE SHALL BE CLEANED OF ALL DEBRIS, DIRT, AND OTHER FOREIGN MATERIAL BEFORE BEING LAID AND SHALL BE KEPT CLEAN UNTIL ACCEPTED IN THE COMPLETED WORK.
  - LAY AND MAINTAIN PIPE TO THE LINES SHOWN ON THE DRAWINGS, EXCEPT AS SPECIFIED IN THIS ARTICLE. LAY AND MAINTAIN PIPE TO THE GRADE SHOWN ON THE DRAWINGS OR TO THE MINIMUM DEPTH SPECIFIED IN THIS ARTICLE. INSTALL FITTINGS AND VALVES, IN THE LOCATIONS SHOWN ON THE DRAWINGS.
  - WHERE THE PIPING IS TO BE CONSTRUCTED PARALLEL TO AND CLOSE TO EXISTING BURIED UTILITIES, THE EXACT LOCATION OF WHICH IS UNKNOWN, ADJUST THE ALIGNMENT OF THE PIPING TO LEAST INTERFERE WITH THESE UTILITIES, UNLESS OTHERWISE SHOWN OR SPECIFIED.
  - POTABLE WATER PIPING SHALL BE LAID AT LEAST TEN FEET HORIZONTALLY FROM ANY EXISTING SANITARY SEWER OR SEWAGE FORCE MAIN. THE DISTANCE SHALL BE MEASURED FROM EDGE OF PIPE TO EDGE OF PIPE. POTABLE WATER PIPING CROSSING SANITARY SEWERS OR SEWAGE FORCE MAINS SHALL BE LAID TO PROVIDE MINIMUM VERTICAL DISTANCE OF 18 INCHES BETWEEN THE OUTSIDE OF THE POTABLE WATER PIPING AND THE OUTSIDE OF THE SEWER OR FORCE MAIN. THE 18 INCH SEPARATION SHALL APPLY WHETHER THE POTABLE WATER PIPING IS OVER OR UNDER THE SEWER OR FORCE MAIN. LAY POTABLE WATER PIPING AT CROSSINGS OF SEWERS AND FORCE MAINS SO A FULL LENGTH OF PIPE IS CENTERED ON THE SEWER OR FORCE MAIN WHENEVER POSSIBLE. NO POTABLE WATER PIPING SHALL PASS THROUGH OR COME IN CONTACT WITH ANY PART OF A SANITARY SEWER MANHOLE.
  - DO NOT LAY PIPE IN WATER OR WHEN THE TRENCH OR WEATHER CONDITIONS ARE UNSUITABLE FOR PROPER INSTALLATION.
  - LOWER PIPE, FITTINGS, AND VALVES INTO THE TRENCH BY HAND, BY MEANS OF HOISTS OR ROPES, OR BY OTHER SUITABLE TOOLS OR EQUIPMENT WHICH WILL NOT DAMAGE PRODUCTS, COATINGS, OR LININGS. DO NOT DROP OR DUMP PIPE, FITTINGS, OR VALVES INTO THE TRENCH.
  - PIPE LAYING SHALL PROCEED UPGRADE, BEGINNING AT THE LOWER END OF THE PIPE LINE.
  - THE CONTRACTOR SHALL USE LASER BEAM EQUIPMENT, SURVEYING INSTRUMENTS, OR OTHER PROVEN TECHNIQUES TO MAINTAIN ACCURATE ALIGNMENT AND GRADE.
  - DEFLECTION OF PRESSURE PIPE FROM A STRAIGHT LINE OR GRADE SHALL NOT EXCEED THE LIMITS SPECIFIED IN THIS SECTION. IF THE ALIGNMENT REQUIRES JOINT DEFLECTIONS IN EXCESS OF THE ALLOWABLE DEFLECTION PER JOINT, FURNISH AND INSTALL FITTINGS OR A SUFFICIENT NUMBER OF SHORTER LENGTHS OF PIPE.
  - PROVIDE THRUST RESTRAINT AT HORIZONTAL AND VERTICAL DEFLECTION FITTINGS AND AT TEES, PLUGS, TAPPING SLEEVES, AND TAPPING SADDLES.
  - LAYING OF DUCTILE IRON PIPING SHALL MEET THE REQUIREMENTS OF ANSIAWWA C600, UNLESS OTHERWISE SPECIFIED IN THIS SECTION.
  - OPEN EXCAVATION SHALL BE SATISFACTORILY PROTECTED AT ALL TIMES. AT THE END OF EACH DAY'S WORK, THE OPEN ENDS OF ALL PIPES SHALL BE PROTECTED AGAINST THE ENTRANCE OF ANIMALS, CHILDREN, EARTH, OR DEBRIS BY BULKHEADS OR STOPPERS. THE BULKHEADS OR STOPPERS SHALL BE PERFORATED TO ALLOW PASSAGE OF WATER INTO THE INSTALLED PIPE LINE TO PREVENT FLOTATION OF THE PIPE LINE. ANY EARTH OR OTHER MATERIAL THAT MAY FIND ENTRANCE INTO THE MAIN SEWER OR INTO ANY LATERAL SEWER THROUGH ANY SUCH OPEN END OF UNPLUGGED BRANCH MUST BE REMOVED AT THE CONTRACTOR'S EXPENSE.
- B. JOINTING
- THE ENDS OF THE PIPE SHALL BE SATISFACTORILY CLEANED JUST BEFORE LAYING, AND THE JOINT SHALL BE MADE IN SATISFACTORY MANNER IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER ON PARTICULAR TYPE OF JOINT AND THE DIRECTIONS OF THE ENGINEER. ALL JOINT WORK SHALL BE DONE BY EXPERIENCED WORKMEN.
  - JOINTS SHALL BE AS SPECIFIED IN THIS SECTION.
  - EACH LENGTH OF PIPE SHALL BE MECHANICALLY PULLED "HOME" WITH A WINCH OR COME-ALONG AGAINST THE SECTION PREVIOUSLY LAID AND HELD IN PLACE UNTIL THE TRENCH AND BEDDING ARE PREPARED FOR THE NEXT PIPE SECTION. CARE SHALL BE TAKEN IN LAYING THE PIPE SO NOT TO DAMAGE THE BELL END OF THE PIPE. MECHANICAL MEANS CONSISTING OF CABLE PLACED INSIDE THE PIPE WITH A WINCH, JACK, OR COME-ALONG SHALL BE CONSIDERED TO PULL THE PIPE HOME WHERE PUSHING THE PIPE WILL NOT RESULT IN A JOINT GOING COMPLETELY HOME AND STAYING IN PLACE. PUSHING THE PIPE HOME SHALL BE DONE BY MEANS OF A BLOCK AND PUSH BAR. USE OF HYDRAULIC EXCAVATING EQUIPMENT AS THE MEANS OF PUSHING OR MOVING THE PIPE TO GRADE WILL NOT BE PERMITTED.
- INSTALLATION OF SMALL PIPE AND FITTINGS:
- PIPING SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER. EXPOSED PIPING SHALL BE INSTALLED PARALLEL TO THE WALLS AND SLABS WHEREVER POSSIBLE. PIPING SHALL BE SUPPORTED WHERE NECESSARY.
  - AFTER CUTTING TO FINAL LENGTHS, ALL PIPE ENDS SHALL BE REAMED. THREADS SHALL BE CLEANED. SCREWED JOINTS SHALL BE MADE UP WITH TEFLON TAPE IN THICKNESS RECOMMENDED BY THE MANUFACTURER OF THREADED FITTINGS.
  - ALL JOINTS SHOWING EVIDENCE OF LEAKING SHALL BE REWORKED.
  - ALL PLUMBING INSTALLATIONS SHALL BE IN ACCORDANCE WITH LOCAL PLUMBING CODE.
- SLEEVES:
- SET SLEEVES IN POSITION IN FORM WORK. PROVIDE REINFORCING AROUND SLEEVES.
  - SIZE SLEEVES LARGE ENOUGH TO ALLOW FOR MOVEMENT DUE TO EXPANSION AND CONTRACTION. PROVIDE FOR CONTINUOUS INSULATION WRAPPING.
  - EXTEND SLEEVES THROUGH FLOORS ONE INCH ABOVE FINISHED FLOOR LEVEL. CAULK SLEEVES.
  - WHERE PIPING OR DUCTWORK PENETRATES FLOOR, CEILING, OR WALL, CLOSE OFF SPACE BETWEEN PIPE OR DUCT AND ADJACENT WORK WITH STUFFING FIRE STOPPING INSULATION AND CAULK, AIR TIGHT. PROVIDE CLOSE FITTING METAL COLLAR OR ESCUTCHEON COVERS AT BOTH SIDES OF PENETRATION.



REVISIONS		DESCRIPTION	NO	DATE	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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**Alabama Water Utilities**  
 BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
**SEU WWTP IMPROVEMENTS**  
 TUSCALOOSA COUNTY, ALABAMA

**SANITARY SEWER PROJECT NOTES**

**BOX IS 2 IN WIDE AT FULL SCALE**

**JOB NO: SW-20026**

**DATE: JUNE, 2023**

**DESIGNED BY: WEC**

**DRAWN BY: LEE**

**DWG: 00-C-04**

**SHEET NUMBER 4**



## GENERAL STRUCTURAL CONCRETE NOTES

- CONSTRUCTION METHODS, PROCEDURES AND SEQUENCES ARE THE CONTRACTOR'S RESPONSIBILITY. THE CONTRACTOR SHALL TAKE ALL THE NECESSARY MEANS TO MAINTAIN AND PROTECT THE STRUCTURAL INTEGRITY OF ALL CONSTRUCTION, NEW AND EXISTING, AT ALL STAGES.
- CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO ANY PERTINENT WORK. ALL EXISTING CONDITIONS AND DIMENSIONS SHALL BE NOTED ON THE SHOP DRAWINGS.
- COORDINATE WITH THE ARCHITECTURAL, CIVIL, MECHANICAL AND ELECTRICAL DRAWINGS, AND VERIFY THE LOCATIONS AND SIZES OF CHASES, INSERTS, OPENINGS, SLEEVES, FINISHES, CONDUIT, DEPRESSIONS AND OTHER PROJECT REQUIREMENTS.
- USE MANUFACTURER'S CERTIFIED DRAWINGS AND SPECIFICATIONS FOR EQUIPMENT ANCHORAGE AND DETAILS.
- ALL CONSTRUCTION JOINTS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE INCORPORATED INTO THE STRUCTURE. ADDITIONAL CONSTRUCTION JOINTS TO FACILITATE CONSTRUCTION SHALL BE LOCATED AND DETAILED ON THE SHOP DRAWINGS FOR REVIEW. ALL CONSTRUCTION JOINTS TO BE KEYS. HORIZONTAL CONSTRUCTION JOINTS SHALL NOT BE PERMITTED IN WALLS AND BEAMS, UNLESS SHOWN ON THE STRUCTURAL DRAWINGS.
- ALL EXPOSED CONCRETE EDGES SHALL BE CHAMFERED.
- THE CONTRACTOR IS RESPONSIBLE FOR REVIEWING THE ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS TO DETERMINE WHERE OPENINGS ARE REQUIRED IN WALLS AND SLABS.
- ALL STRUCTURAL MEMBERS, AS SHOWN, HAVE BEEN DESIGNED TO CARRY IN PLACE DESIGN LOADS ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SUPPORT OF ANY ADDITIONAL LOADS AND FORCES IMPOSED DURING CONSTRUCTION, TRUCKING, ERECTING AND HANDLING.

## SITE AND FOUNDATION

- COMPACTED DENSE GRADED STONE IS REQUIRED A MINIMUM OF 6" BELOW ALL FOOTINGS AND A MINIMUM OF 12" BELOW ALL FLOOR SLABS. STONE SHALL BE COMPACTED IN 6" LIFTS TO 100% STANDARD PROCTOR DENSITY. ANY OVER EXCAVATION BEYOND THESE SPECIFIED DEPTHS REQUIRED FOR THE CONTRACTOR'S NEEDS OR CONSTRUCTION REQUIREMENTS SHALL BE LEVELED ACROSS THE ENTIRE SLAB OR FOOTING WIDTH/LENGTH AND THEN MAY BE BACKFILLED IN 6" EVEN/CONSISTENT LIFTS WITH SELECT MATERIAL OR DENSE GRADED STONE AND COMPACTED TO 100% STANDARD PROCTOR DENSITY. DENSE GRADED STONE SHALL BE PUG MIX/ MOIST, TYP "B" SECTION 825 OF ALDOT MANUAL. VIBRATORY COMPACTIONS REQUIRED. LAB TESTS WILL BE PERFORMED.
- ALL HDPE PIPE BENEATH SLABS SHALL BE CONCRETE ENCASED.
- VAPOR BARRIER REQUIRED BENEATH ALL INTERIOR SLABS.

## FORM REMOVAL

- DO NOT REMOVE FORMS OR BRACING UNTIL CONCRETE HAS GAINED SUFFICIENT STRENGTH TO CARRY ITS OWN WEIGHT AND IMPOSED LOADS.
- LOOSEN FORMS CAREFULLY. DO NOT WEDGE PRY BARS, HAMMERS, OR TOOLS AGAINST FINISH CONCRETE SURFACES SCHEDULED FOR EXPOSURE TO VIEW.
- STORE REMOVED FORMS IN MANNER THAT SURFACES TO BE IN CONTACT WITH FRESH CONCRETE WILL NOT BE DAMAGED. DISCARD DAMAGED FORMS.
- DO NOT REMOVE WALL AND EDGE FORMS OR BRACING UNTIL A MINIMUM OF 72 HOURS, FROM THE COMPLETION OF THE POUR, HAS PASSED.
- SLAB AND BEAM SUPPORTS AND FORMS SHALL NOT BE REMOVED UNTIL THE TEST CYLINDERS REACH A MINIMUM OF 4000 PSI. THE FORMS AND BRACING SHALL BE REMOVED AND DEAD MEN SUPPORTS SHALL THEN BE INSTALLED UNTIL THE OWNER AND ENGINEER AGREE WITH THEIR REMOVAL.

## CONCRETE MIX

- MIX AND DELIVER CONCRETE IN ACCORDANCE WITH ASTM C94, ALTERNATIVE NO. 1.
- SELECT PROPORTIONS FOR NORMAL WEIGHT CONCRETE IN ACCORDANCE WITH ACI 301.2.
- PROVIDE CONCRETE MIX CLASS 'A' TO THE FOLLOWING CRITERIA:
  - COMPRESSIVE STRENGTH (28 DAYS): 4500 PSI
  - SLUMP: 4 TO 6 INCHES
  - WATER/CEMENT RATIO: 0.48
- PROVIDE CONCRETE MIX CLASS 'B' TO THE FOLLOWING CRITERIA:
  - COMPRESSIVE STRENGTH (7 DAYS): 1800 PSI
  - COMPRESSIVE STRENGTH (28 DAYS): 3000 PSI
  - SLUMP: 3 TO 5 INCHES
  - MAXIMUM WATER TO CEMENT RATIO: 0.59
- USE ACCELERATING ADMIXTURES IN COLD WEATHER ONLY WHEN APPROVED BY ENGINEER. USE OF ADMIXTURES WILL NOT RELAX COLD WEATHER PLACEMENT REQUIREMENTS.
- USE SET RETARDING ADMIXTURES DURING HOT WEATHER ONLY WHEN APPROVED BY ENGINEER.
- CLASS "A" SHALL CONTAIN 517 POUNDS OF TYPE II CEMENT WITH 100 POUNDS OF TYPE F FLY ASH.
- CLASS "B" CONCRETE SHALL CONTAIN 400 POUNDS OF CEMENT WITH 100 POUNDS OF TYPE F FLY ASH.
- CONCRETE SUPPLIER SHALL USE A CHILLER FOR THE WATER TO MAINTAIN THE CONCRETE MIX TEMPERATURE BELOW 90°F.
- THE CONCRETE SHALL BE FURNISHED FROM ONLY ONE SUPPLIER FOR THE ENTIRE PROJECT.

## REINFORCEMENT

- ALL REINFORCING SHALL CONFORM TO THE LATEST REVISION OF A.S.T.M. SPECIFICATION A615, GRADE 60.
- ALL REINFORCING SHALL BE DETAILED IN ACCORDANCE WITH A.C.I. STANDARD 315, OF LATEST REVISION.
- WHERE SPLICES ARE NECESSARY, REINFORCING SHALL BE LAPPED 32 DIAMETERS, UNLESS SHOWN OTHERWISE ON DRAWINGS.
- NO REINFORCING BAR SHALL BE WELDED OR FIELD BENT IN ANY MANNER, UNLESS SPECIFICALLY SHOWN OR NOTED ON THE DRAWINGS OR LAP SPLICE SCHEDULE.
- PROVIDE FULL EMBEDMENT FOR ALL DOWELS. IF NOT OTHERWISE SPECIFIED, DOWEL SIZE AND SPACING SHALL BE THE SAME AS MAIN REINFORCING.

## TESTING

- THE OWNER SHALL EMPLOY AND PAY FOR THE SERVICES OF AN INDEPENDENT TESTING LABORATORY TO PERFORM THE FOLLOWING TESTS AS SPECIFIED BELOW AND AS REQUESTED BY THE ENGINEER.
  - PERFORM TESTS IN ACCORDANCE WITH THE FOLLOWING ASTM SPECIFICATIONS:

TESTS	ASTM SPECIFICATIONS
SLUMP	C 143
TEST CYLINDERS	C 31 OR C 513
CORE SAMPLES	C 42
FLY ASH	C 311
- MAKE TEST CYLINDERS IN SETS OF FOUR, MINIMUM. FIELD CURE ONE CYLINDER. BREAK FIELD CURED CYLINDER AT SEVEN DAYS. LABORATORY CURE THE REMAINING THREE CYLINDERS FROM EACH SET OF FOUR. BREAK TWO LABORATORY CURED CYLINDERS AT 28 DAYS. THE TEST LAB SHALL BE RESPONSIBLE FOR HANDLING AND TRANSPORTATION OF CYLINDERS. HOLD FOURTH CYLINDER FOR POSSIBLE 56 DAY BREAK.
- MAKE ONE SET OF TEST CYLINDERS FOR EACH 50 CUBIC YARDS, OR FRACTION OF 50 CUBIC YARDS, OF CONCRETE PLACED, OR AT OTHER TIMES REQUESTED BY THE ENGINEER.
- FLY ASH SHALL BE SAMPLED AND TESTED AS SPECIFIED IN ASTM C 311 PRIOR TO USE AS AN ADMIXTURE IN CONCRETE.

## CONCRETE NOTES

### A. CONCRETE SCHEDULES

- CONCRETE FOR NON-STRUCTURAL MEMBERS CLASS "B"
- ALL OTHER CONCRETE CLASS "A"

### B. CONCRETE COVER OVER REINFORCING

- FOR CONCRETE DEPOSITED AGAINST THE GROUND WITHOUT THE USE OF FORMS, THE STEEL SHALL NOT BE LESS THAN THREE INCHES, EXCEPT A FOUR-INCH SLAB SHALL HAVE TWO INCHES OF COVER.
- FOR CONCRETE EXPOSED TO THE WEATHER OR TO THE GROUND WITH THE USE OF FORMS, THE STEEL SHALL BE AS INDICATED IN THE STANDARD DETAIL
- FOR SLABS AND WALLS NOT EXPOSED TO THE GROUND OR TO THE WEATHER, THE STEEL CONCRETE COVER SHALL NOT BE LESS THAN 1 INCH FOR #11 BARS AND SMALLER OR 1-1/2 INCH FOR #14 AND #18 BARS.
- FOR BEAMS, GIRDERS, AND COLUMNS NOT EXPOSED TO THE GROUND OR TO THE WEATHER, THE STEEL CONCRETE COVER SHALL NOT BE LESS THAN 1-1/2 INCHES.
- WATERSTOP PIPE SLEEVES REQUIRED ON ALL WATERTIGHT WALLS AND FLOORS.
- TREMIES REQUIRED ON ALL POURS DEEPER THAN 10 FEET.
- CHAMFER ALL SEEN EXPOSED, OR SUBMERGED EDGES OF BEAMS, COLUMNS, SLABS AND WALLS.
- WATERSTOP TO BE PVC RIBBED WITH CENTER BULB. GREENSTREAK STYLE 704 OR APPROVED EQUAL.
- ALL WATERTIGHT CONCRETE STRUCTURES SHALL HAVE 72 HOURS WATER TEST FOR LEAKAGE ON STRUCTURE BEFORE BACKFILL.
- WHEN WATERSTOP IS PLACED HORIZONTALLY IN SLABS, THE CONTRACTOR SHALL TEMPORARILY TIE UP OR CLAMP UP THE WATERSTOP UNTIL THE CONCRETE IS PLACED TO SLIGHTLY ABOVE THE DEPTH OF THE WATERSTOP.
- PROVIDE A MINIMUM OF SEVEN (7) DAYS BETWEEN ADJACENT POURS.
- HOLD SLUMP TO 3 TO 4 INCHES IN ALL FLOOR SLABS.
- VERTICAL WATERSTOP BE FULLY EMBEDDED IN SLAB POUR AND WELDED TO ALL ADJACENT WATERSTOP.
- WALKWAYS AND SIDEWALKS SHALL BE Poured WITH SLIGHT SLOPE AND NO LOW SPOTS SO THEY WILL DRAIN FREE.

## PLACING CONCRETE

- PLACE CONCRETE IN ACCORDANCE WITH ACI 304.
- NOTIFY ENGINEER MINIMUM 24 HOURS PRIOR TO COMMENCEMENT OF OPERATIONS.
- PLACING CONCRETE ENSURE REINFORCEMENT, INSERTS, EMBEDDED PARTS, FORMED JOINT FILLERS, JOINT DEVICES AND CONDUIT ARE NOT DISTURBED DURING CONCRETE PLACEMENT.
- INSTALL VAPOR BARRIER UNDER INTERIOR SLABS ON GRADE. LAP JOINTS MINIMUM 6 INCHES AND SEAL WATERTIGHT BY SEALANT APPLIED BETWEEN OVERLAPPING EDGES AND ENDS.
- REPAIR VAPOR BARRIER DAMAGED DURING PLACEMENT OF CONCRETE REINFORCING. REPAIR WITH VAPOR BARRIER MATERIAL; LAP OVER DAMAGED AREAS MINIMUM 6 INCHES AND SEAL WATERTIGHT.
- INSTALL JOINT FILLERS, PRIMER AND SEALANT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- SEPARATE SLABS ON GRADE FROM VERTICAL SURFACES WITH 1 INCH THICK JOINT FILLER.
- EXTEND JOINT FILLER FROM BOTTOM OF SLAB TO WITHIN ½ INCH OF FINISHED SLAB SURFACE. INSTALL JOINT DEVICES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- INSTALL JOINT DEVICE ANCHORS. MAINTAIN CORRECT POSITION TO ALLOW JOINT COVER FLUSH WITH FLOOR AND WALL FINISH.
- APPLY SEALANTS IN JOINT DEVICES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- MAINTAIN RECORDS OF CONCRETE PLACEMENT. RECORD DATE, LOCATION, QUANTITY, AIR TEMPERATURE, AND TEST SAMPLES TAKEN.
- PLACE CONCRETE CONTINUOUSLY BETWEEN PREDETERMINED EXPANSION, CONTROL, AND CONSTRUCTION JOINTS.
- DO NOT INTERRUPT SUCCESSIVE PLACEMENT; DO NOT PERMIT COLD JOINTS TO OCCUR.
- PLACE FLOOR SLABS IN PATTERN INDICATED.
- SAW CUT JOINTS WITHIN 24 HOURS AFTER PLACING. USING 3/16 INCH THICK BLADE, CUT INTO ½ INCH DEPTH OF SLAB THICKNESS.
- SCREED FLOORS AND SLABS ON GRADE TO FLOOR DRAINS OR SLOPE AS REQUIRED.
- WHEN PLACING CONCRETE WITH A TREMIE, THE LOWER END OF THE TREMIE OR SPOUT SHALL BE WITHIN FIVE (5) FEET OF THE CONCRETE SURFACE.
- THE CONCRETE SHALL BE PLACED IN CONTINUOUS HORIZONTAL LAYERS SUCH THAT THIRTY (30) MINUTES IS THE MAXIMUM ELAPSED TIME BETWEEN PLACEMENT OF SUCCESSIVE LAYERS.
- WHEN PLACING CONCRETE THE DISCHARGED CONCRETE SHALL BE WITHIN FIVE (5) FEET OF THE CONCRETE SURFACE.
- DISCHARGE CONCRETE FROM CEMENT MIXER WITHIN NINETY (90) MINUTES AFTER WATER HAS BEEN ADDED TO THE MIX IN THE TRUCK.
- NO WATER SHALL BE ADDED ON THE JOB SITE, UNLESS NECESSARY AND APPROVED BY THE ENGINEERS' REPRESENTATIVE.
- WHEN WATER IS ADDED TO CONCRETE AT THE JOB SITE THERE SHALL BE A MINIMUM OF 30 REVOLUTIONS OF MIXING PER EACH CUBIC YARD REMAINING IN THE TRUCK.
- ALL WALL POURS SHALL HAVE A MINIMUM OF 2" OF THE APPROPRIATE CONSTRUCTION GROUT BEFORE CONCRETE PLACEMENT BEGINS.

## PLACING CONCRETE IN HOT AND COLD WEATHER

- CONCRETE, WHEN PLACED IN FORMS, SHALL HAVE A TEMPERATURE GREATER THAN 50° F AND LESS THAN 90° F.
- THE TEMPERATURES OF NEITHER AGGREGATES NOR MIXING WATER SHALL BE GREATER THAN 100° F JUST PRIOR TO MIXING WITH THE CEMENT.
- CONCRETE SHALL NOT BE Poured UNTIL THE AMBIENT TEMPERATURE IS 40° F AND RISING, AS MEASURED AT THE ENGINEER'S TRAILER AT THE JOB SITE.
- CONCRETE SHALL NOT BE Poured WHEN THE AMBIENT TEMPERATURE IS ABOVE 95° F.
- WHEN THE TEMPERATURE IS BETWEEN 35° F AND 50° F, THE CONTRACTOR SHALL TAKE MEASURES THAT MAY INCLUDE INSULATION OF THE Poured CONCRETE STRUCTURE, PROTECTIVE COVERS AND HEAT SOURCES CAPABLE OF MAINTAINING TEMPERATURE OF THE Poured STRUCTURE AT 50° F OR ABOVE.
- THE PROTECTIVE COVERS AND HEAT SERVICES SHALL BE MAINTAINED FOR TWENTY-FOUR (24) HOURS BEFORE THE POUR AND SEVENTY-TWO (72) HOURS AFTER THE POUR AS AGREED UPON WITH THE OWNER AND ENGINEER.

## FIELD QUALITY CONTROL

- FIELD INSPECTION AND TESTING WILL BE PERFORMED IN ACCORDANCE WITH ACI 301.
- PROVIDE FREE ACCESS TO WORK AND COOPERATE WITH APPOINTED FIRM.
- SUBMIT PROPOSED MIX DESIGN OF EACH CLASS OF CONCRETE TO ENGINEER FOR REVIEW PRIOR TO COMMENCEMENT OF WORK.
- TESTS OF CEMENT AND AGGREGATES MAY BE PERFORMED TO ENSURE CONFORMANCE WITH SPECIFIED REQUIREMENTS.
- FOUR CONCRETE TEST CYLINDERS WILL BE TAKEN FOR EVERY 50 CU YDS OF EACH CLASS OF CONCRETE PLACED.
- ONE ADDITIONAL TEST CYLINDER WILL BE TAKEN DURING COLD WEATHER CONCRETING, CURED ON JOB SITE UNDER SAME CONDITIONS AS CONCRETE IT REPRESENTS.
- ONE SLUMP TEST WILL BE TAKEN FOR EACH SET OF TEST CYLINDERS TAKEN.
- CONCRETE TESTING SHALL BE CONDUCTED BY AN INDEPENDENT TESTING AGENCY BY THE OWNER.

## PREPARATION

- PREPARE PREVIOUSLY PLACED CONCRETE BY CLEANING WITH STEEL BRUSH AND APPLYING BONDING AGENT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- IN LOCATIONS WHERE NEW CONCRETE IS DOWELED TO EXISTING WORK, DRILL HOLES IN EXISTING CONCRETE, INSERT STEEL DOWELS AND PACK SOLID WITH NON-SHRINK GROUT.
- SUBGRADE AND/OR SURFACE TO BE Poured AGAINST SHALL BE FREE OF SAWDUST, DEBRIS, WATER, ICE, SNOW, FROZEN MATERIAL, EXTRANEIOUS OIL, MORTAR OR ANY OTHER MATERIALS THAT MAY BE DELETERIOUS TO THE CONCRETE.
- CLEAN ROCK SURFACES BY AIR-WATER CUTTING, A WET SANDBLASTING OR WIRE BRUSH SCRUBBING. WET ROCK SURFACES IMMEDIATELY PRIOR TO PLACING CONCRETE.
- EARTH SURFACES SHALL BE FIRM AND DAMP.
- DO NOT PLACE CLASS A CONCRETE ON MUD, DRIED EARTH, UNCOMPACTED FILL, OR FROZEN SUBGRADE. MUD MATS OF CLASS B CONCRETE OR SIX INCH MINIMUM OF CRUSHED LIMESTONE MATERIAL WILL BE REQUIRED.
- ANY FLOW OF WATER INTO OR THROUGH THE FORMS SHALL BE DIVERTED THROUGH PROPER SIDE DRAINS INTO A SUMP OR REMOVED BY OTHER APPROVED METHODS WHICH WILL PREVENT WASHING THE FRESHLY DEPOSITED CONCRETE.

## DEFECTIVE CONCRETE

- DEFECTIVE CONCRETE: CONCRETE NOT CONFORMING TO REQUIRED LINES, DETAILS, DIMENSIONS, TOLERANCES OR SPECIFIED REQUIREMENTS.
- REPAIR OR REPLACEMENT OF DEFECTIVE CONCRETE WILL BE DETERMINED BY THE ENGINEER.
- DO NOT PATCH, FILL, TOUCH-UP, REPAIR, OR REPLACE EXPOSED CONCRETE EXCEPT UPON EXPRESS DIRECTION OF ENGINEER FOR EACH INDIVIDUAL AREA.

## PATCHING

- ALLOW ENGINEER TO INSPECT CONCRETE SURFACES IMMEDIATELY UPON REMOVAL OF FORMS.
- EXCESSIVE HONEYCOMB OR EMBEDDED DEBRIS IN CONCRETE IS NOT ACCEPTABLE. NOTIFY ENGINEER UPON DISCOVERY.
- PATCH IMPERFECTIONS AS DIRECTED.

## WELDING NEW MEMBERS

FABRICATION AND ERECTION SHALL CONFORM TO THE APPROPRIATE REQUIREMENTS OF "AISC SPECIFICATION FOR BUILDINGS". CONNECTION SHALL CONFORM TO THE REQUIREMENTS OF THE AMERICAN WELDING SOCIETY'S CODE AND SHALL DEVELOP THE FULL STRENGTH OF THE MEMBER.

## COATING AND CORROSION CONTROL

- ALL VESSEL SURFACES TO BE PAINTED SHALL BE PROPERLY PREPARED IN A WORKMAN LIKE MANNER TO OBTAIN A SMOOTH, CLEAN AND DRY SURFACE. ALL RUST, DUST, AND MILL SCALE AS WELL AS OTHER EXTRANEIOUS MATTER SHALL BE REMOVED BY MEANS SANDBLAST. INTERIOR (IMMERSION) SURFACES WILL RECEIVE NEAR WHITE BLAST CLEANING SSPC-SP10, ALL INTERIOR VESSEL SURFACES SHALL RECEIVE A TWO COAT APPLICATION OF SHERWIN-WILLIAMS HIGH MIL SHER-TAR EPOXY OR RAVEN LINING SYSTEMS AQUATAPOXY, APPLIED AT A RATE TO ACHIEVE APPROXIMATELY 8.0 DRY MIL THICKNESS PER COAT (MINIMUM TOTAL THICKNESS EQUALS 15.0 DRY MIL). ALL EXTERIOR (NON-IMMERSION) VESSEL SURFACES WILL RECEIVE COMMERCIAL BLAST CLEANING SSPC-SP6, AND WILL BE PAINTED WITH TWO (2) COATS OF TNEC SERIES 66 HIGH BUILD EPOXY, 7-11 MILS TOTAL DRY FILM THICKNESS.
- CONTRACTOR SHALL ENSURE THAT NEW COATING IS COMPATIBLE WITH EXISTING PRIMER AND/OR ADJACENT COATING.
- ALL METAL SURFACES SCARED DURING WORK SHALL BE PREPPED AND COATED AS DESCRIBED ABOVE.



REVISIONS		DESCRIPTION	NO	DATE	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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**Alabama Water Utilities**  
 BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
**SEU WWTP IMPROVEMENTS**  
 TUSCALOOSA COUNTY, ALABAMA

STRUCTURAL  
CONCRETE  
SPECIFICATIONS

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

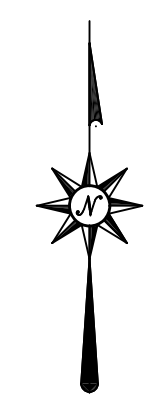
DESIGNED BY: WEC

DRAWN BY: LEE

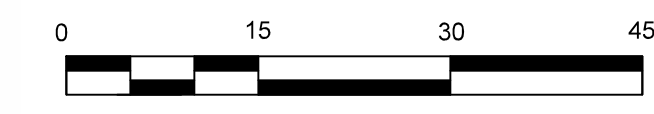
DWG: 00-C-05

SHEET NUMBER **5**





GRAPHIC SCALE: 1" = 15'



= TO BE DEMOLISHED AND OR REMOVED

**DEMOLITION NOTES**

**GENERAL NOTES**  
EXCEPT AS OTHERWISE SPECIFIED, THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIAL EQUIPMENT AND INCIDENTALS REQUIRED TO MODIFY, ALTER AND/OR CONVERT EXISTING STRUCTURES AS SHOWN OR SPECIFIED AND AS REQUIRED FOR THE INSTALLATION OF EQUIPMENT, PIPING AND APPURTENANCES. EXISTING PIPING AND EQUIPMENT SHALL BE REMOVED AND DISMANTLED AS NECESSARY FOR THE PERFORMANCE OF STRUCTURAL, PIPING AND EQUIPMENT ALTERATIONS IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED HEREIN. MODIFICATION AND DEMOLITION OF ELECTRICAL POWER AND CONTROL COMPONENTS SHALL BE BY THE CONTRACTOR.

THE CONTRACTOR SHALL DISMANTLE AND REMOVE ALL EXISTING EQUIPMENT, PIPING AND OTHER APPURTENANCES REQUIRED FOR THE COMPLETION OF THE WORK. WHERE SPECIFIED OR REQUIRED, EXISTING PIPELINES SHALL BE CUT FOR THE PURPOSE OF MAKING CONNECTIONS THERETO TO ANCHOR BOLTS FOR EQUIPMENT AND STRUCTURAL STEEL REMOVED SHALL BE CUT OFF 1 INCH BELOW THE CONCRETE SURFACE.

**MODIFICATIONS**  
WHEN REMOVING MATERIALS OR PORTIONS OF EXISTING STRUCTURES AND WHEN MAKING OPENINGS IN WALLS AND PARTITIONS, THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS AND USE ALL NECESSARY BARRIERS AND OTHER PROTECTIVE DEVICES SO AS NOT TO DAMAGE THE STRUCTURES BEYOND THE LIMITS NECESSARY FOR THE NEW WORK, NOR TO DAMAGE THE STRUCTURES OR CONTENTS BY FALLING OR FLYING DEBRIS.

ALL WORK OF ALTERING EXISTING STRUCTURES SHALL BE DONE AT SUCH TIME AND IN SUCH MANNER AS WILL COMPLY WITH THE APPROVED TIME SCHEDULE. SO FAR AS POSSIBLE BEFORE ANY PART OF THE WORK IS STARTED, ALL TOOLS, EQUIPMENT, AND MATERIALS SHALL BE ASSEMBLED AND MADE READY SO THAT THE WORK CAN BE COMPLETED WITHOUT DELAY.

WHERE HOLES IN EXISTING CONCRETE AND MASONRY ARE REQUIRED TO BE SEALED, UNLESS OTHERWISE SPECIFIED, THEY SHALL BE SEALED WITH CEMENT MORTAR OR CONCRETE. THE SIDES OF THE OPENINGS SHALL BE PROVIDED WITH KEYS JOINTS AND SHALL BE SUITABLY ROUGHENED TO FURNISH A GOOD BOND AND MAKE A WATERTIGHT JOINT. ALL LOOSE OR UNSOUND MATERIAL ADJACENT TO THE OPENING SHALL BE REMOVED AND, IF NECESSARY, REPLACED WITH NEW MATERIAL. THE METHOD OF PLACING THE MORTAR SEAL SHALL PROVIDE A SUITABLE MEANS OF RELEASING ENTRAPPED AIR.

SURFACES OF SEALED OPENINGS VISIBLE IN THE COMPLETED WORK SHALL BE MADE TO MATCH THE ADJACENT SURFACES.

NON-SHRINK GROUT SHALL BE USED FOR SETTING WALL CASTINGS, SLEEVES, LEVELING PUMP BASES, DOWELING ANCHORS INTO EXISTING CONCRETE AND ELSEWHERE AS SHOWN.

WHEN NECESSARY OR REQUIRED FOR THE PURPOSE OF MAKING CONNECTIONS, THE CONTRACTOR SHALL CUT EXISTING PIPELINES IN A MANNER TO PROVIDE AN APPROVED JOINT. WHERE REQUIRED, BEADS OR FLANGES SHALL BE WELDED OR COUPLINGS PROVIDED.

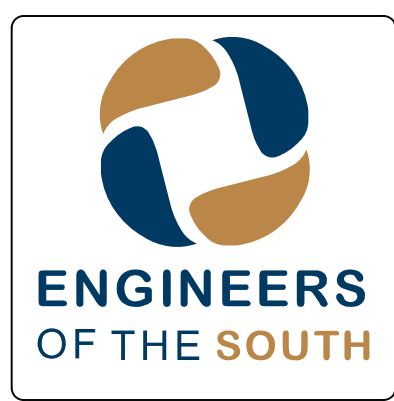
THE CONTRACTOR SHALL PROVIDE SUITABLE PLUGS, BULKHEADS OR OTHER MEANS TO HOLD BACK OR DIVERT THE FLOW OF WATER OR OTHER LIQUIDS, ALL AS REQUIRED IN THE PERFORMANCE OF THE WORK UNDER THIS CONTRACT.

**DEMOLITION**  
FOR STRUCTURES INDICATED FOR FULL STRUCTURE DEMOLITION, EQUIPMENT SHALL BE SALVAGED AS DIRECTED BY THE OWNER OR PROJECT ENGINEER. STRUCTURES SHALL THEN BE DEMOLISHED TO A DEPTH OF NOT LESS THAN 2 FEET BELOW FINISHED GRADE AND CLEARED OF ALL NON-CONCRETE PROTRUSIONS. ADDITIONAL OR TOTAL DEMOLITION WILL BE REQUIRED WHERE THE DEMOLISHED STRUCTURE INTERFERES WITH THE NEW CONSTRUCTION UNDER THIS CONTRACT.

WHERE DEMOLITION OF PIPE IS INDICATED AND THE PIPE DOES NOT INTERFERE WITH THE NEW CONSTRUCTION, THE DEMOLISHED PIPE MAY BE FLUSHED WITH WATER, PLUGGED AT BOTH ENDS AND ABANDONED IN PLACE, OR REMOVED ENTIRELY.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR INVESTIGATING THE EXTENT OF ANY FULL STRUCTURE DEMOLITION. RECORD DRAWINGS OF PREVIOUS CONSTRUCTION AT THE SITE ARE AVAILABLE FOR INSPECTION AT THE OFFICES OF THE OWNER.

**CONTENTS OF EXISTING TANKS**  
THE CONTRACTOR SHALL REMOVE ALL CONTENTS OF TANKS TO BE MODIFIED AND/OR DEMOLISHED AND PERFORM BASIC WASHDOWN OF TANK WALLS AND FLOORS. THE ABANDONED STEEL WASTEWATER TREATMENT TANK WILL NEED TO BE REMOVED COMPLETE AND VOID BACKFILLED AS SPECIFIED. ANY STANDING WATER SHOULD BE DISPOSED OF BY PUMPING THROUGH THE EXISTING TREATMENT SYSTEM. THIS WORK SHALL BE SCHEDULED WITH THE OWNER 48 HOURS IN ADVANCE. TANK SHALL BE DISPOSED OF OFFSITE UNLESS OTHER ARRANGEMENTS ARE MADE WITH THE OWNER.



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
 BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
 SEU WWTP IMPROVEMENTS  
 TUSCALOOSA COUNTY, ALABAMA

EXISTING SITE PLAN / DEMO

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

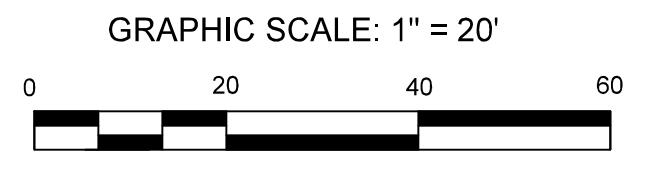
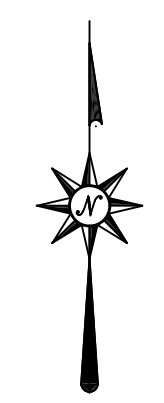
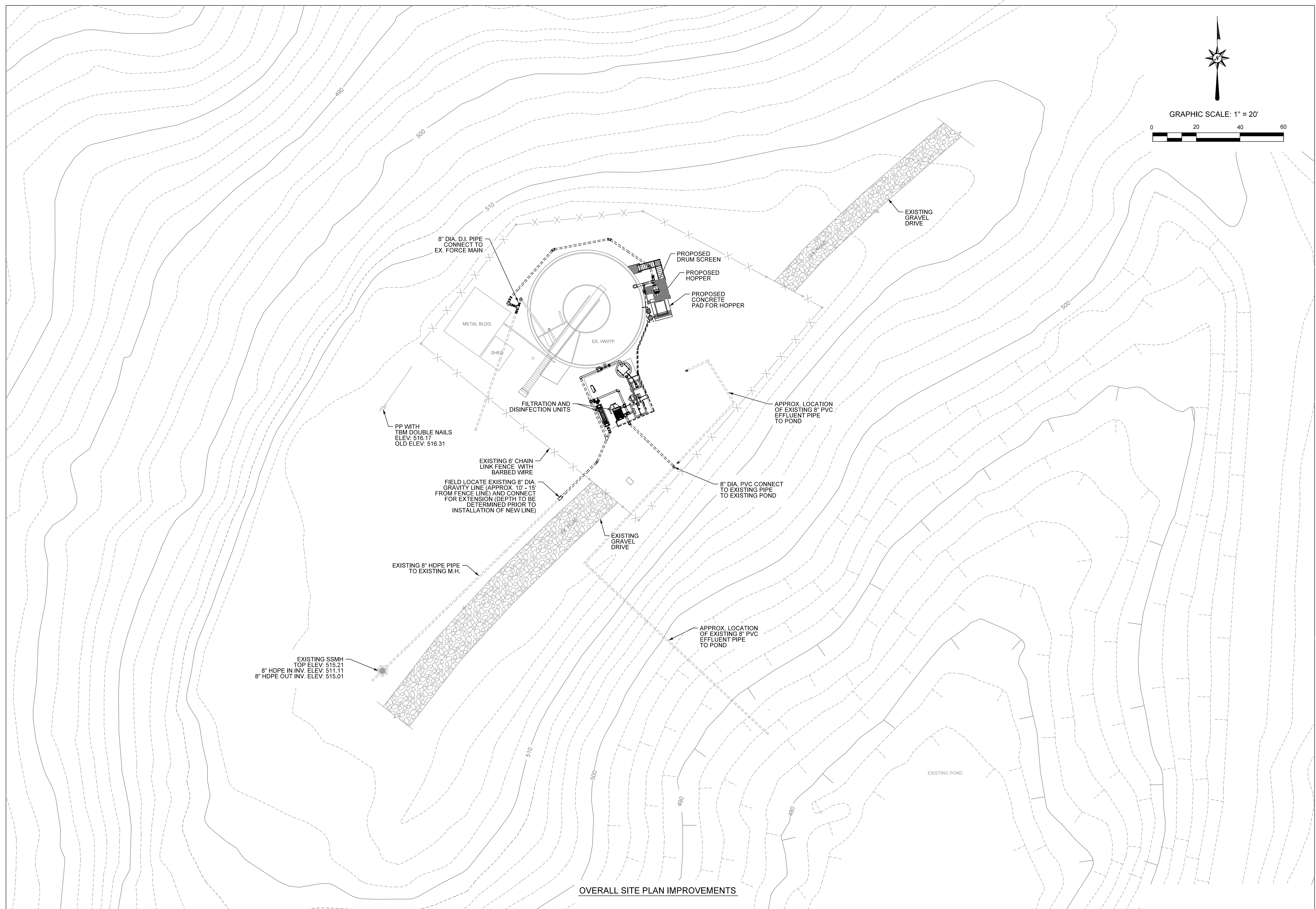
DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 10-C-01

SHEET NUMBER **6**





NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

OVERALL  
SITE PLAN  
IMPROVEMENTS

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

DESIGNED BY: WEC

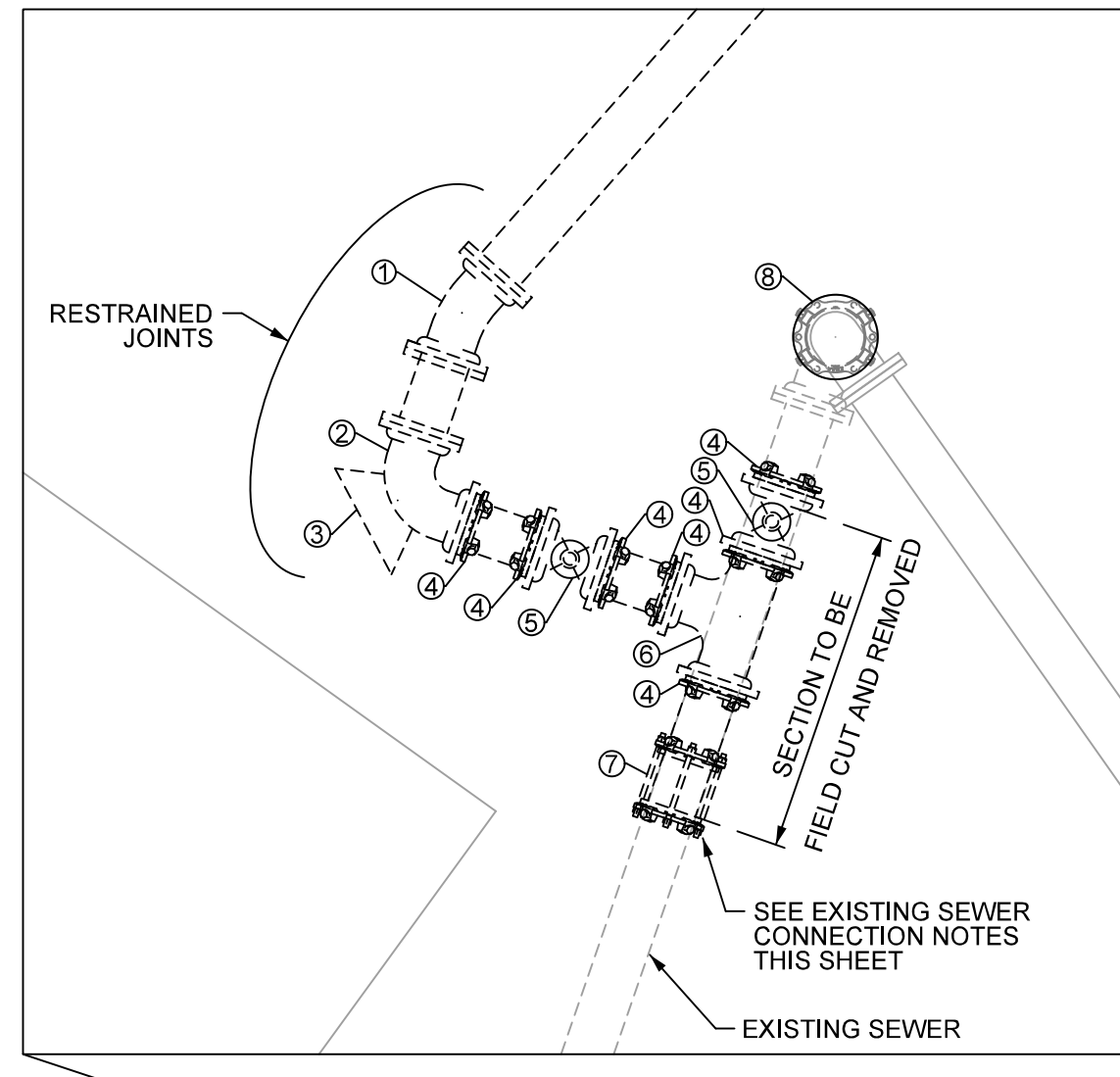
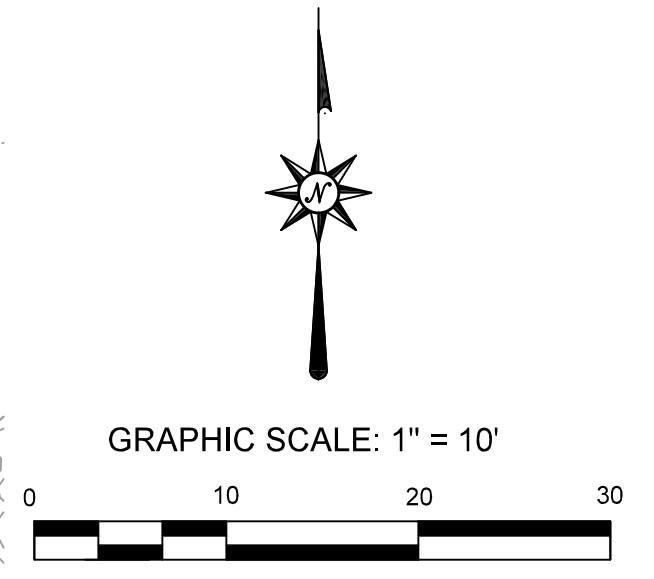
DRAWN BY: LEE

DWG: 10-C-05

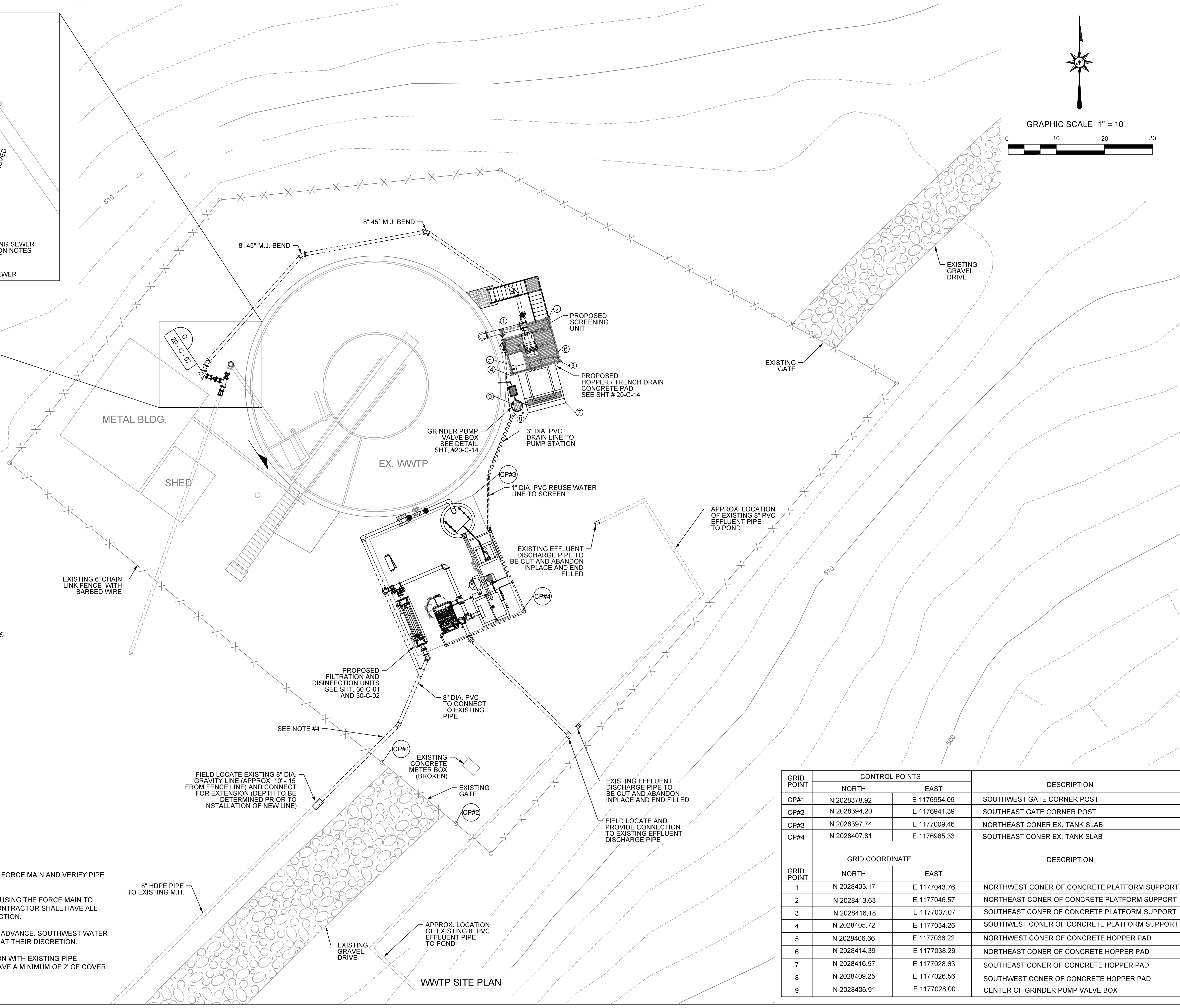
SHEET NUMBER **7**

OVERALL SITE PLAN IMPROVEMENTS





MATERIALS LIST	
ITEM NO.	DESCRIPTION
1	8" 22.5" M.J. x M.J. BEND
2	8" 90° M.J. x M.J. BEND
3	CONCRETE THRUST BLOCK
4	8" MEGALUG
5	8" GATE VALVE M.J. x M.J.
6	8" x 8" x 8" M.J. x PE x M.J. TEE
7	8" MEGA-COUPLING
8	8" MEGA-COUPLING AND M.J. PLUG



**EXISTING SEWER CONNECTION NOTES**

- CONTRACTOR SHALL HAND DIG TO LOCATE AND EXPOSE EXISTING FORCE MAIN AND VERIFY PIPE MATERIAL AND CONDITION PRIOR TO ORDERING MATERIALS.
- SOUTHWEST WATER WILL PROVIDE SHUTDOWN OF LIFT STATIONS USING THE FORCE MAIN TO ALLOW FOR A 2 HOUR TIME FRAME FOR THE NEW CONNECTION. CONTRACTOR SHALL HAVE ALL MATERIALS AND EQUIPMENT AT THE SITE TO PROVIDE THE CONNECTION.
- THE CONNECTION SHALL BE COORDINATED AT LEAST 72 HOURS IN ADVANCE. SOUTHWEST WATER MAY REQUIRE CONNECTION TO OCCUR DURING NON-PEAK HOURS AT THEIR DISCRETION.
- NEW OUTFALL PIPE SHALL MAINTAIN POSITIVE FALL TO CONNECTION WITH EXISTING PIPE (1% MIN.) TO AVOID ANY SAGS IN THE LINE. OUTFALL PIPE SHALL HAVE A MINIMUM OF 2' OF COVER. PROVIDE HDPE TO PVC TRANSITION COUPLING AT CONNECTION.

GRID POINT	CONTROL POINTS		DESCRIPTION
	NORTH	EAST	
CP#1	N 2028378.92	E 11776954.06	SOUTHWEST GATE CORNER POST
CP#2	N 2028394.20	E 11776941.39	SOUTHEAST GATE CORNER POST
CP#3	N 2028397.74	E 11777009.46	NORTHEAST CONER EX. TANK SLAB
CP#4	N 2028407.81	E 11776985.33	SOUTHEAST CONER EX. TANK SLAB

GRID POINT	GRID COORDINATE		DESCRIPTION
	NORTH	EAST	
1	N 2028403.17	E 11777043.76	NORTHWEST CONER OF CONCRETE PLATFORM SUPPORT
2	N 2028413.63	E 11777046.57	NORTHEAST CONER OF CONCRETE PLATFORM SUPPORT
3	N 2028416.18	E 11777037.07	SOUTHEAST CONER OF CONCRETE PLATFORM SUPPORT
4	N 2028405.72	E 11777034.26	SOUTHWEST CONER OF CONCRETE PLATFORM SUPPORT
5	N 2028406.66	E 11777036.22	NORTHWEST CONER OF CONCRETE HOPPER PAD
6	N 2028414.39	E 11777038.29	NORTHEAST CONER OF CONCRETE HOPPER PAD
7	N 2028416.97	E 11777028.63	SOUTHEAST CONER OF CONCRETE HOPPER PAD
8	N 2028409.25	E 11777026.56	SOUTHWEST CONER OF CONCRETE HOPPER PAD
9	N 2028406.91	E 11777028.00	CENTER OF GRINDER PUMP VALVE BOX

NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

WWTP  
SITE PLAN

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

DESIGNED BY: WEC

DRAWN BY: LEE

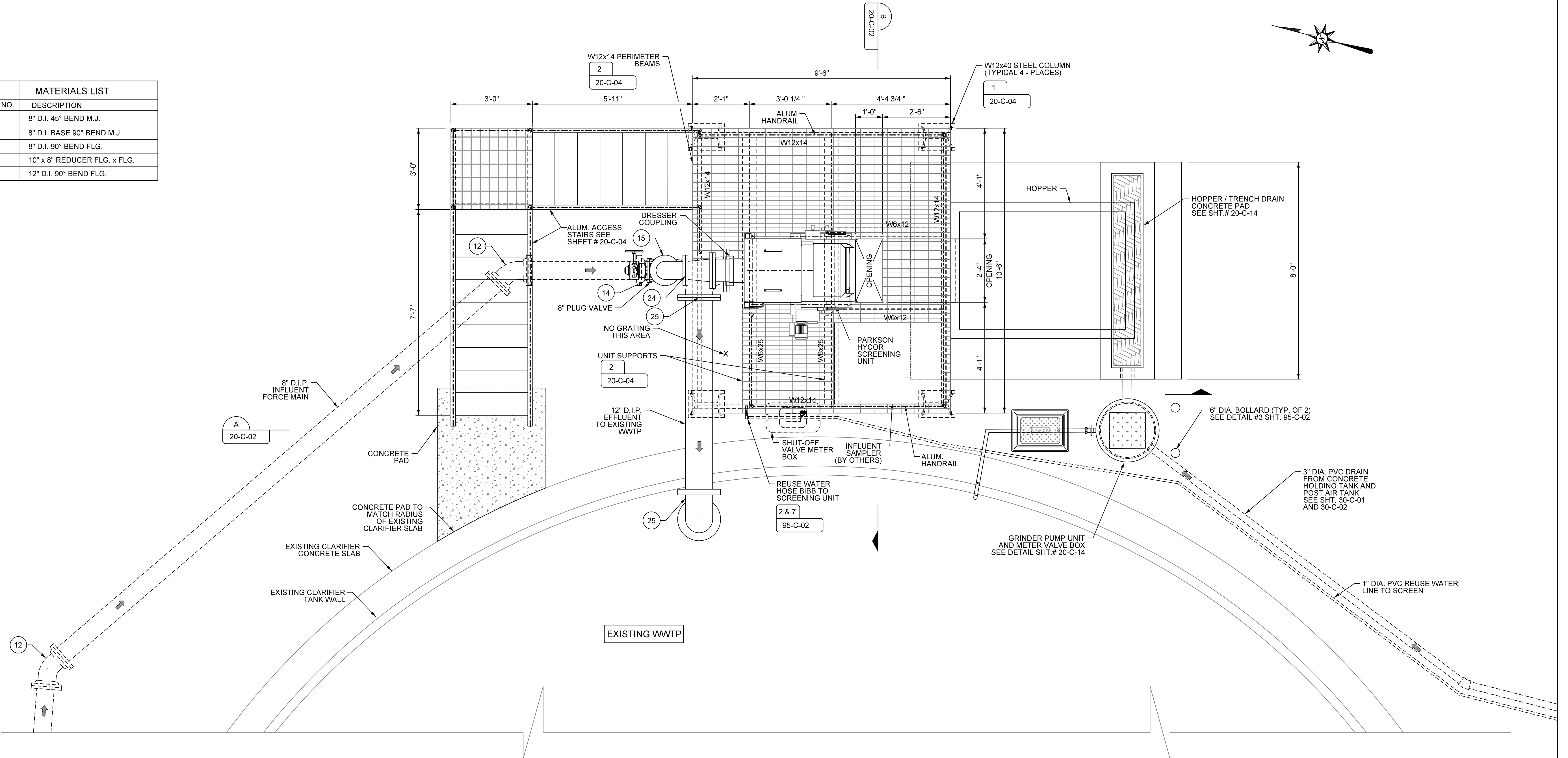
DWG: 10-C-06

SHEET NUMBER **8**

WWTP SITE PLAN



MATERIALS LIST	
ITEM NO.	DESCRIPTION
12	8" D.I. 45° BEND M.J.
14	8" D.I. BASE 90° BEND M.J.
15	8" D.I. 90° BEND FLG.
24	10" x 8" REDUCER FLG. x FLG.
25	12" D.I. 90° BEND FLG.



**PARKSON HYCOR SCREENING UNIT PLAN**  
SCALE: 1/2" = 1'-0"

NO.	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Alabama Water Utilities**  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

PARKSON HYCOR  
ROTOSTRAINER  
SCREENING UNIT  
PLAN

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 20-C-01

SHEET NUMBER **9**



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT

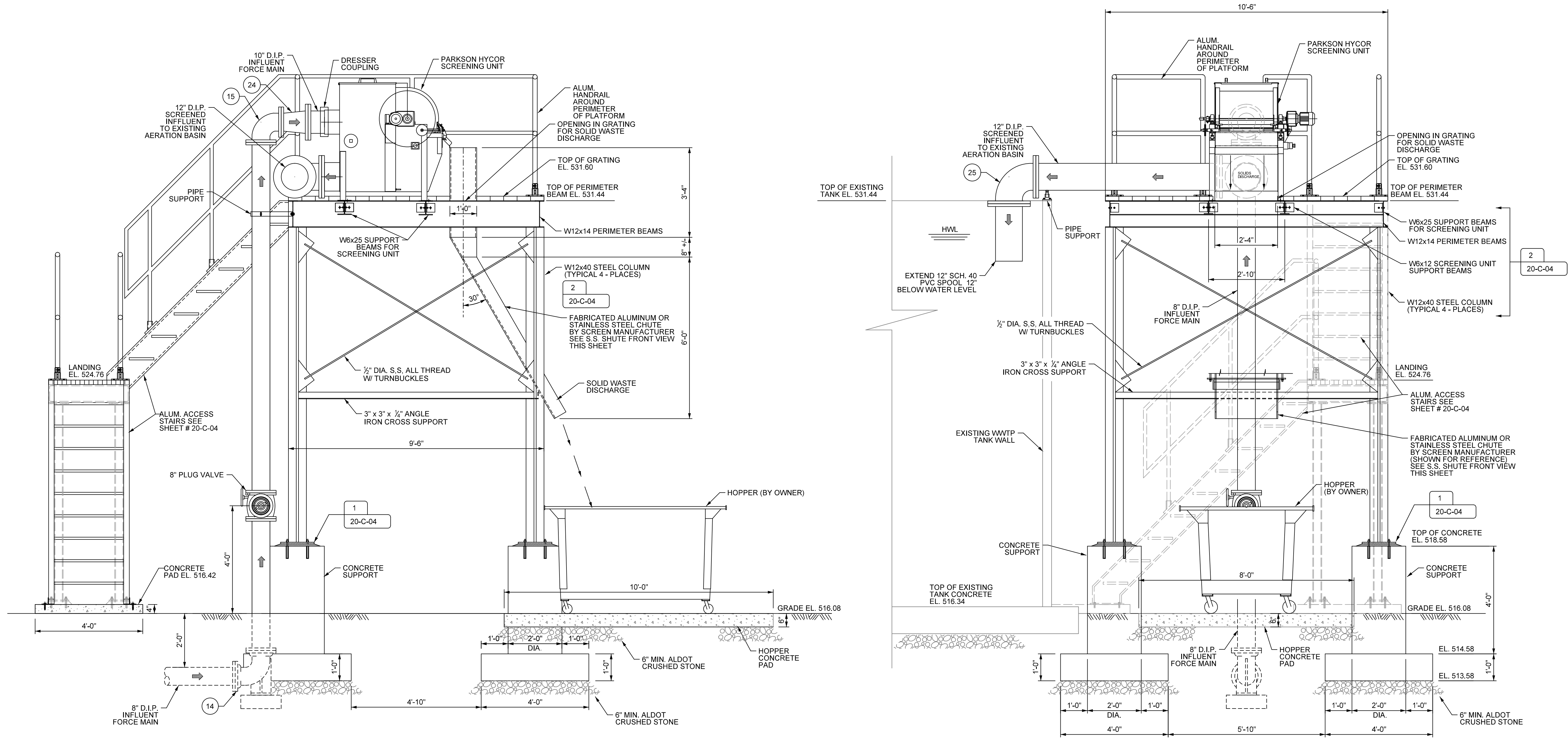
Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

PARKSON HYCOR  
ROTOSTRainer  
SCREENING UNIT  
SECTIONS

BOX IS 2 IN WIDE  
AT FULL SCALE

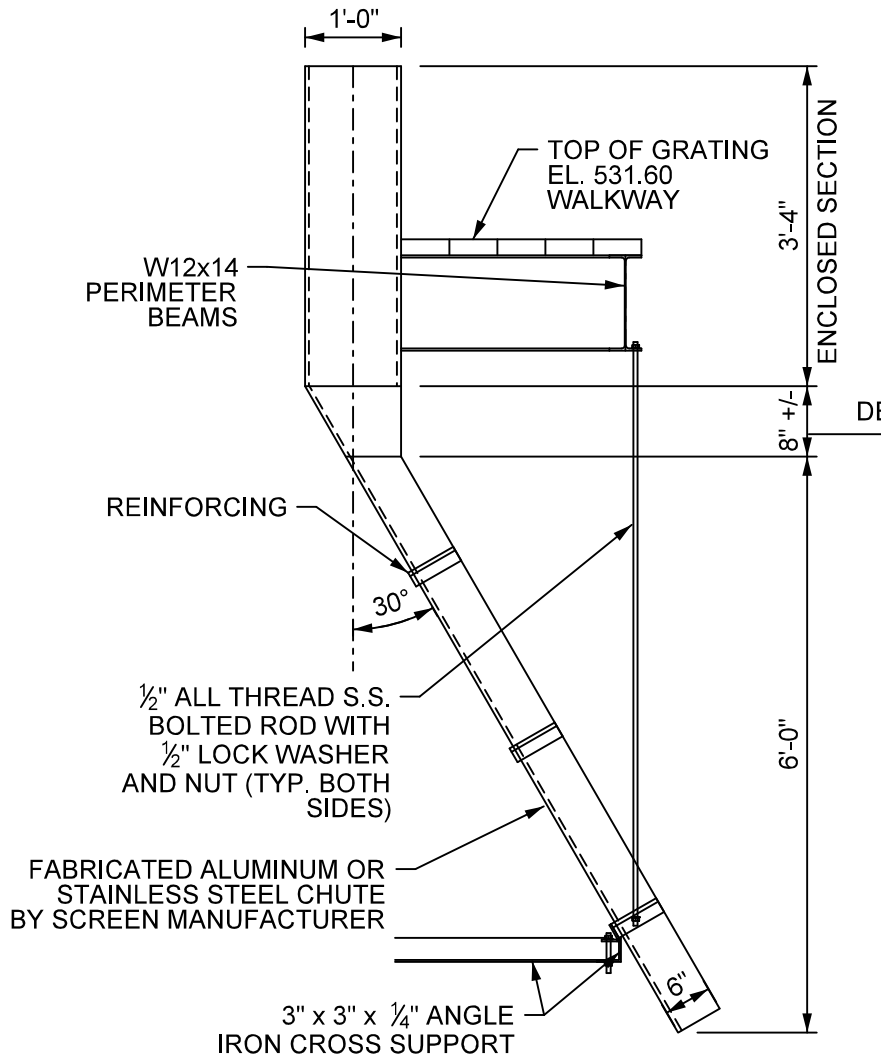
JOB NO: SW-20026  
DATE: JUNE, 2023  
DESIGNED BY: WEC  
DRAWN BY: LEE  
DWG: 20-C-02

SHEET NUMBER **10**



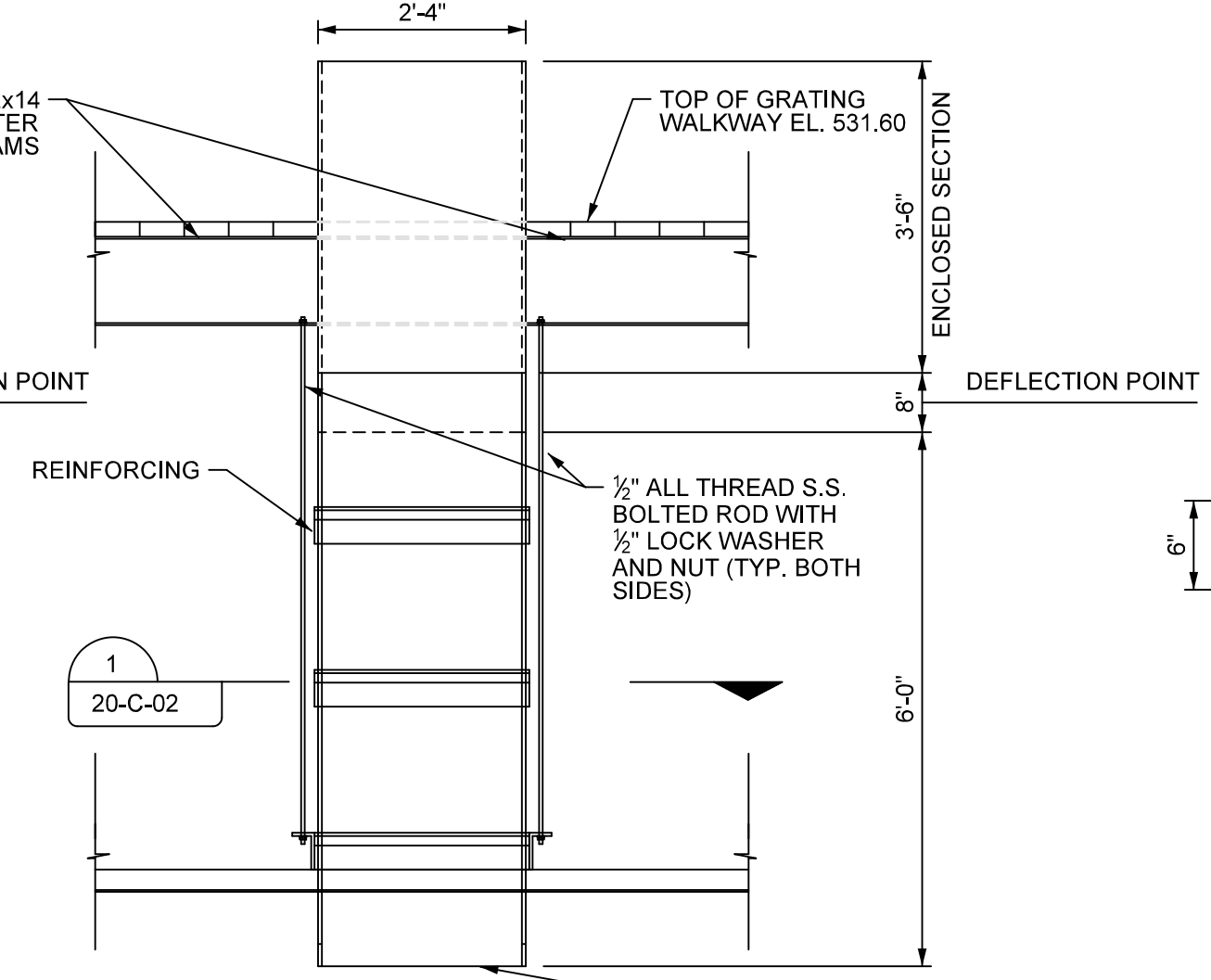
ITEM NO.	DESCRIPTION
14	8" D.I. BASE 90° BEND M.J.
15	8" D.I. 90° BEND FLG.
24	10" x 8" REDUCER FLG. x FLG.
25	12" D.I. 90° BEND FLG.

**A SECTION**  
20-C-02 SCALE: 1/2" = 1'-0"

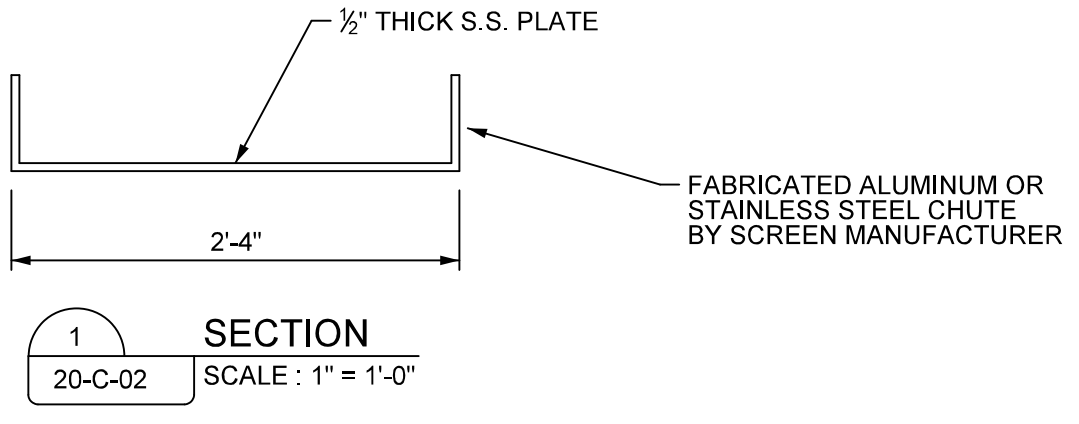


**S.S. SHUTE SIDE VIEW**  
SCALE: 1/2" = 1'-0"

**B SECTION**  
20-C-02 SCALE: 1/2" = 1'-0"

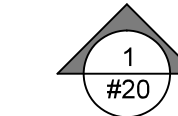
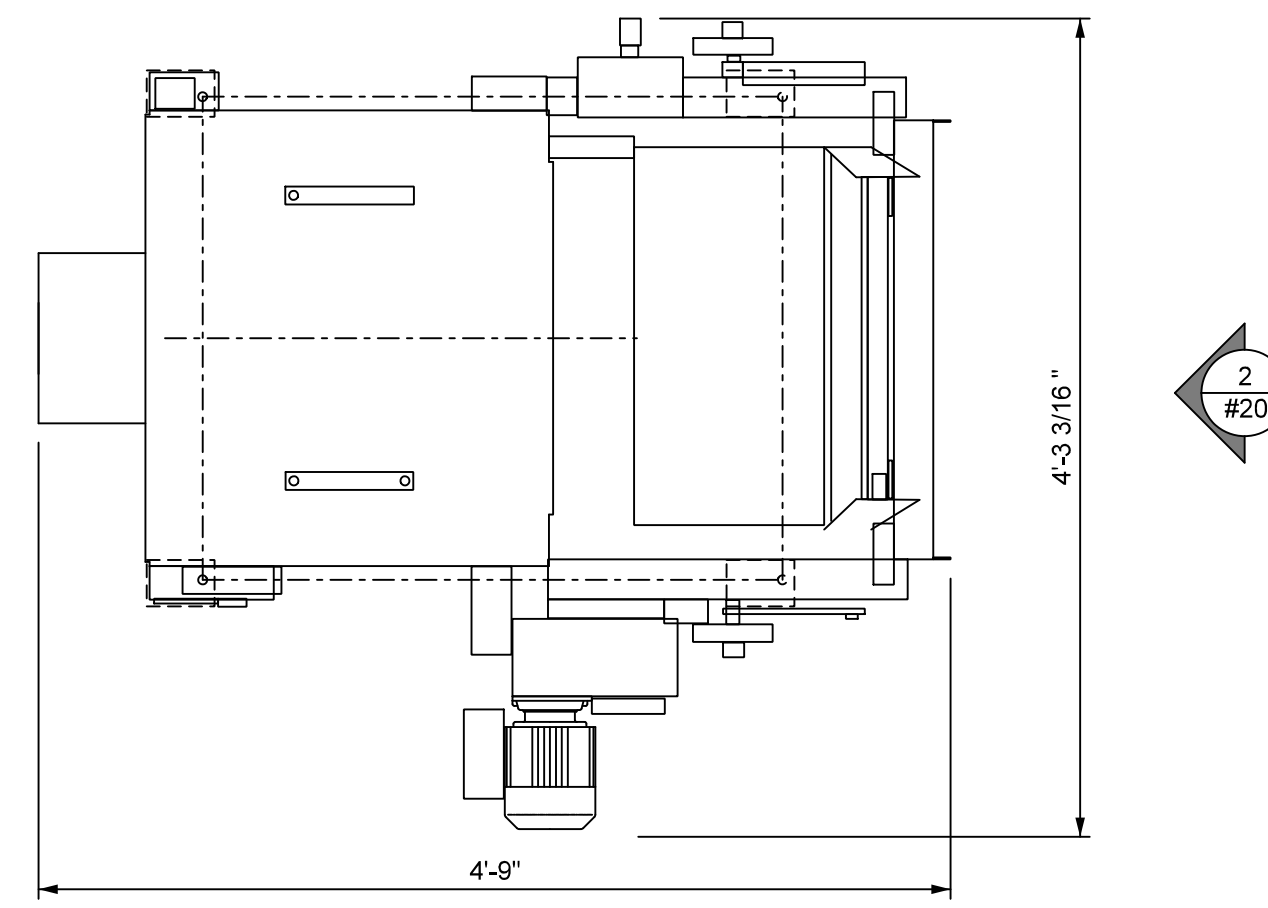


**S.S. SHUTE FRONT VIEW**  
SCALE: 1/2" = 1'-0"



**SECTION 1**  
20-C-02 SCALE: 1" = 1'-0"





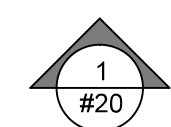
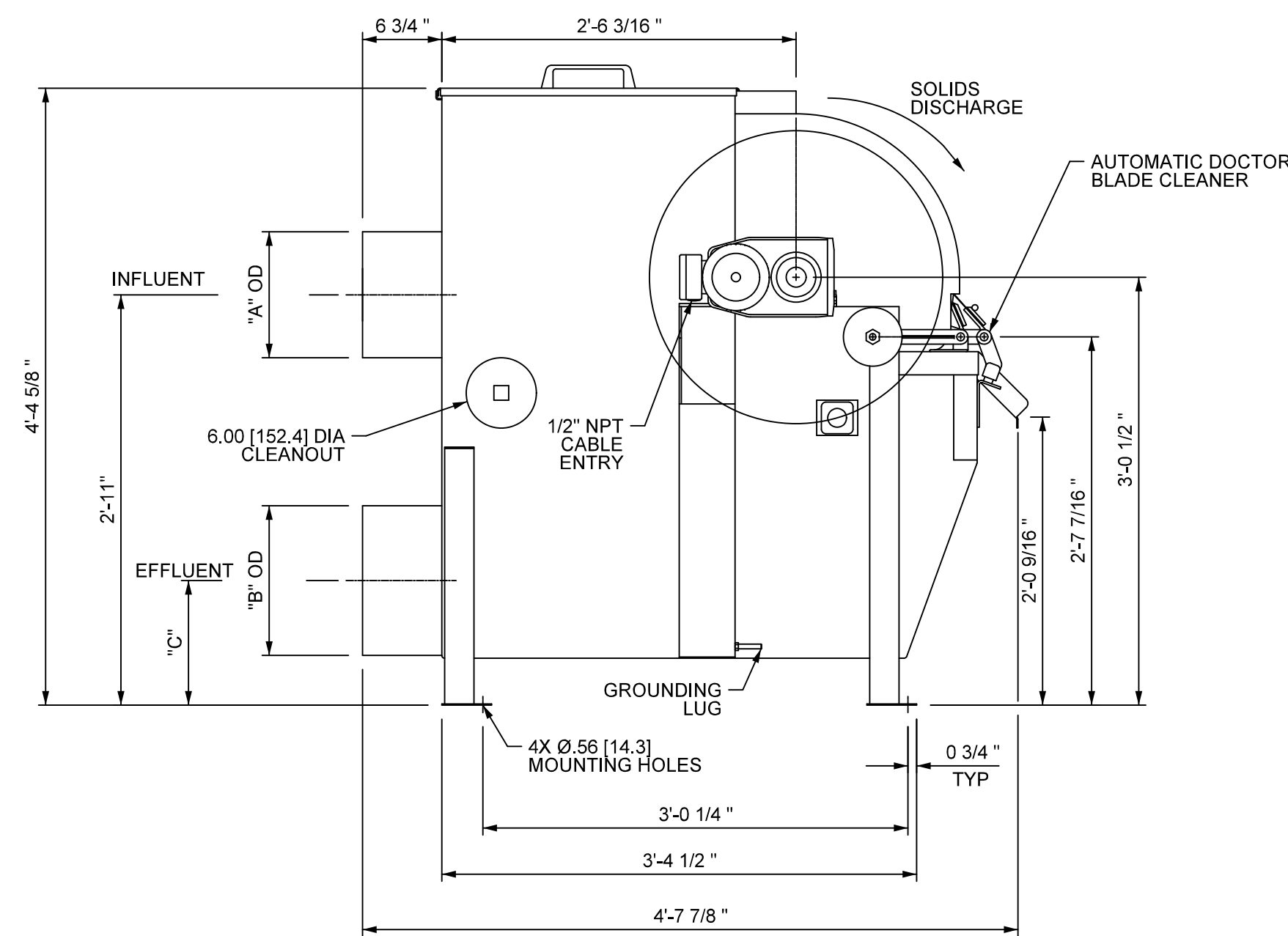
**PLAN VIEW**  
SCALE : NOT TO SCALE

**NOTES:**

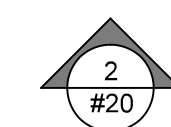
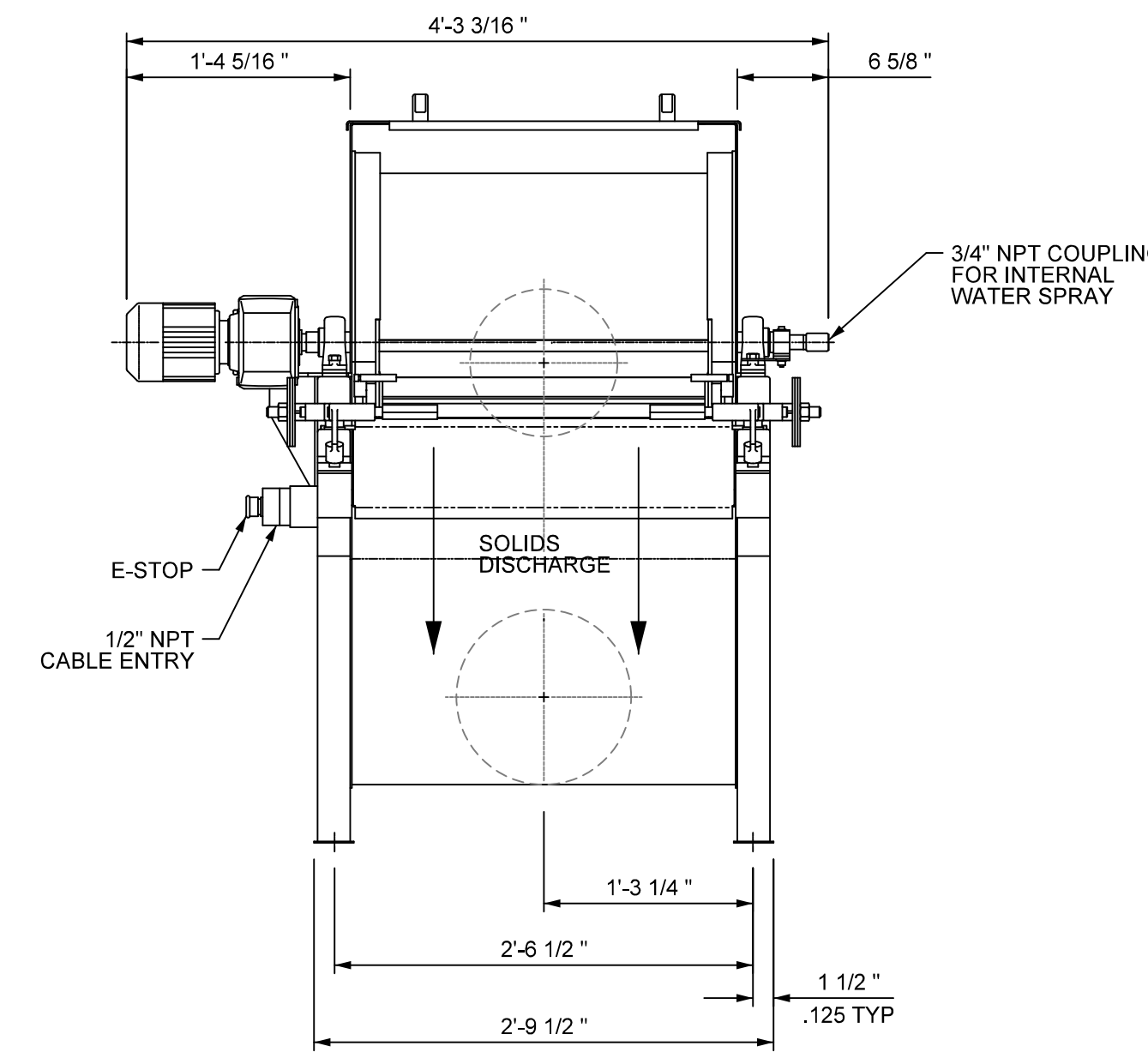
1. ALL 304 STAINLESS STEEL CONSTRUCTION EXCEPT FOR CLEANOUT PLUG, E-STOP HANDLES, BEARINGS, DOCTOR BLADES, BUSHINGS, PIPE CLAMPS, GEARMOTOR AND SPLASH GUARDS.
2. GEARMOTOR: 1/3 HP [0.25 kW], 1800 RPM, 230/460 V, 3 PH, 60 HZ, TEFC, SEVERE DUTY.
3. CYLINDER SPEED: 11 RPM.
4. CYLINDER SCREEN OPENING:
5. RECOMMENDED CLEARANCE TO BE 24.00 [609.6] AROUND UNIT AND 36.00 [914.4] ABOVE UNIT.
6. ALL EXTERNAL PIPING TO BE SUPPORTED INDEPENDENTLY OF THE ROTOSTRAINER UNIT.
7. DRY WEIGHT: 716 LB [325 kg]; WET WEIGHT: 1548 LB [703 kg].
8. TOTAL SPRAY WATER USAGE BASED ON .7 GPM [0.04 L/s] PER NOZZLE AT 40 PSI [2.8 BAR]; 8.4 GPM [0.5 L/s].
9. DIMENSIONS WRITTEN AS INCH [mm] UNLESS OTHERWISE SPECIFIED.
10. STANDARD MODEL SHOWN.

	A	B	C
STANDARD	10.75 [273.1]	12.75 [323.9]	10.63 [270.0]

**PIPE DIMENSIONS**



**LEFT VIEW**  
SCALE : NOT TO SCALE



**FRONT VIEW**  
SCALE : NOT TO SCALE

NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

PARKSON HYCOR  
ROTOSTRAINER  
SCREENING UNIT  
MECHANICAL

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 20-C-03

SHEET NUMBER **11**



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

PARKSON HYCOR  
SCREENING UNIT  
STAIRS AND SUPPORT  
DETAIL

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

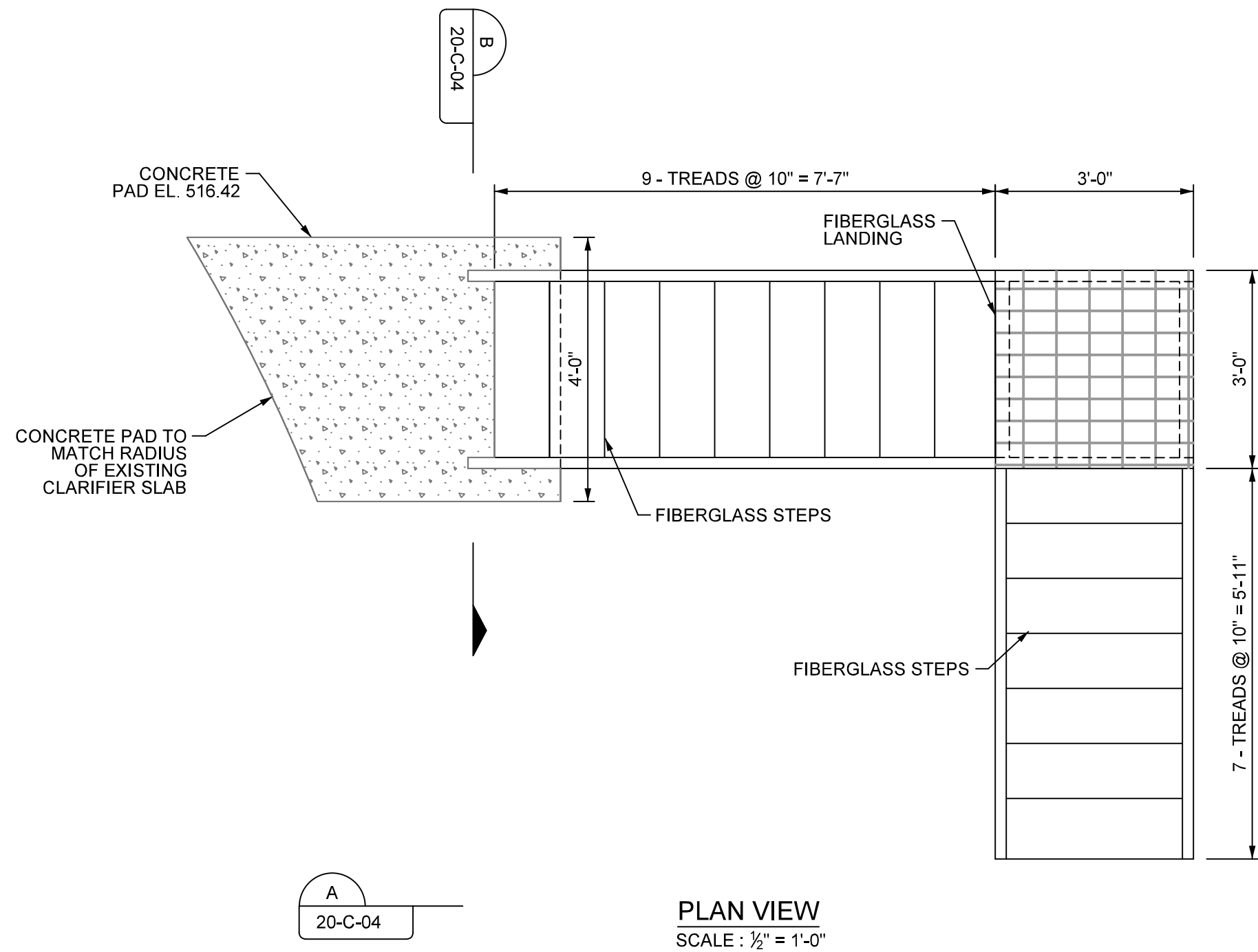
DATE: JUNE, 2023

DESIGNED BY: WEC

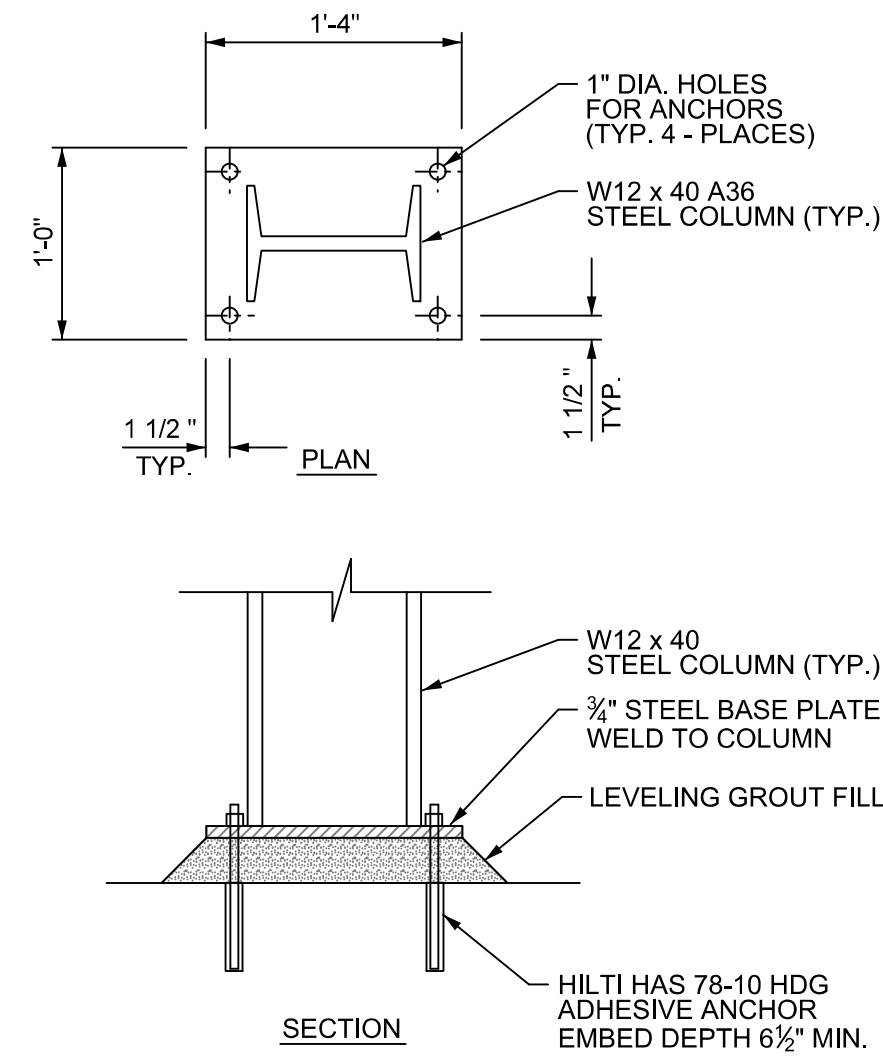
DRAWN BY: LEE

DWG: 20-C-04

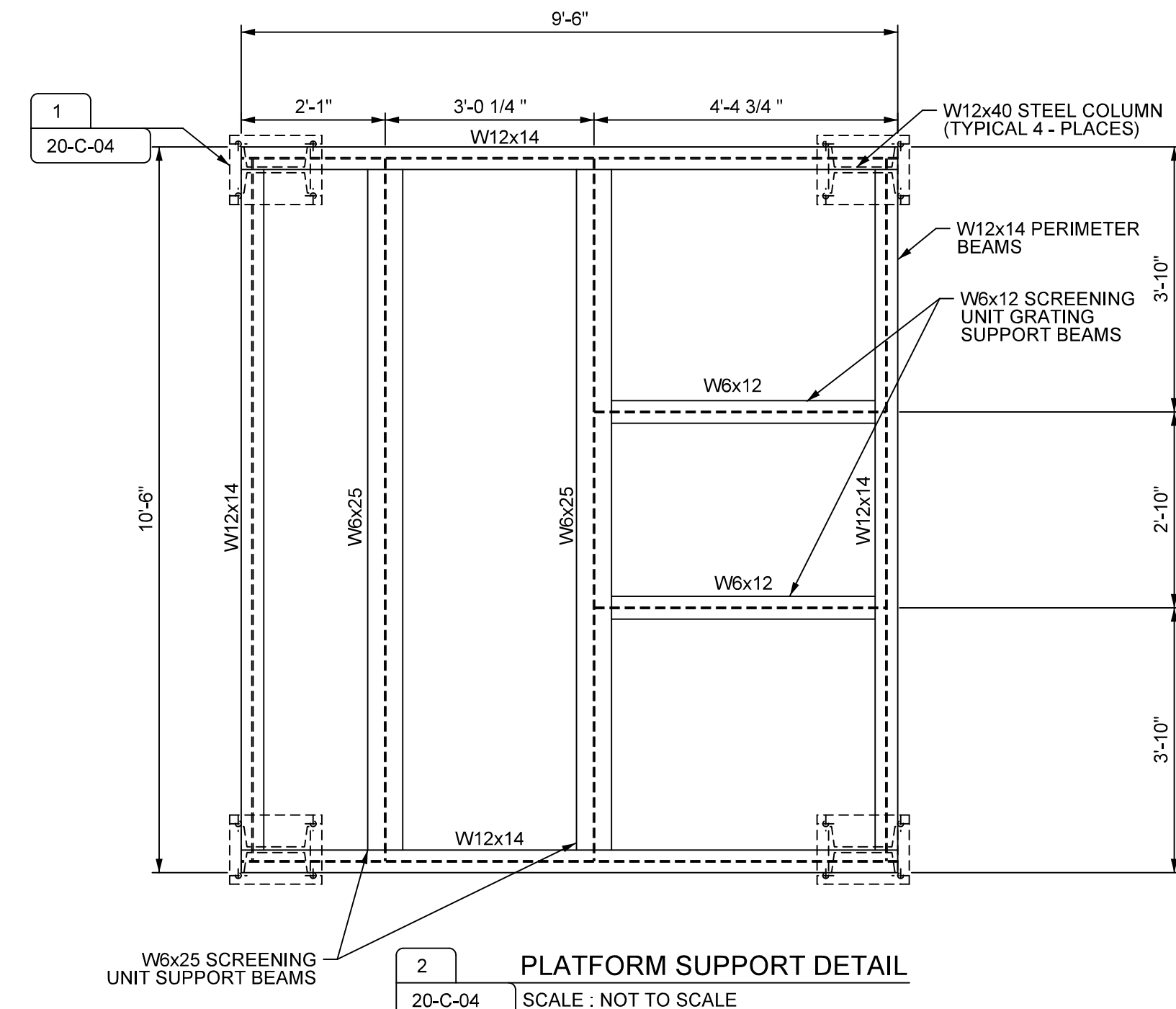
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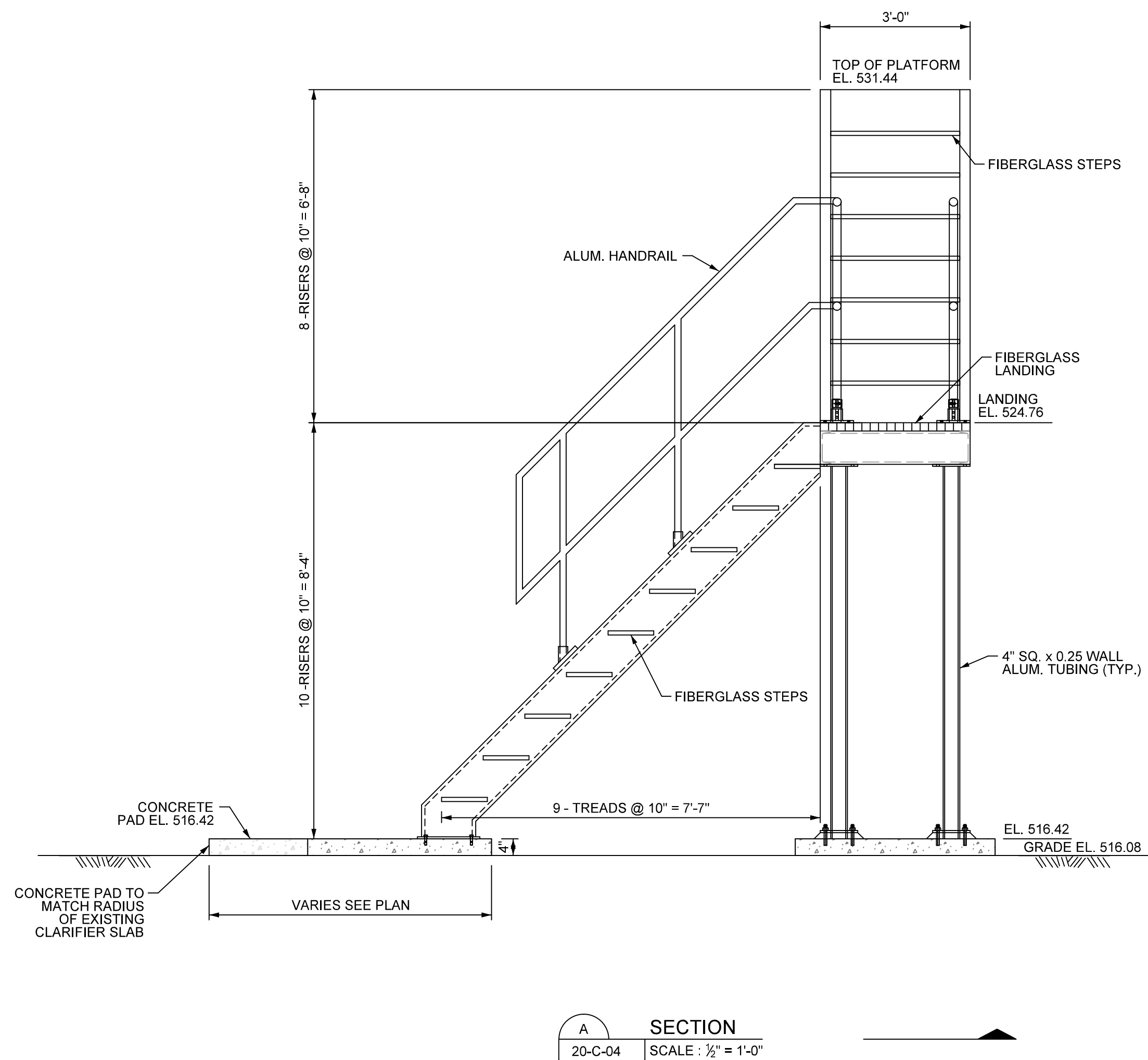
**PLAN VIEW**  
SCALE: 1/2" = 1'-0"



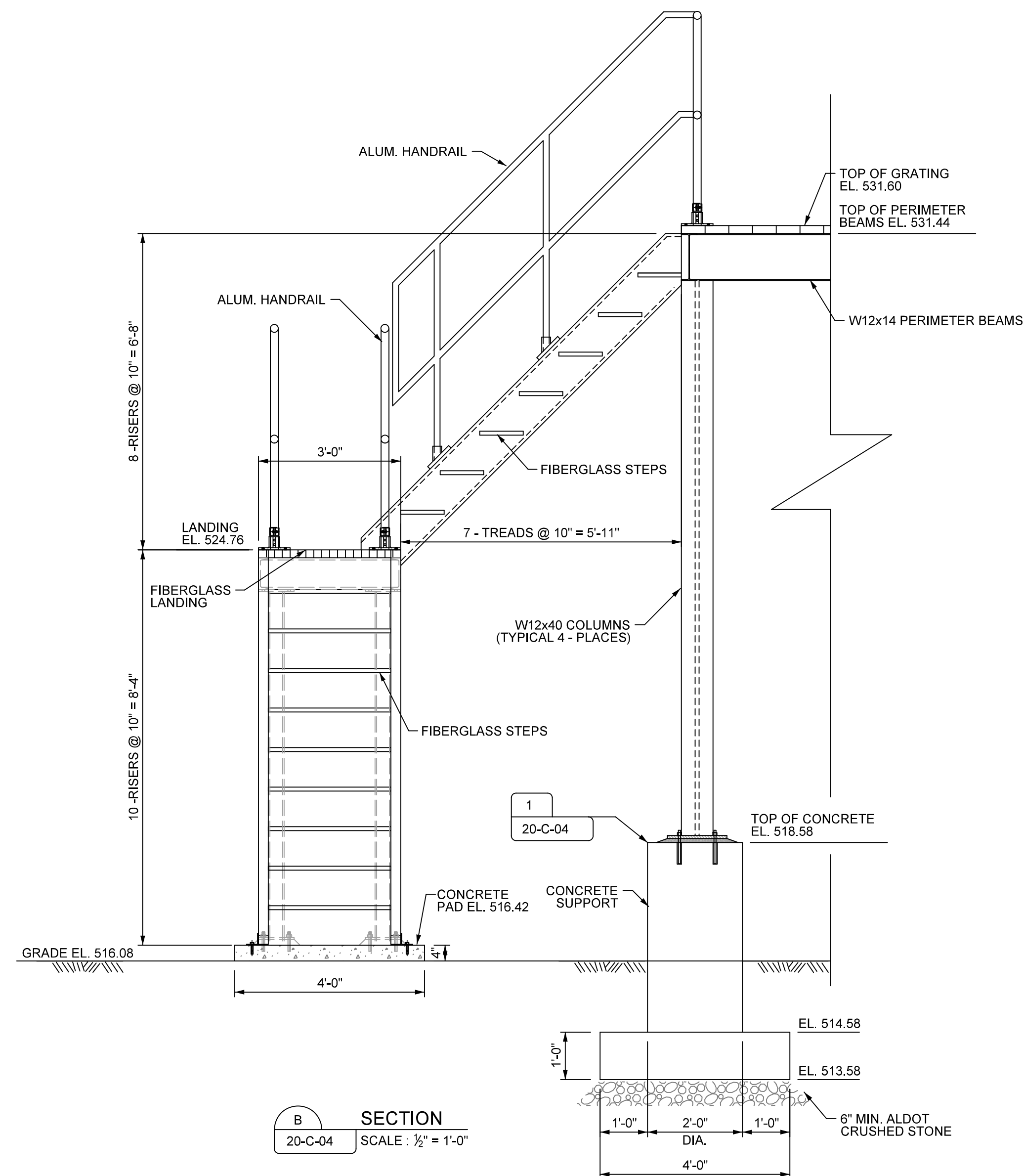
**1 PLATFORM SUPPORT BASE PLATE DETAIL**  
SCALE: NOT TO SCALE



**2 PLATFORM SUPPORT DETAIL**  
SCALE: NOT TO SCALE



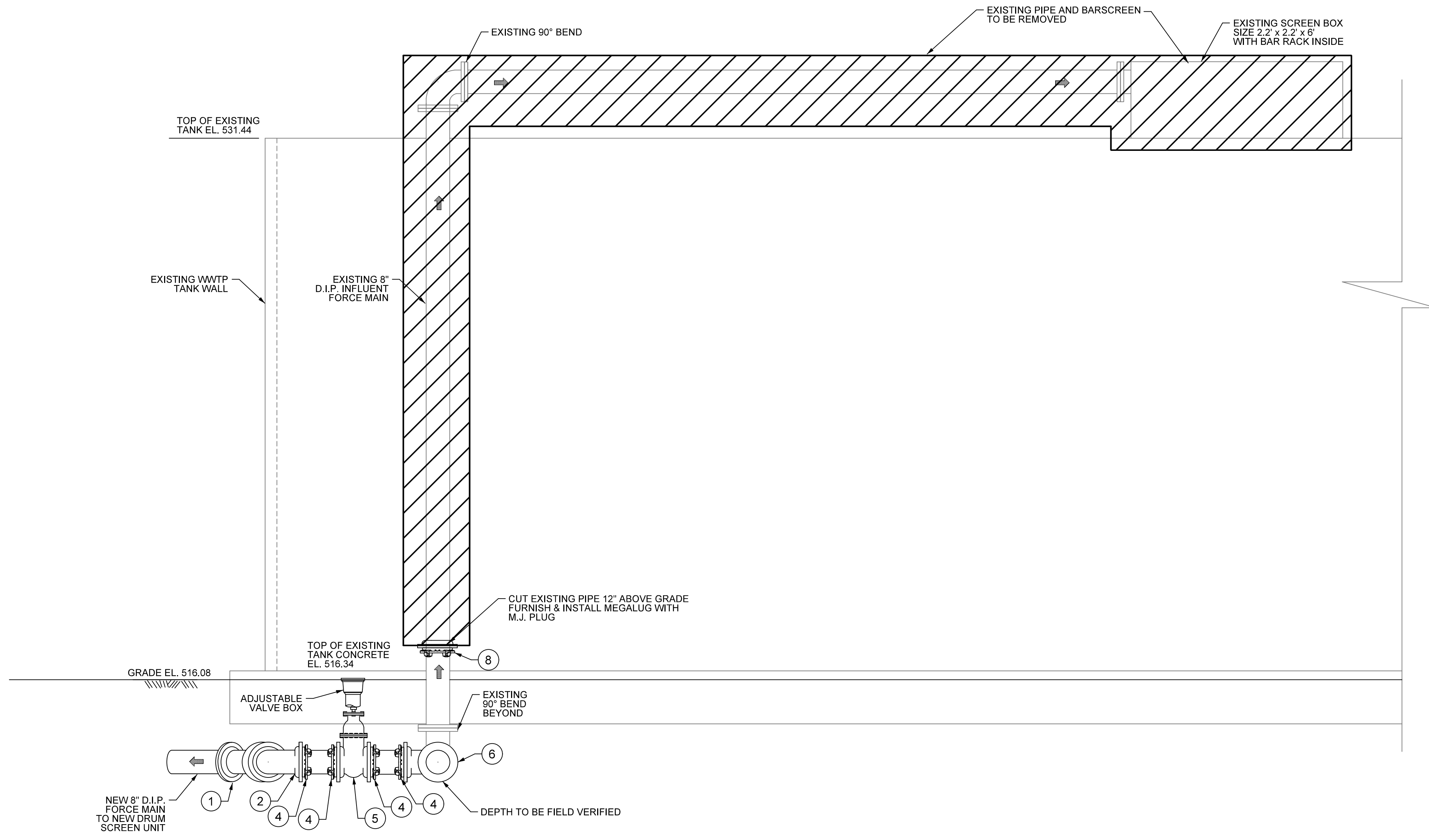
**A SECTION**  
SCALE: 1/2" = 1'-0"



**B SECTION**  
SCALE: 1/2" = 1'-0"



= TO BE REMOVED



MATERIALS LIST	
ITEM NO.	DESCRIPTION
①	8" 22.5° M.J. x M.J. BEND
②	8" 90° M.J. x M.J. BEND
③	CONCRETE THRUST BLOCK
④	8" MEGALUG
⑤	8" GATE VALVE M.J. x M.J.
⑥	8" x 8" x 8" M.J. x PE x M.J. TEE
⑦	8" MEGA-COUPLING
⑧	8" MEGA-COUPLING AND M.J. PLUG

**C SECTION**  
20-C-07 SCALE : 1/2" = 1'-0"

REVISIONS		NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

SCREENING UNIT  
FORCE MAIN  
CONNECTION  
SECTION -C

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

DESIGNED BY: WEC

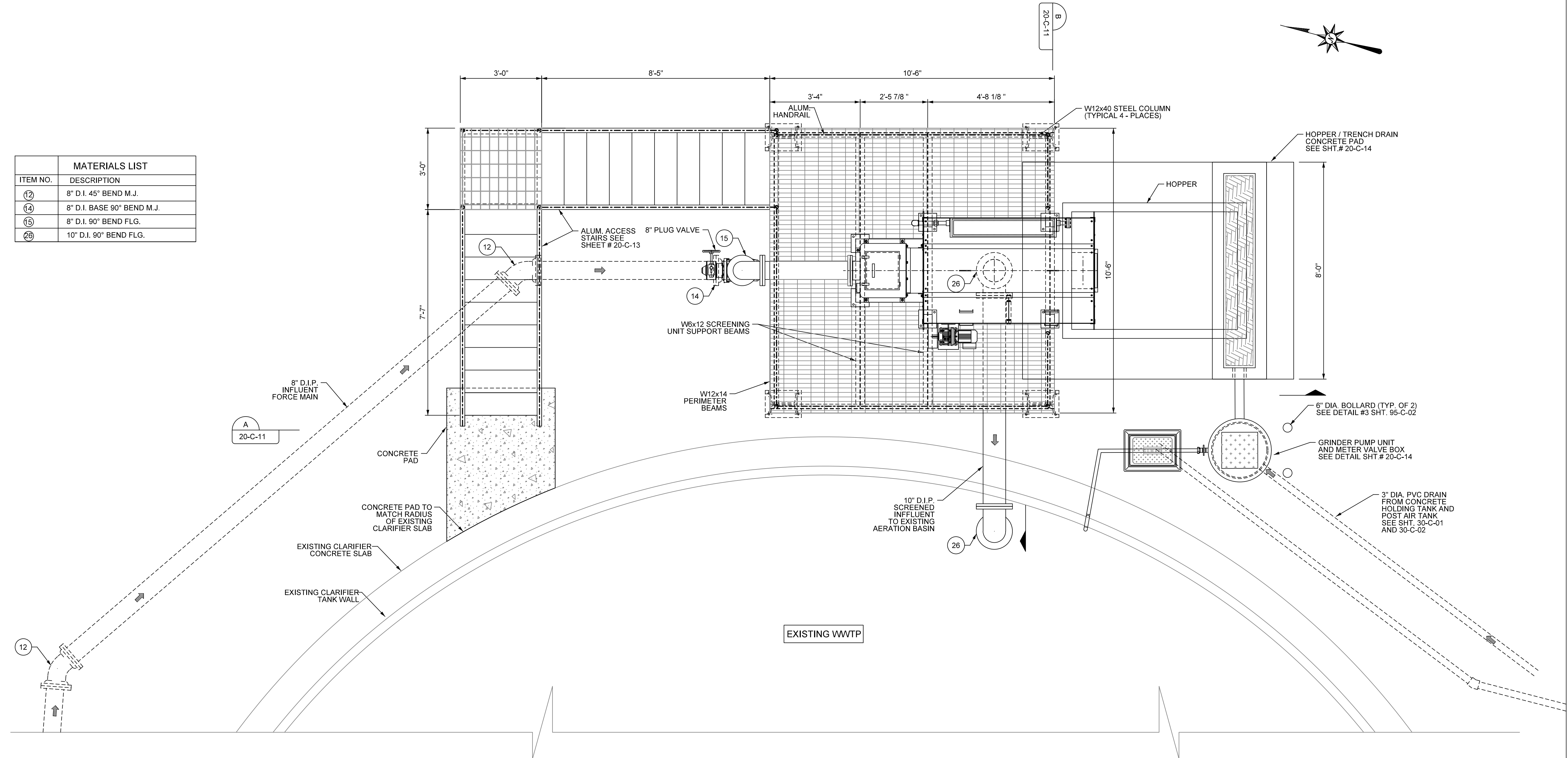
DRAWN BY: LEE

DWG: 20-C-07

SHEET NUMBER **13**



MATERIALS LIST	
ITEM NO.	DESCRIPTION
12	8" D.I. 45° BEND M.J.
14	8" D.I. BASE 90° BEND M.J.
15	8" D.I. 90° BEND FLG.
26	10" D.I. 90° BEND FLG.



NO.	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

IPEC SCREENING UNIT PLAN

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026  
DATE: JUNE, 2023  
DESIGNED BY: WEC  
DRAWN BY: LEE  
DWG: 20-C-10

SHEET NUMBER **14**

IPEC SCREENING UNIT PLAN  
SCALE: 1/2" = 1'-0"





ENGINEERS  
OF THE SOUTH



06-16-2023

NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION	AS-BUILT
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Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

IPEC SCREENING  
UNIT SECTIONS

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

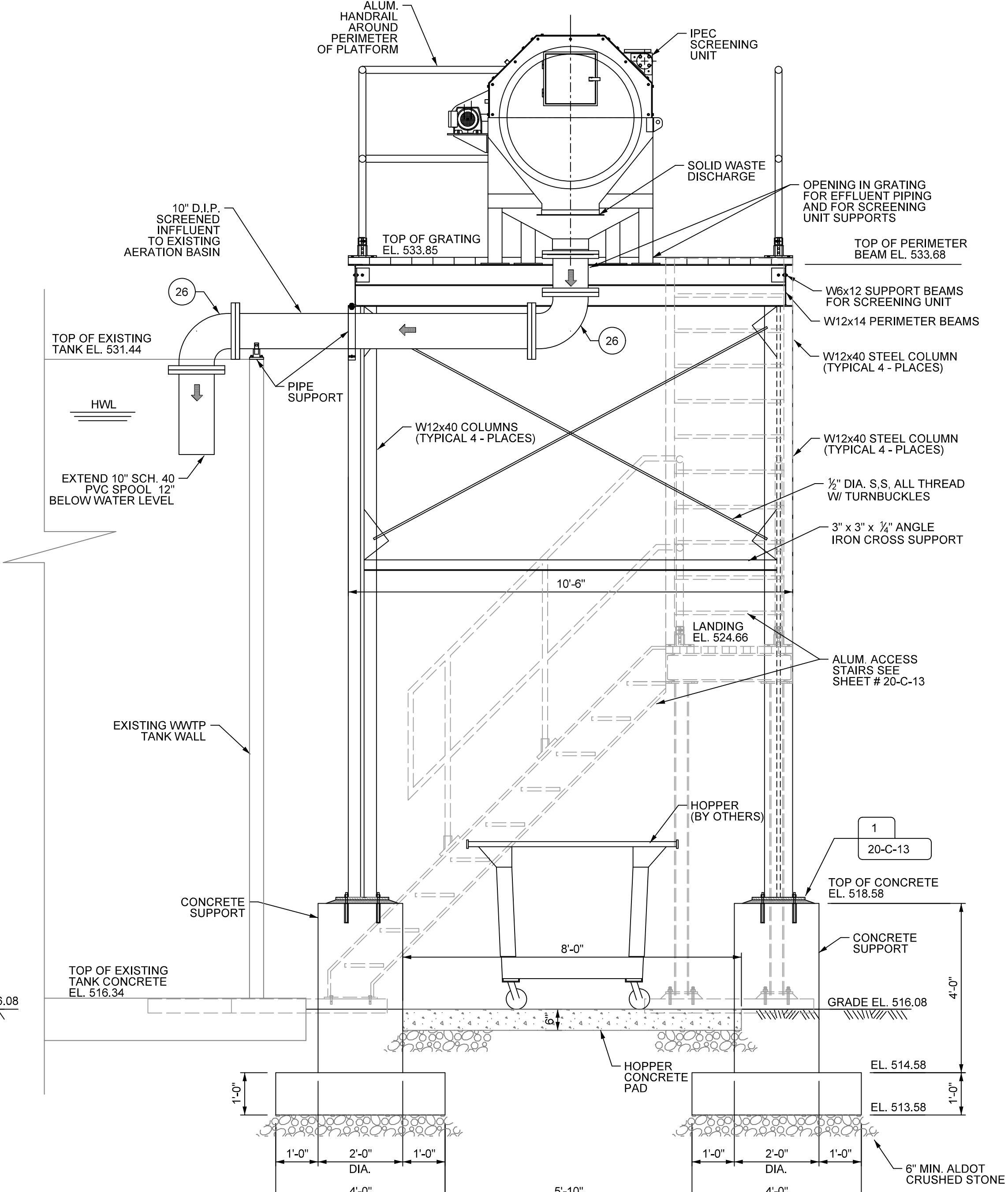
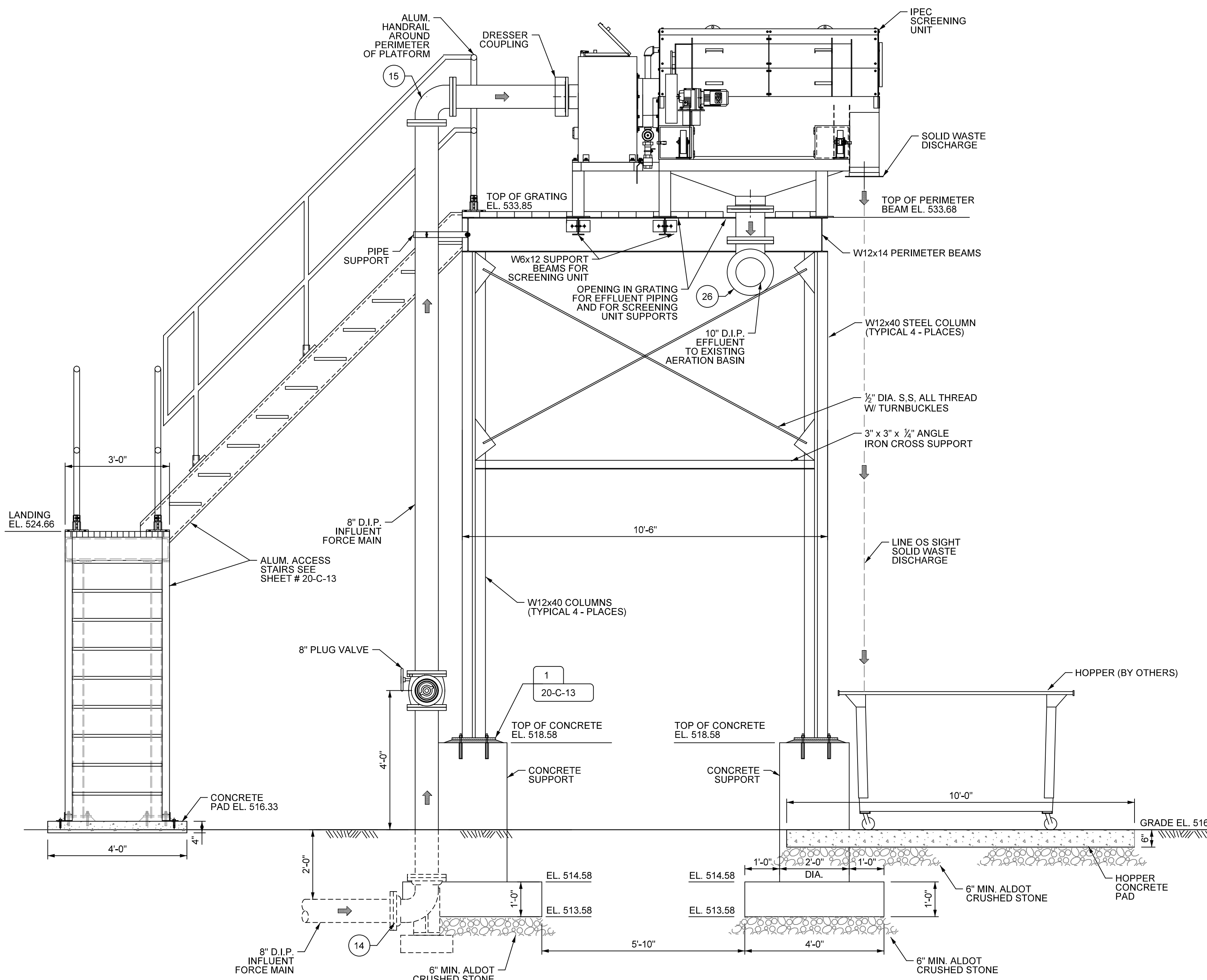
DATE: JUNE, 2023

DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 20-C-11

SHEET NUMBER **15**



MATERIALS LIST	
ITEM NO.	DESCRIPTION
14	8" D.I. BASE 90° BEND M.J.
15	8" D.I. 90° BEND FLG.
25	10" D.I. 90° BEND FLG.

**A** SECTION  
20-C-11 SCALE: 1/2" = 1'-0"

**B** SECTION  
20-C-11 SCALE: 1/2" = 1'-0"



NO.	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

IPEC  
SCREENING UNIT  
MECHANICAL

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

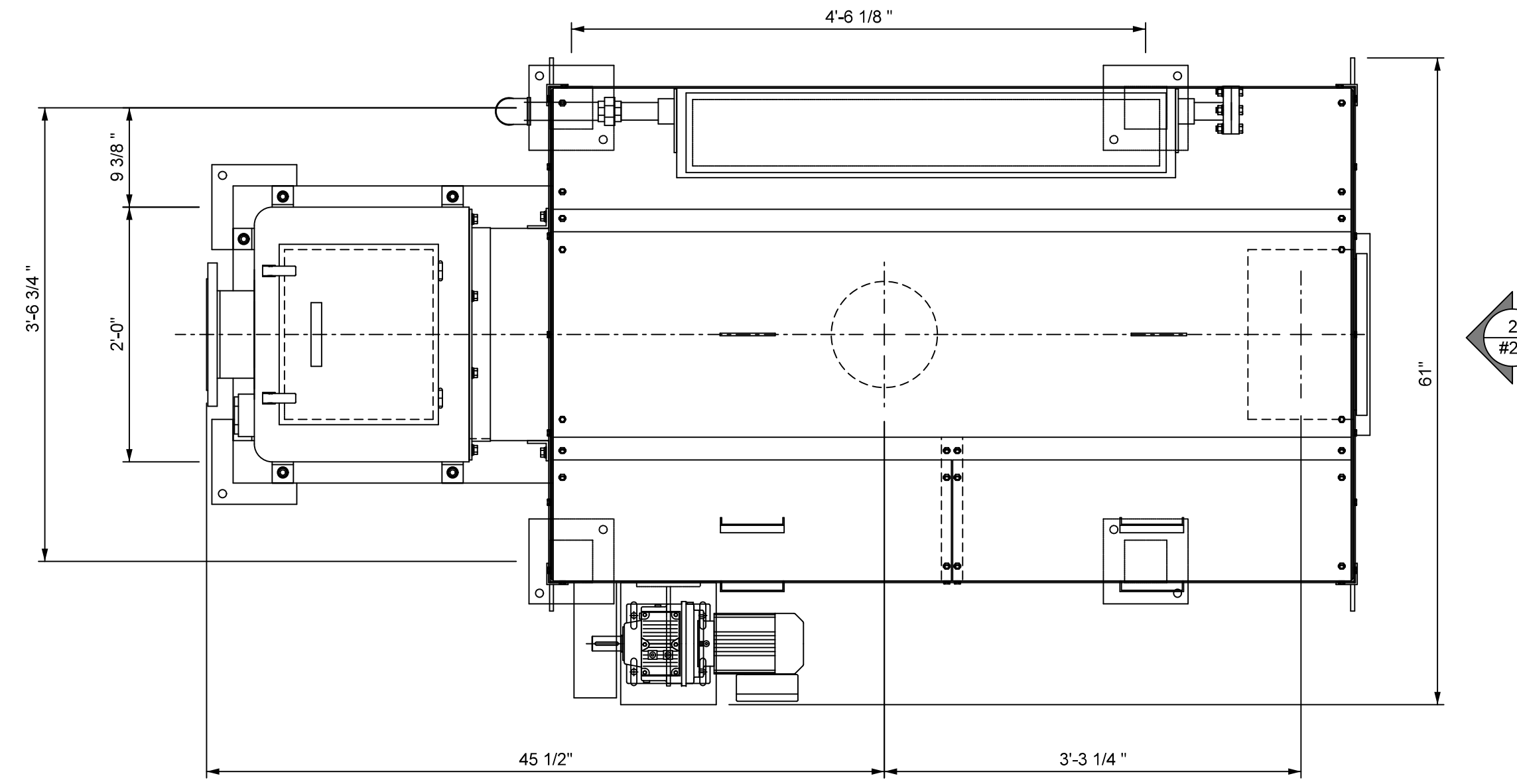
DATE: JUNE, 2023

DESIGNED BY: WEC

DRAWN BY: LEE

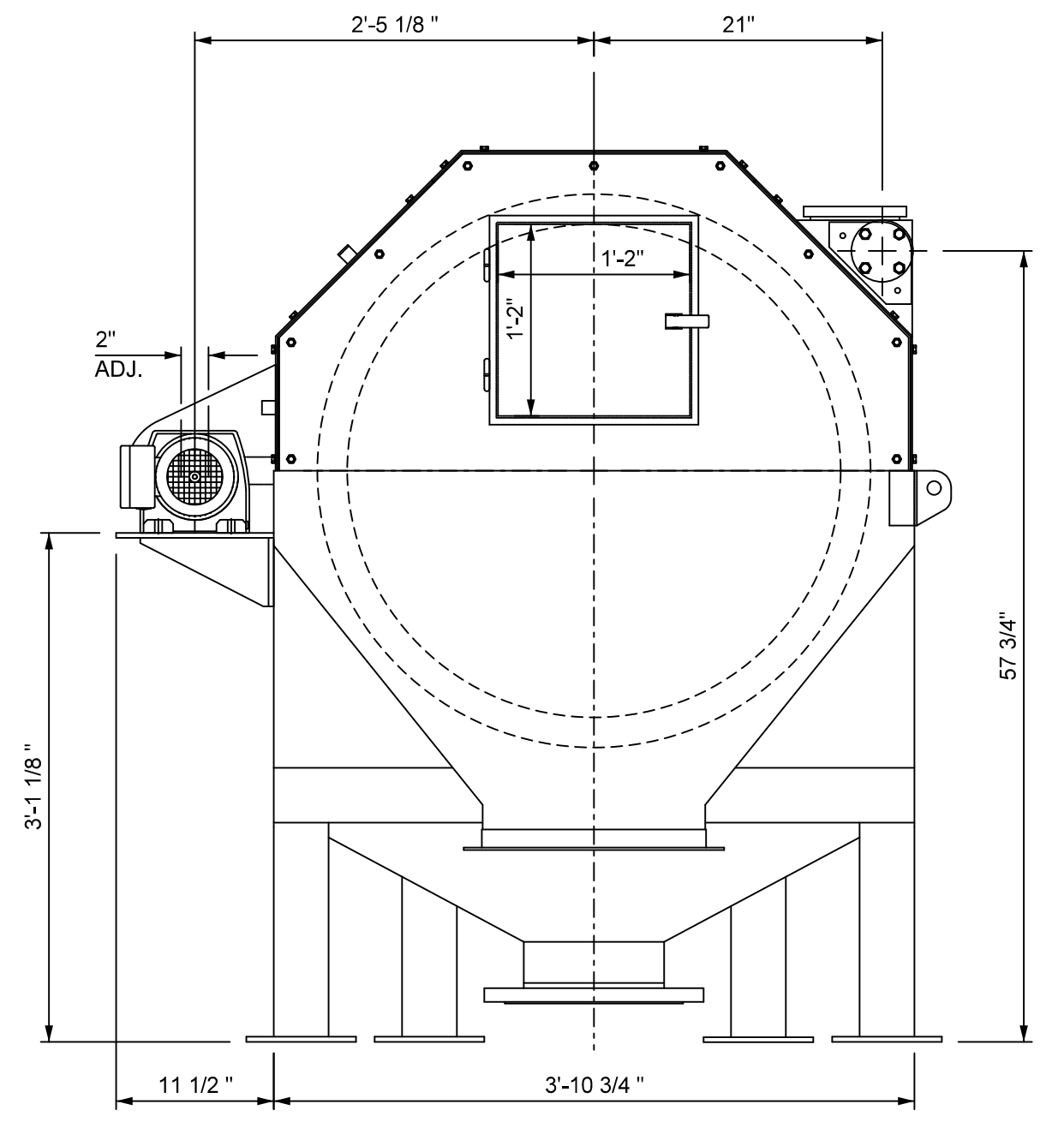
DWG: 20-C-12

SHEET NUMBER **16**



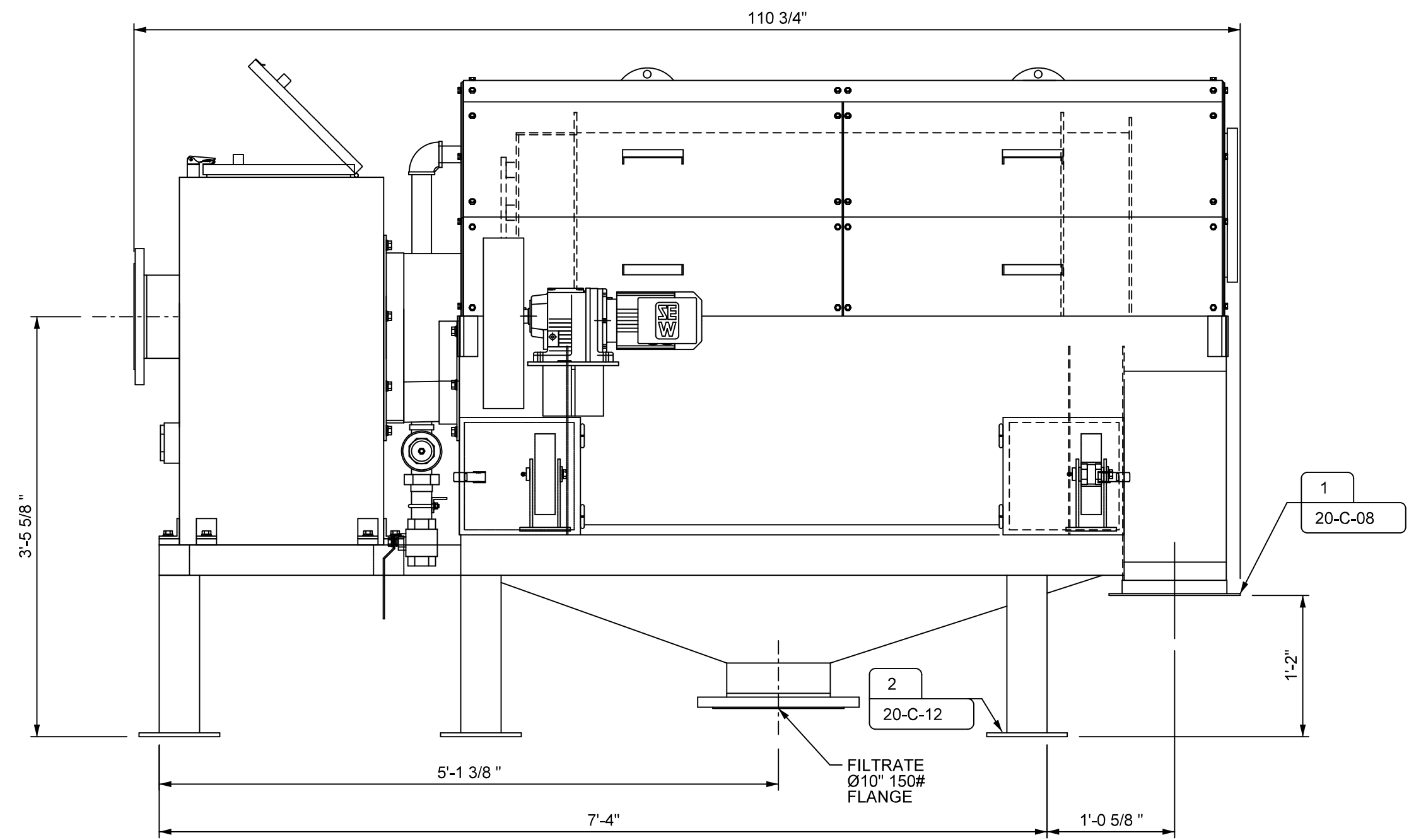
1 #20

**PLAN VIEW**  
SCALE: NOT TO SCALE



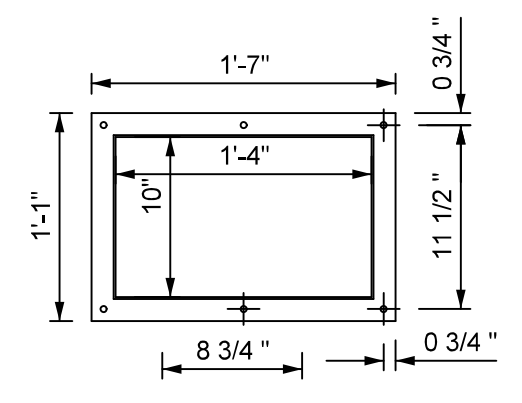
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**RIGHT VIEW**  
SCALE: NOT TO SCALE

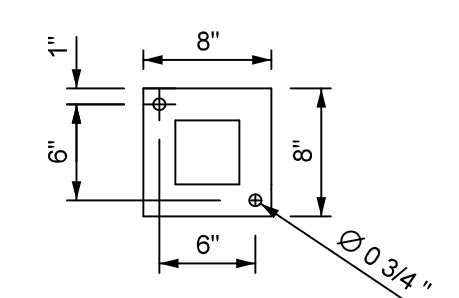


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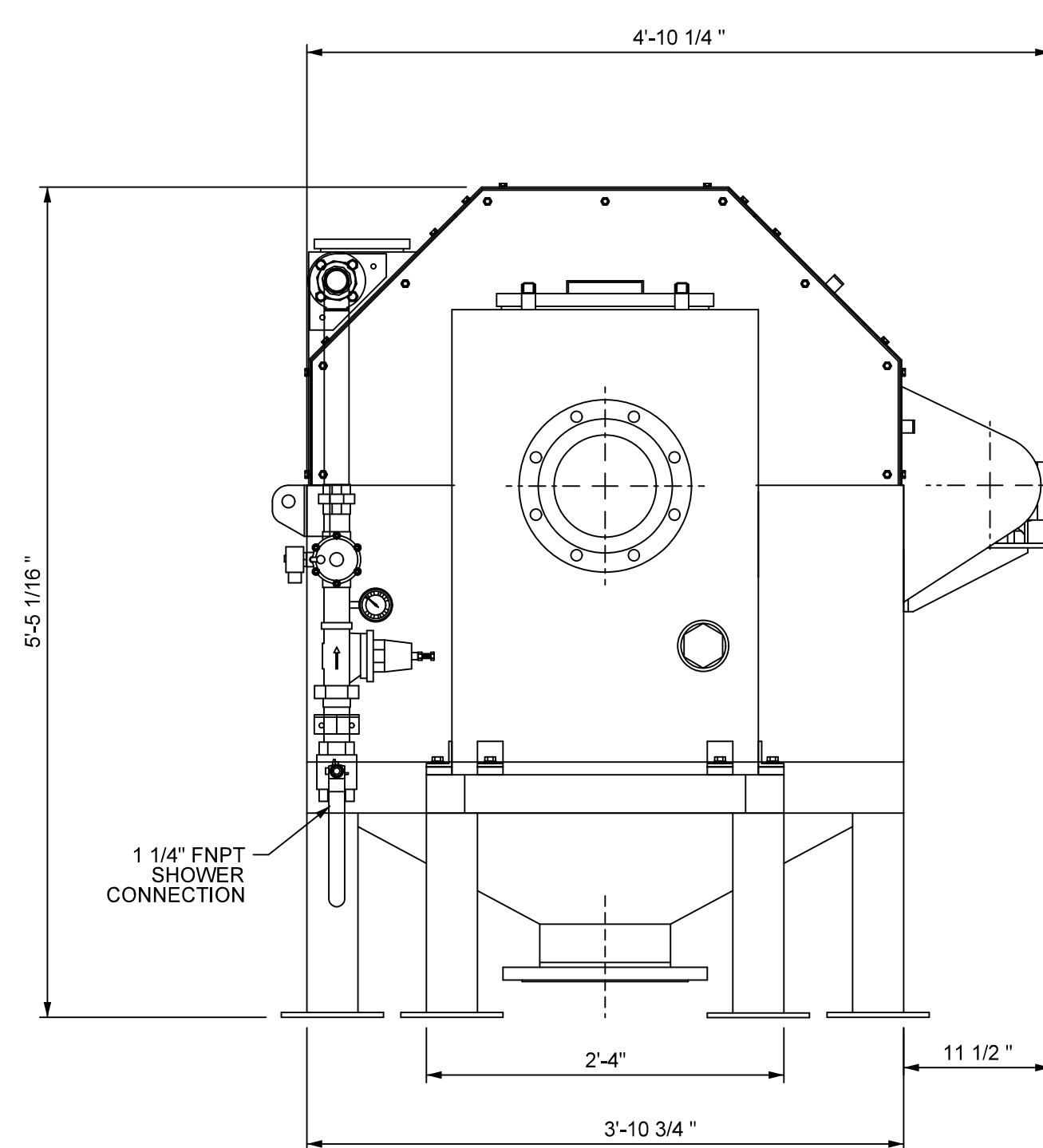
**FRONT VIEW**  
SCALE: NOT TO SCALE



1 20-C-12 **SOLIDS DISCHARGE DETAIL**  
SCALE: NOT TO SCALE



2 20-C-12 **FOOT PLATE DETAIL**  
SCALE: NOT TO SCALE



3 #20

**LEFT VIEW**  
SCALE: NOT TO SCALE



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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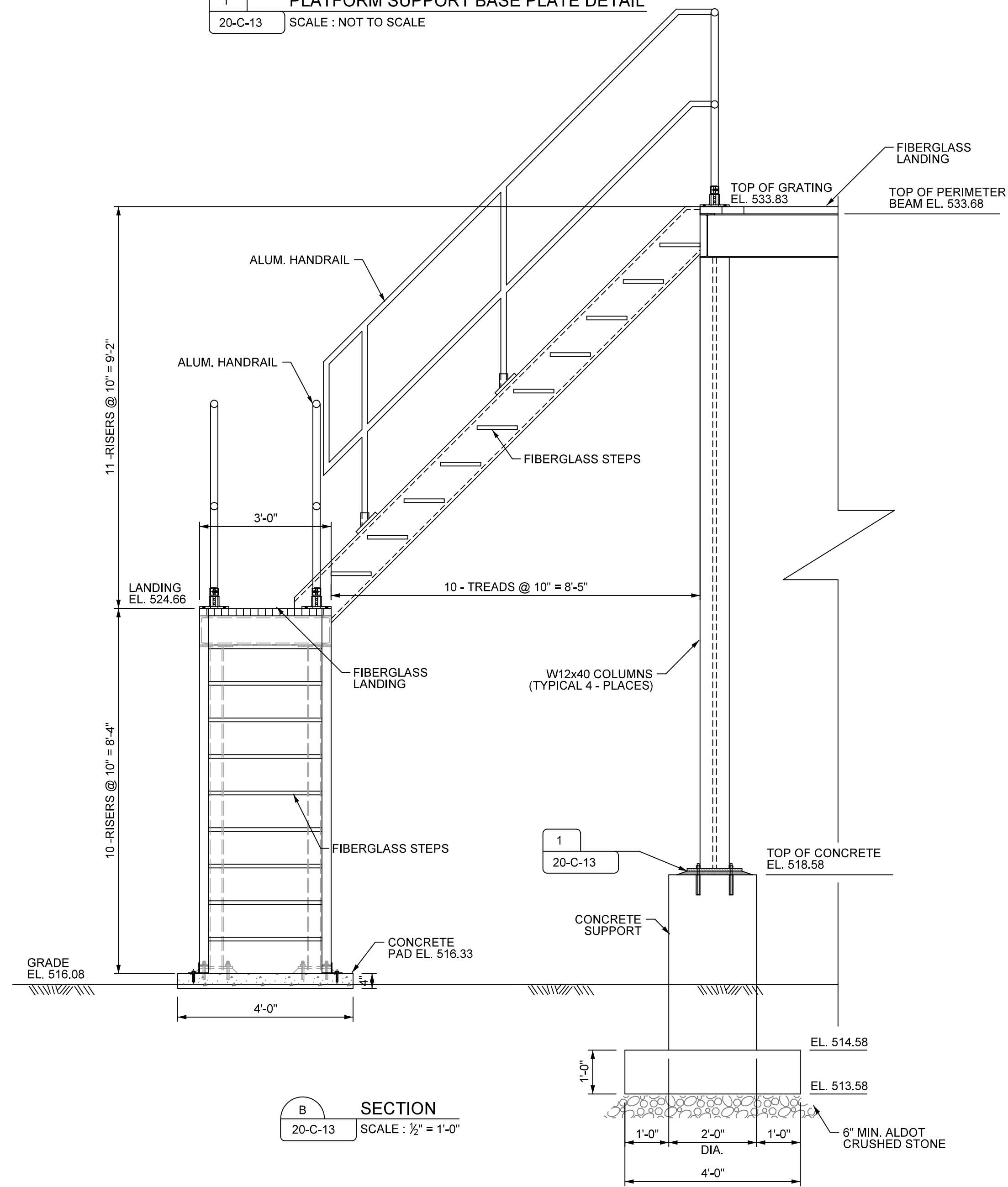
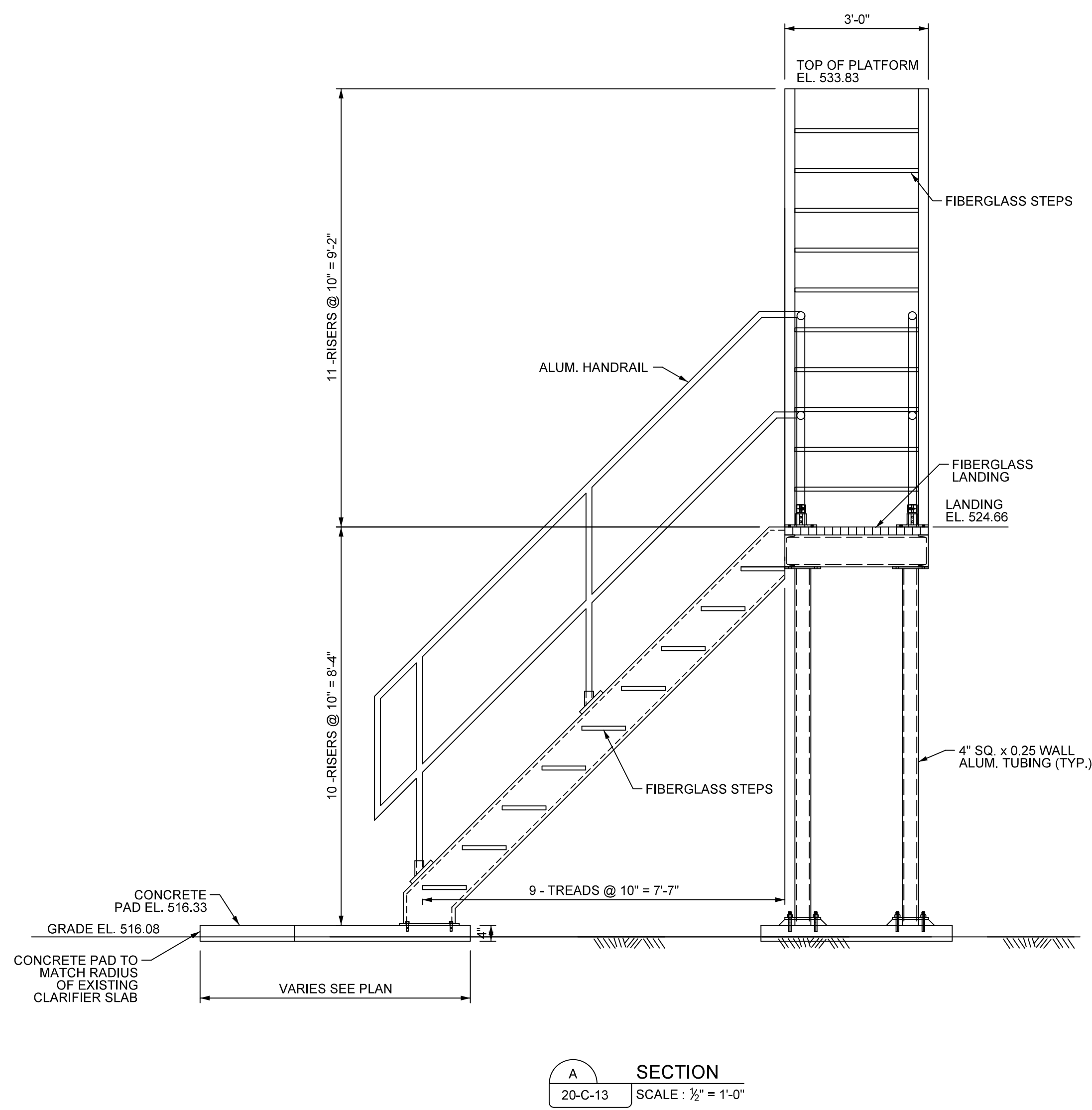
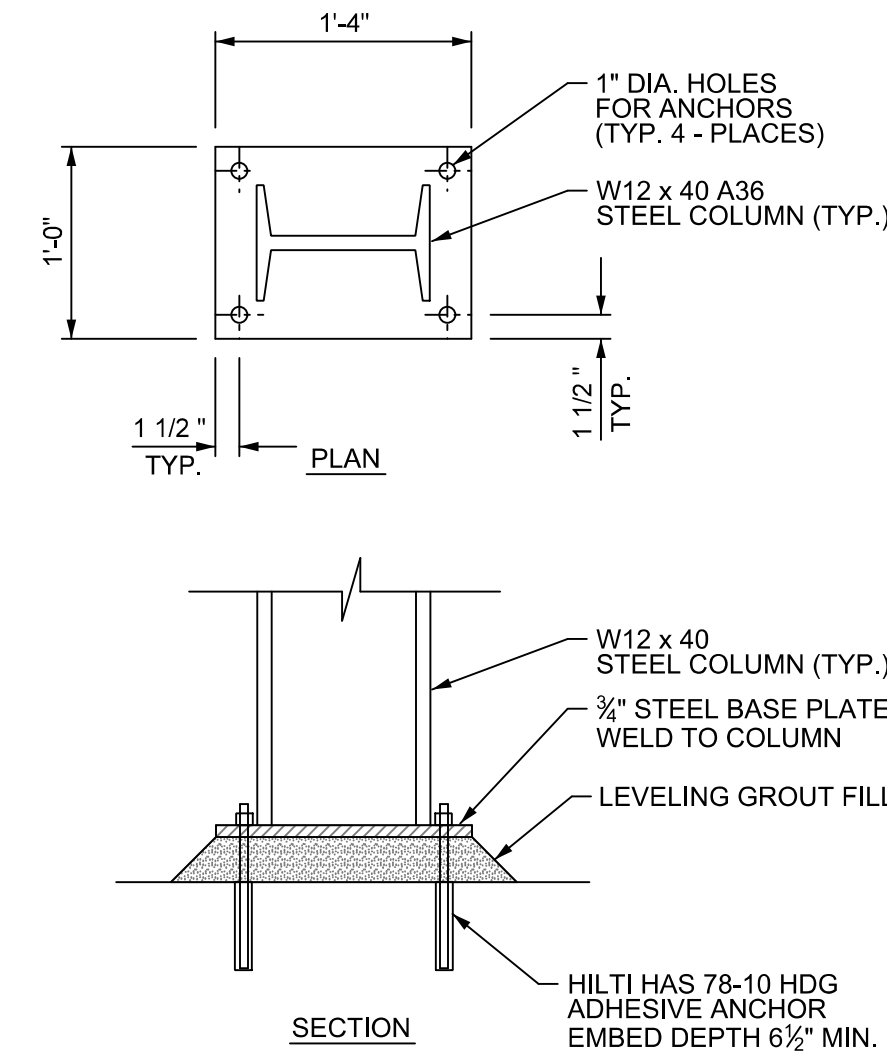
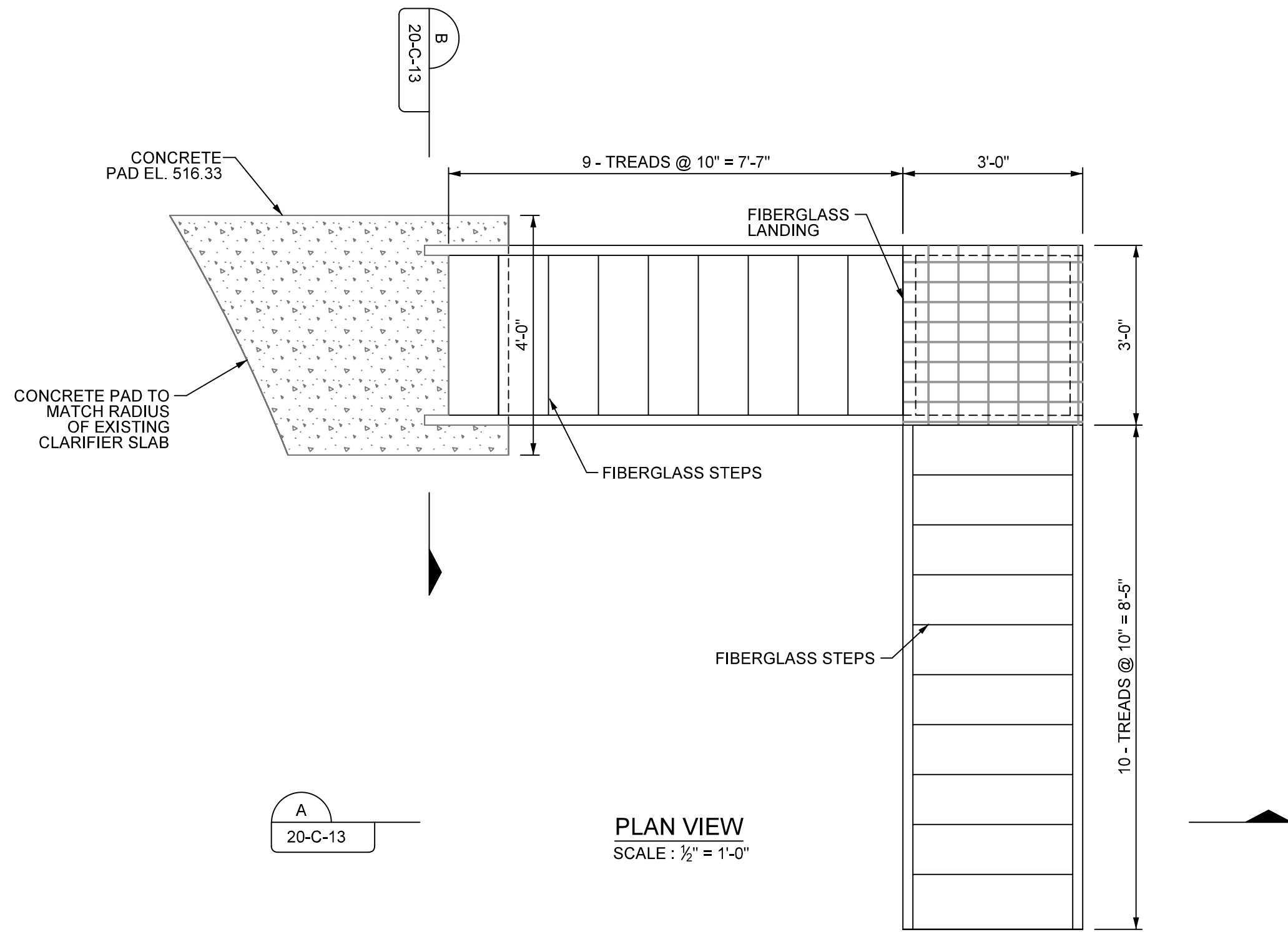
Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

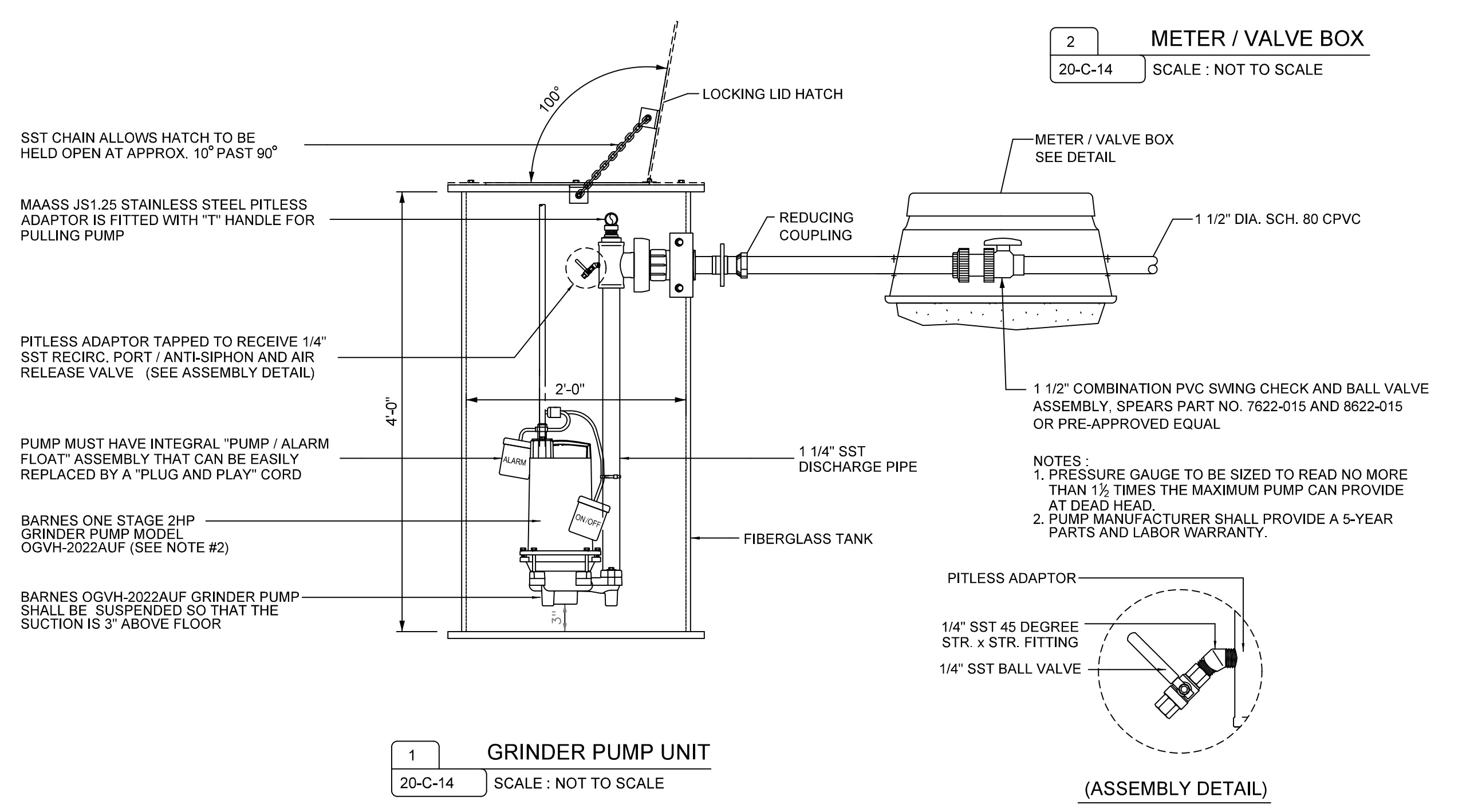
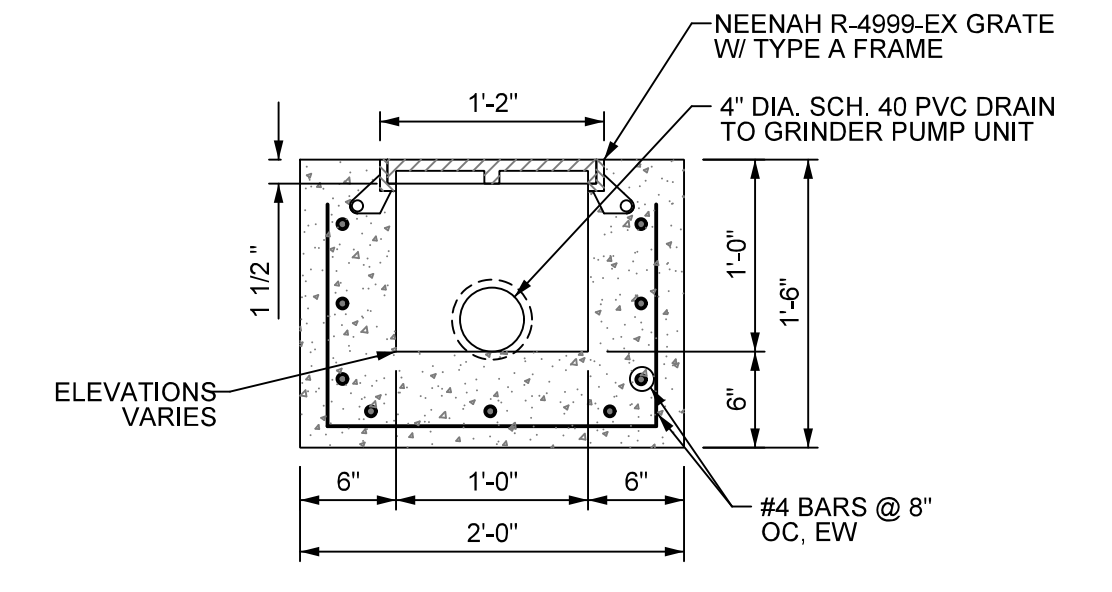
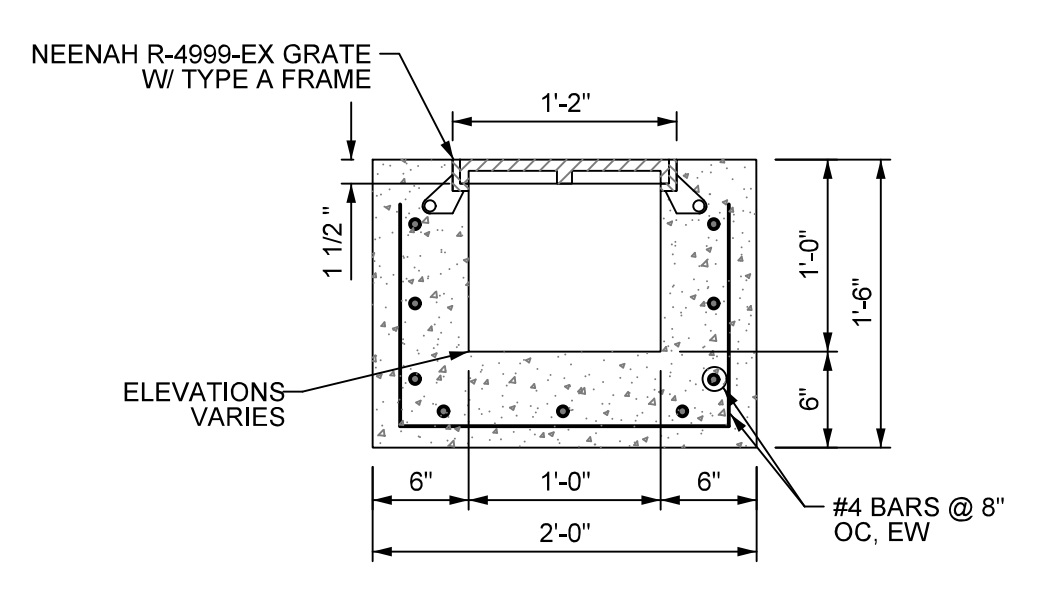
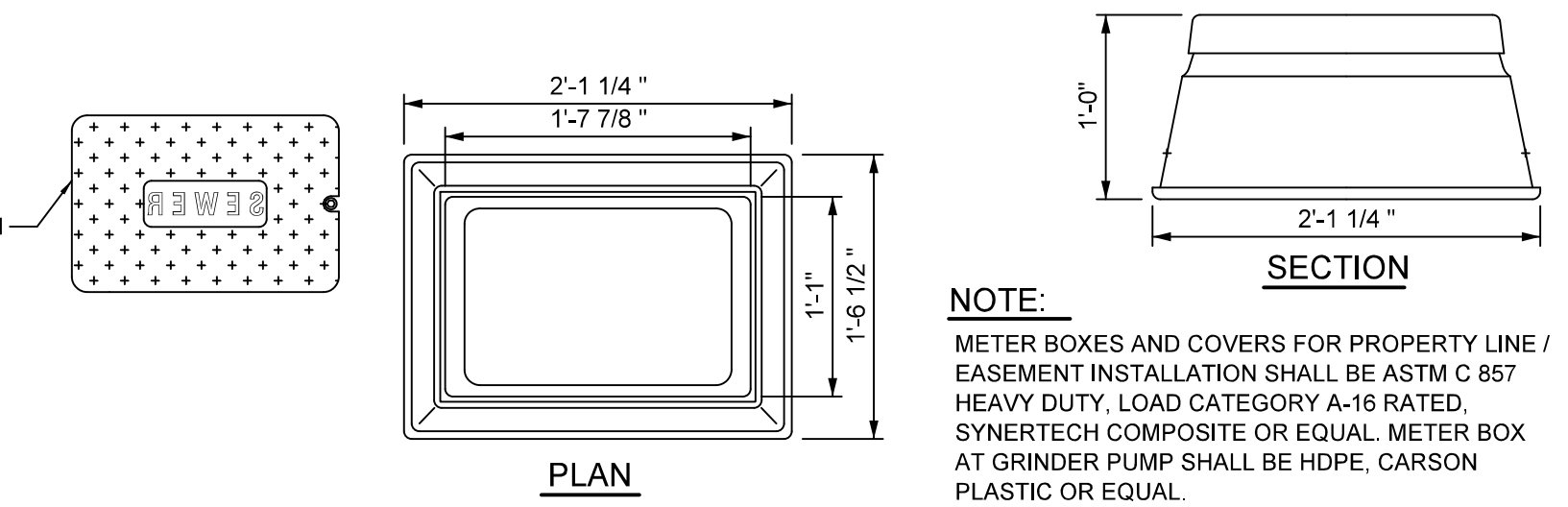
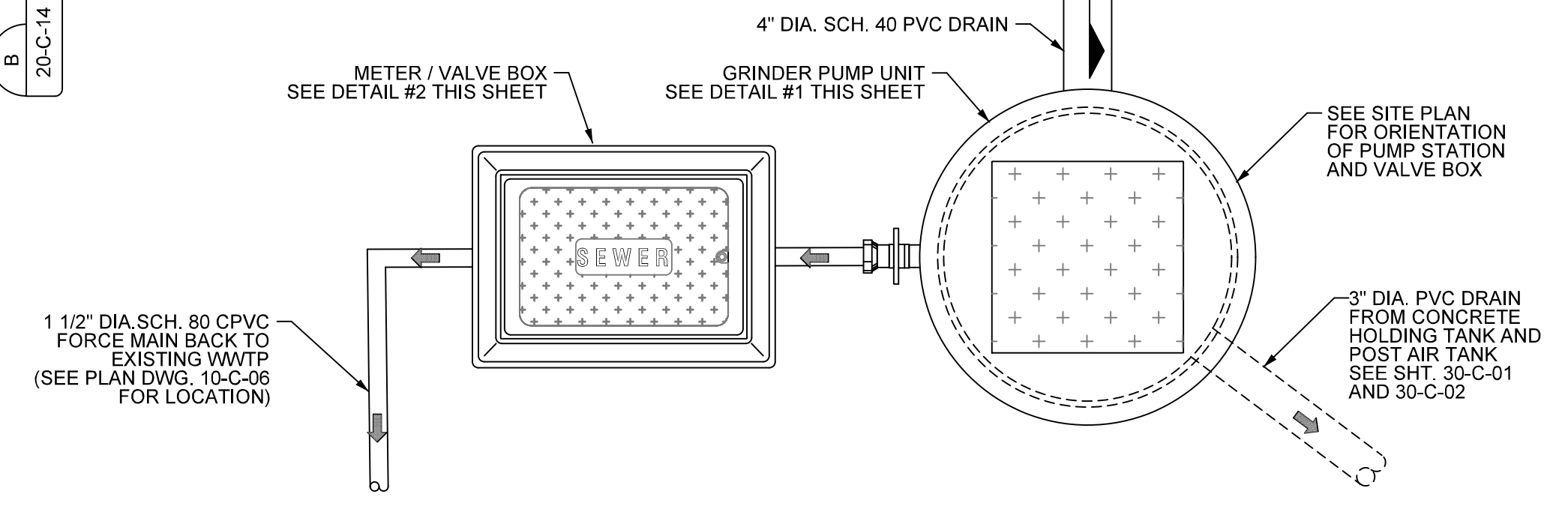
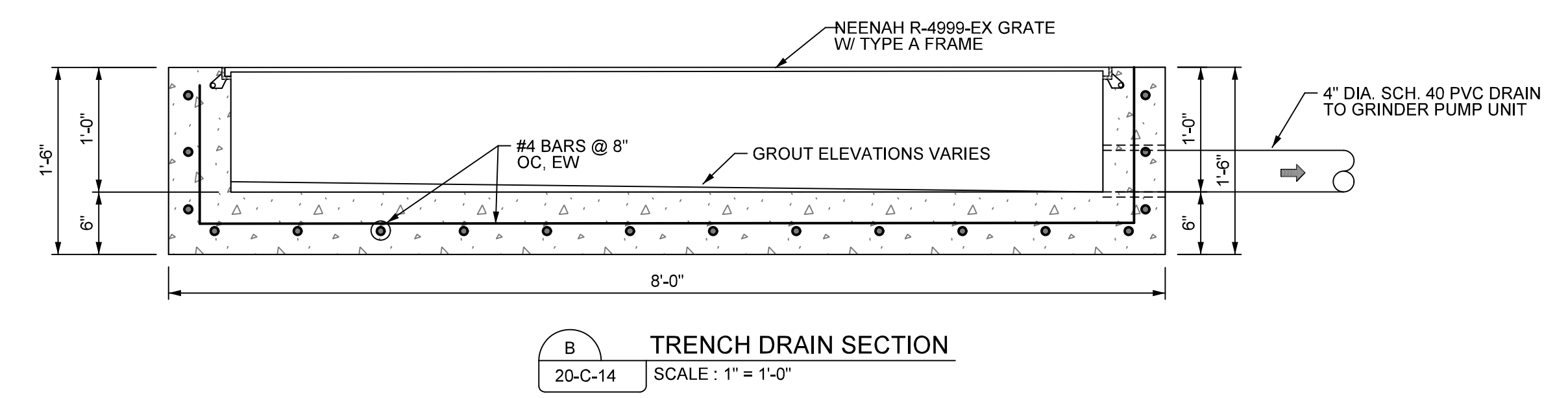
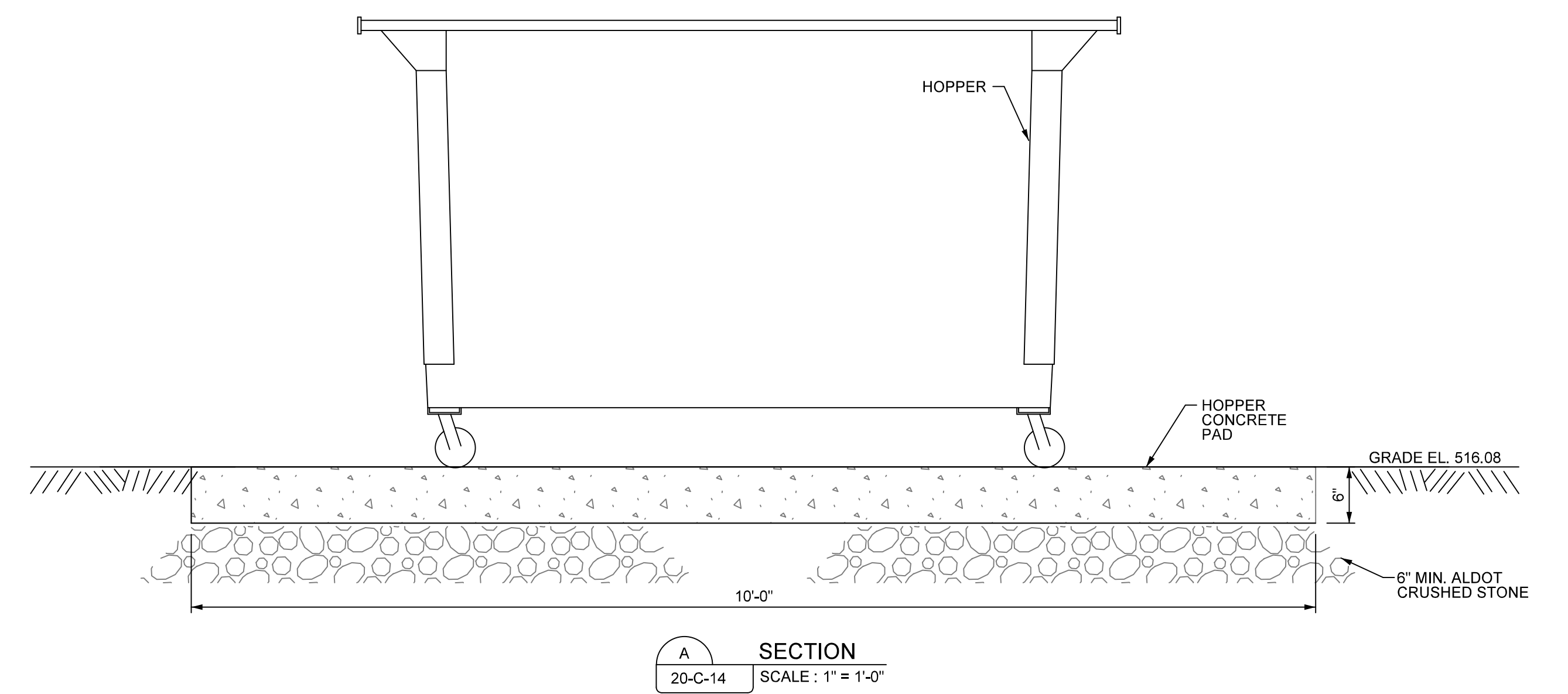
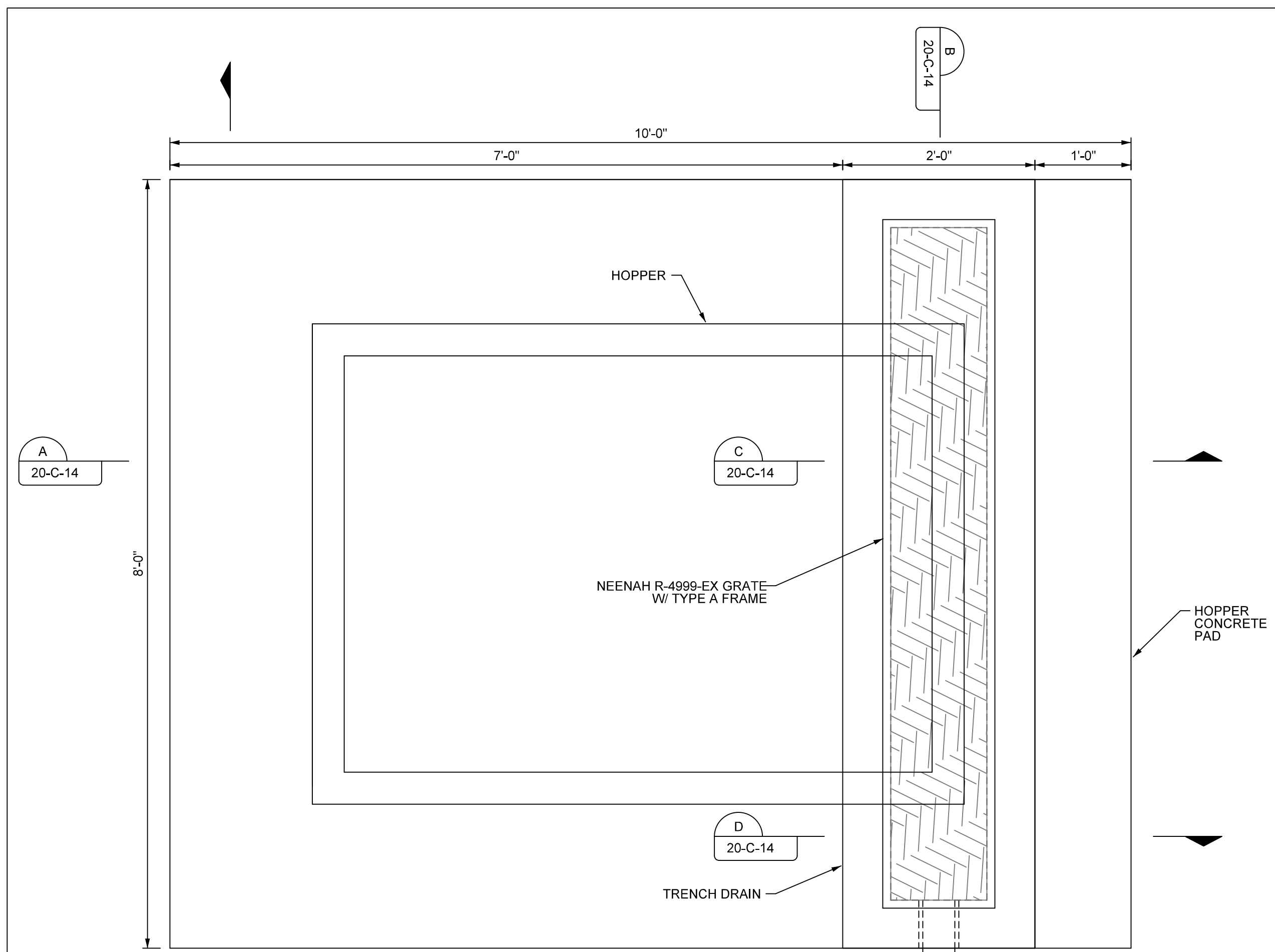
IPEC SCREENING UNIT  
STAIRS DETAIL

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026  
DATE: JUNE, 2023  
DESIGNED BY: WEC  
DRAWN BY: LEE  
DWG: 20-C-13  
SHEET NUMBER **17**







NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

GRINDER PUMP STATION / TRENCH DRAIN DETAILS

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026  
DATE: JUNE, 2023  
DESIGNED BY: WEC  
DRAWN BY: LEE  
DWG: 20-C-14

SHEET NUMBER **18**



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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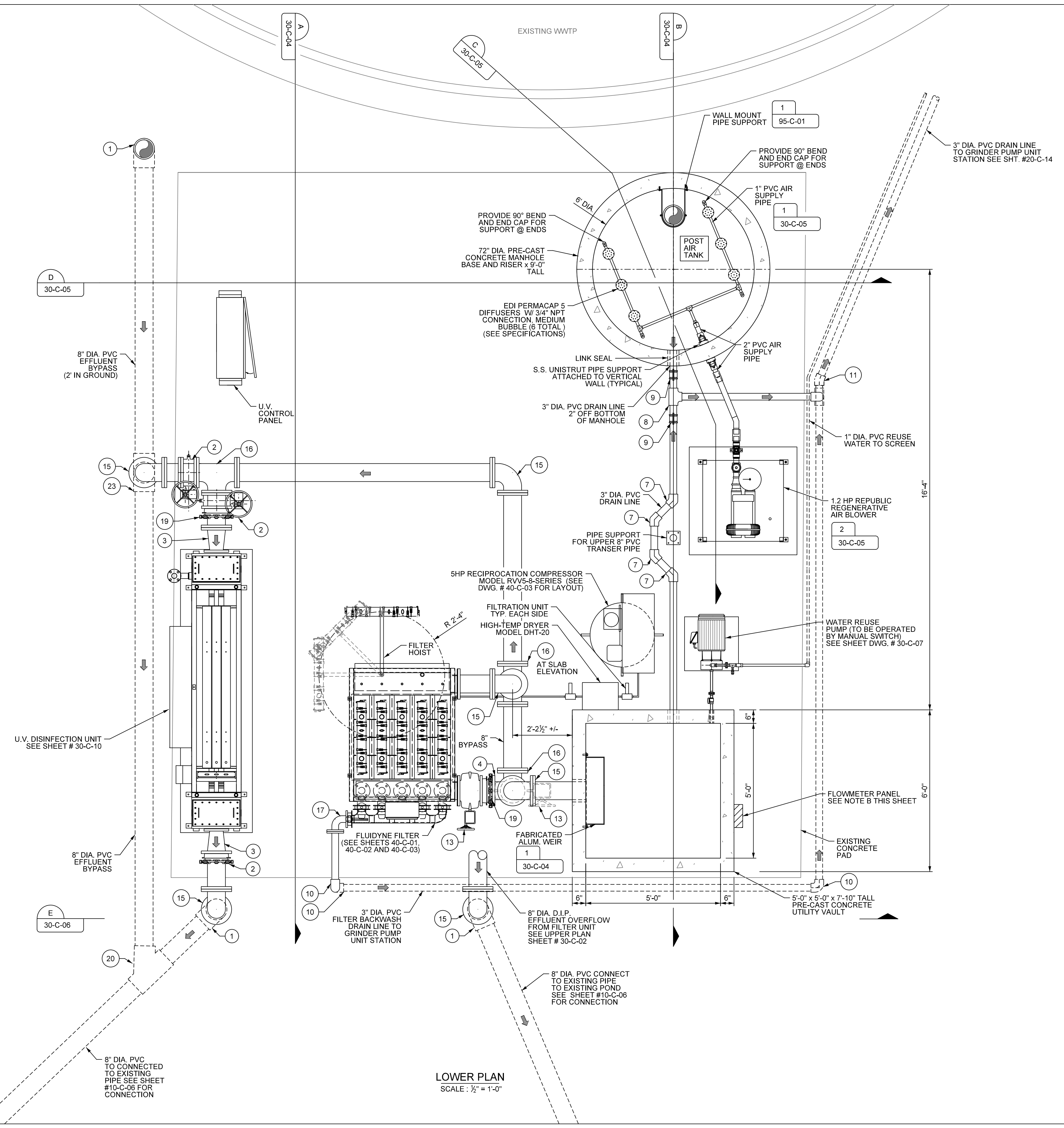
**Alabama Water Utilities**  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

**FILTRATION AND DISINFECTION UNITS LOWER PLAN**

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026  
DATE: JUNE, 2023  
DESIGNED BY: WEC  
DRAWN BY: LEE  
DWG: 30-C-01  
SHEET NUMBER **19**



MATERIALS LIST *	
ITEM NO.	DESCRIPTION
1	8" PVC 90° BEND
2	8" BUTTERFLY VALVE
3	8" x 6" REDUCER FLG. x FLG.
4	8" D.I. BASE 90° BEND FLG.
5	8" KNIFE VALVE
6	8" x 8" PVC COUPLING
7	3" PVC 45° BEND
8	3" x 3" x 3" PVC TEE
9	3" BALL VALVE
10	3" PVC 90° BEND
11	3" PVC 22.5° BEND
12	8" D.I. 45° BEND M.J.
13	SEE NOTE #1 THIS SHEET
14	8" D.I. BASE 90° BEND M.J.
15	8" D.I. 90° BEND FLG.
16	8" x 8" x 8" D.I. TEE FLG.
17	3" x 3" D.I. FLG. 90° BEND
18	8" D.I. BLIND FLG.
19	MEGALUG SIZES AS REQUIRED
20	8" x 8" x 8" PVC WYE
21	8" PVC 22 1/2° BEND
22	8" PVC 45° BEND
23	8" x 8" x 8" PVC TEE
24	10" x 8" REDUCER FLG. x FLG.
25	12" D.I. 90° BEND FLG.

\* SEE COATING REQUIREMENTS FOR EXPOSED PVC PIPE ON DRAWING #30-C-04

NOTE A : ULTRASONIC TRANSDUCER TO BE PROVIDED BY SCADA INTEGRATOR

NOTE B : FLOWMETER SHALL BE GREYLINE OCF 5.0 WITH DATA LOGGER AND SURGE PROTECTION, USA BLUEBOOK STOCK NO. 28496

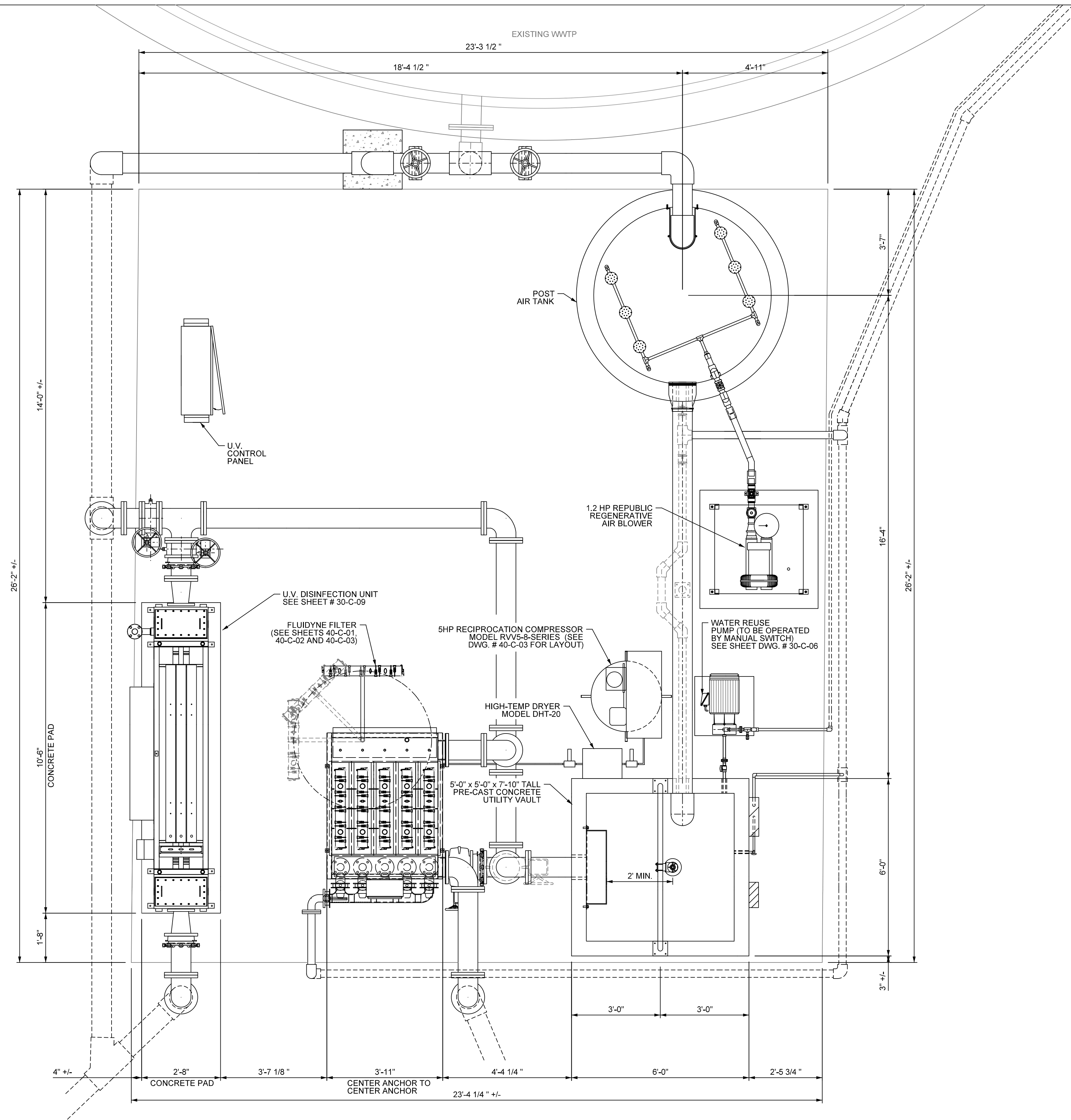
NOTE #1 : 8" DIA. RESILIENT WEDGE GATE VALVE WITH ELECTRIC ACTUATOR (SEE SPEC. SECTION 40 23 61).

**LOWER PLAN**  
SCALE : 1/2" = 1'-0"

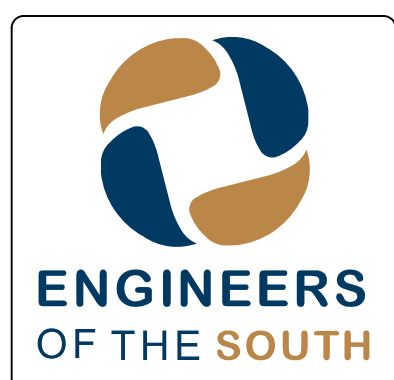
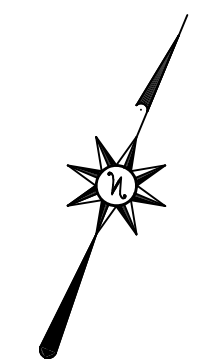








UPPER PLAN  
SCALE: 1/2" = 1'-0"



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
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TUSCALOOSA COUNTY, ALABAMA

FILTRATION AND  
DISINFECTION UNITS  
EQUIPMENT PLAN

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 30-C-03

SHEET NUMBER **21**



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT

Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

FILTRATION AND  
DISINFECTION UNITS  
SECTIONS A AND B

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

DESIGNED BY: WEC

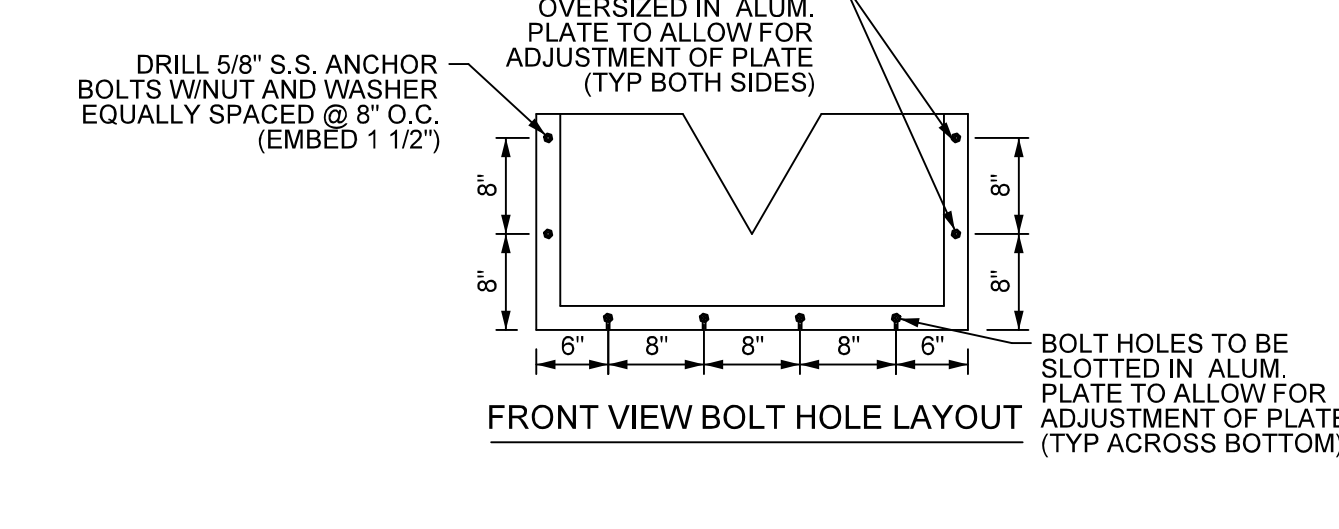
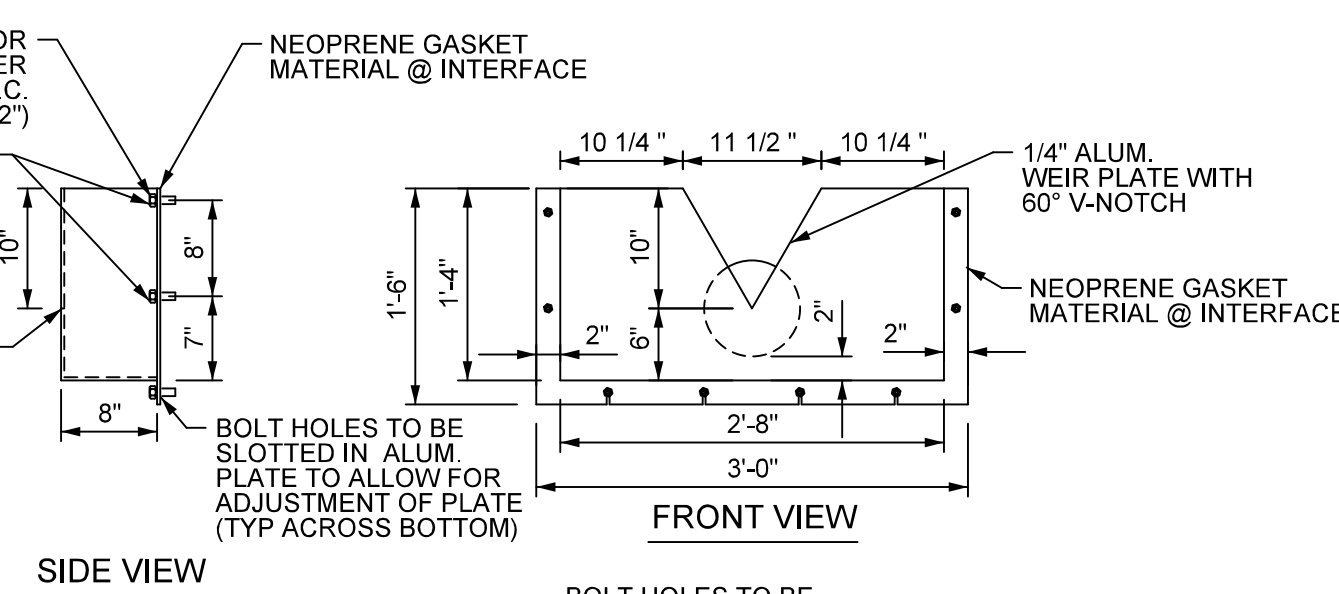
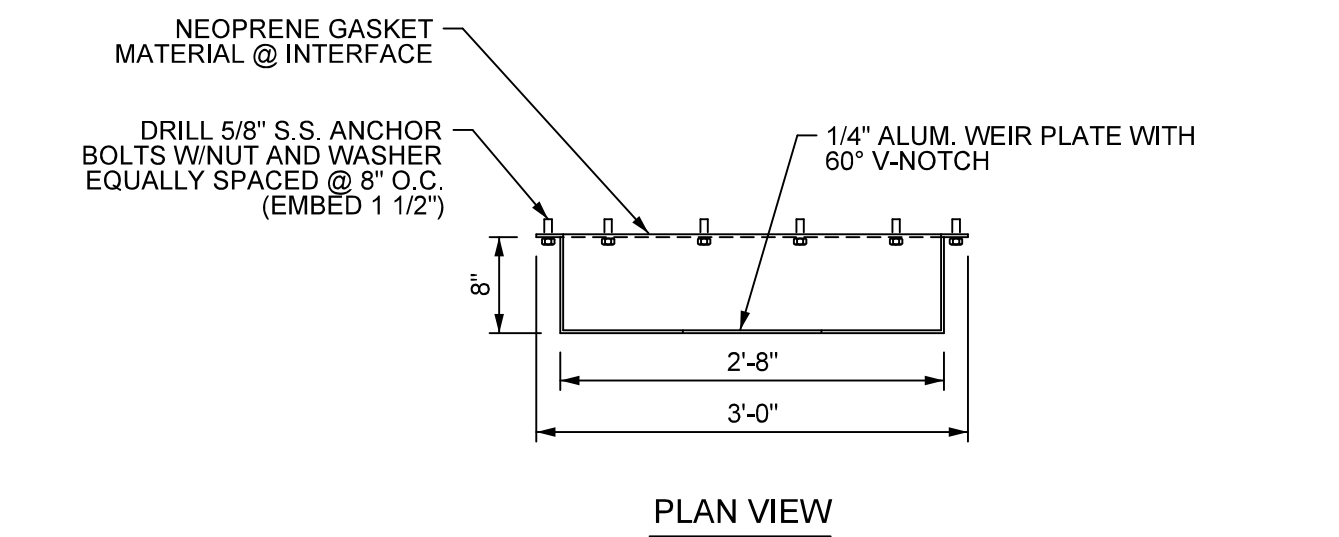
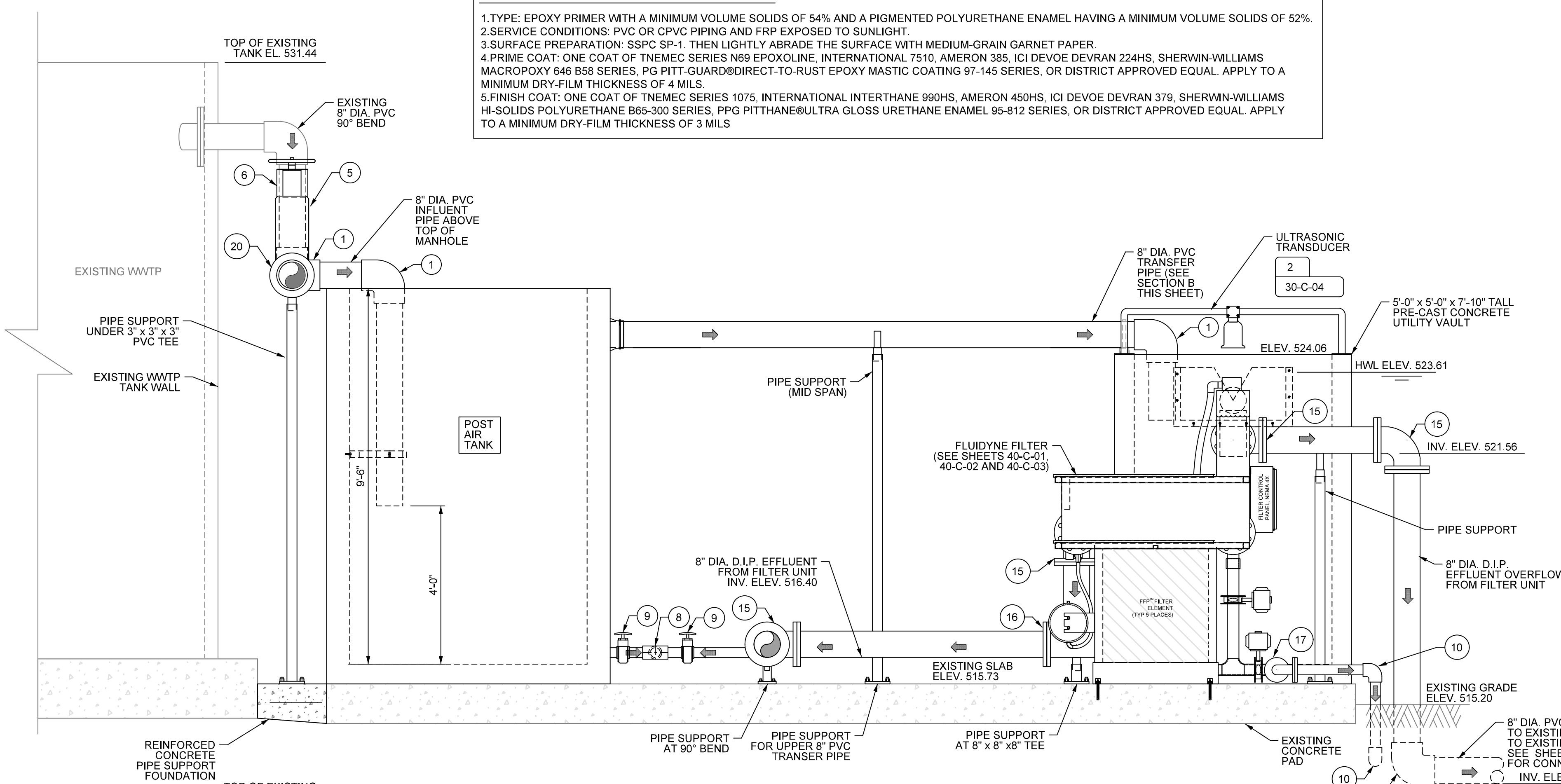
DRAWN BY: LEE

DWG: 30-C-04

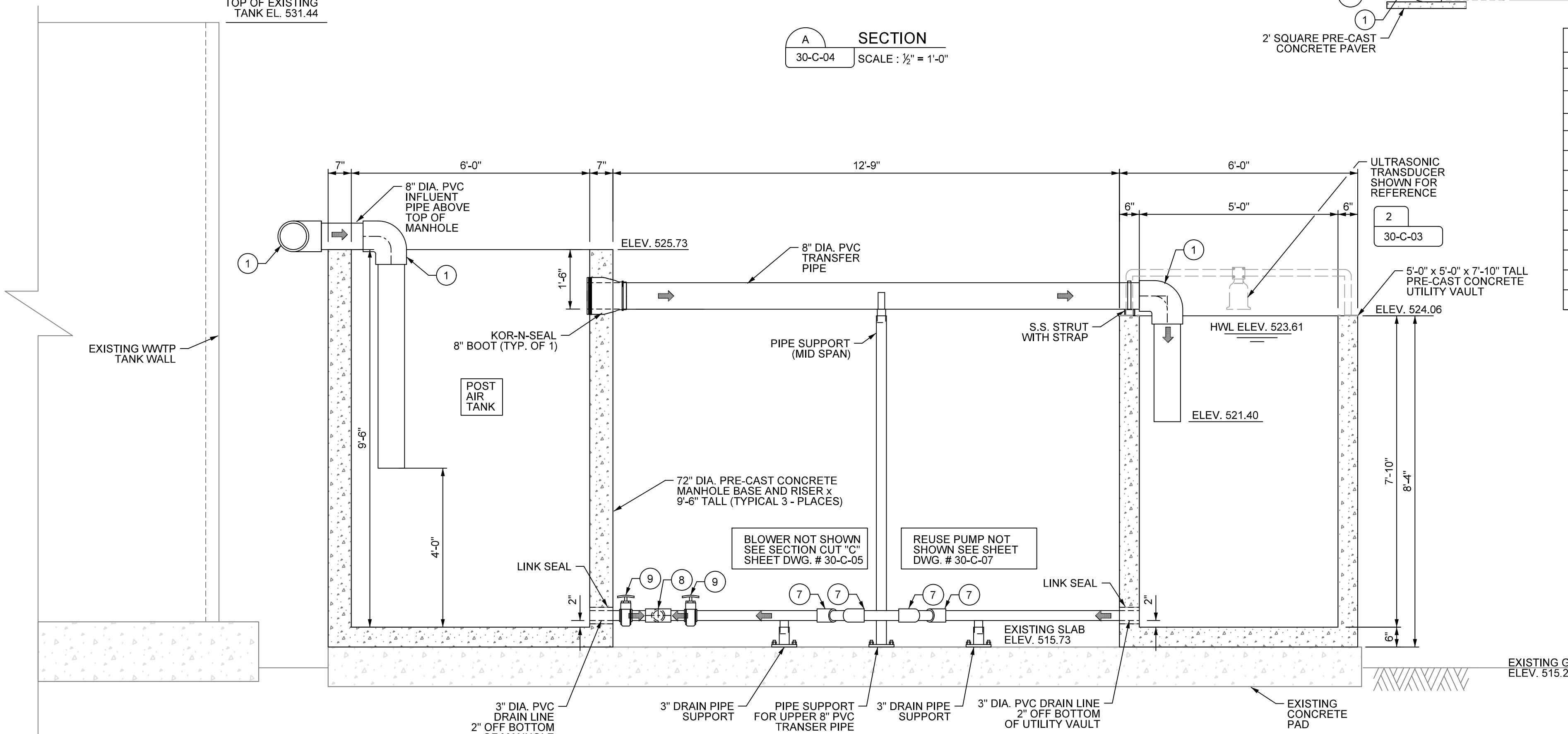
SHEET NUMBER **22**

**PVC COATING SYSTEM (FOR ABOVE GRADE PVC PIPE)**

1. TYPE: EPOXY PRIMER WITH A MINIMUM VOLUME SOLIDS OF 54% AND A PIGMENTED POLYURETHANE ENAMEL HAVING A MINIMUM VOLUME SOLIDS OF 52%.
2. SERVICE CONDITIONS: PVC OR CPVC PIPING AND FRP EXPOSED TO SUNLIGHT.
3. SURFACE PREPARATION: SSPC SP-1. THEN LIGHTLY ABRASIVE THE SURFACE WITH MEDIUM-GRAIN GARNET PAPER.
4. PRIME COAT: ONE COAT OF TMEC SERIES N69 EPOXOLINE, INTERNATIONAL 7510, AMERON 385, ICI DEVOE DEVTRAN 224HS, SHERWIN-WILLIAMS MACROPOXY 646 B58 SERIES, PG PITT-GUARD DIRECT-TO-RUST EPOXY MASTIC COATING 97-145 SERIES, OR DISTRICT APPROVED EQUAL. APPLY TO A MINIMUM DRY-FILM THICKNESS OF 4 MILS.
5. FINISH COAT: ONE COAT OF TMEC SERIES 1075, INTERNATIONAL INTERTHANE 990HS, AMERON 450HS, ICI DEVOE DEVTRAN 379, SHERWIN-WILLIAMS HI-SOLIDS POLYURETHANE B65-300 SERIES, PPG PITTHANE ULTRA GLOSS URETHANE ENAMEL 95-812 SERIES, OR DISTRICT APPROVED EQUAL. APPLY TO A MINIMUM DRY-FILM THICKNESS OF 3 MILS.



**SECTION A**  
30-C-04 SCALE: 1/2" = 1'-0"

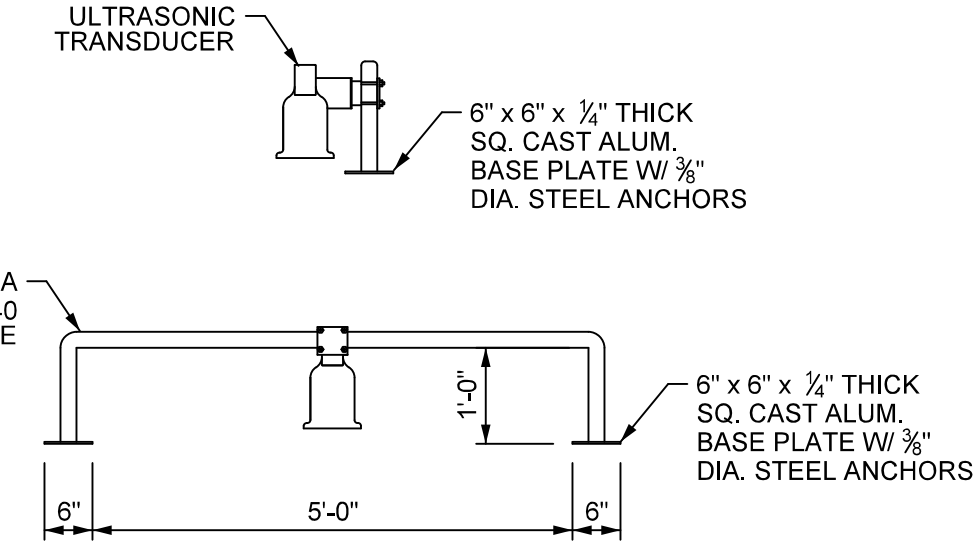
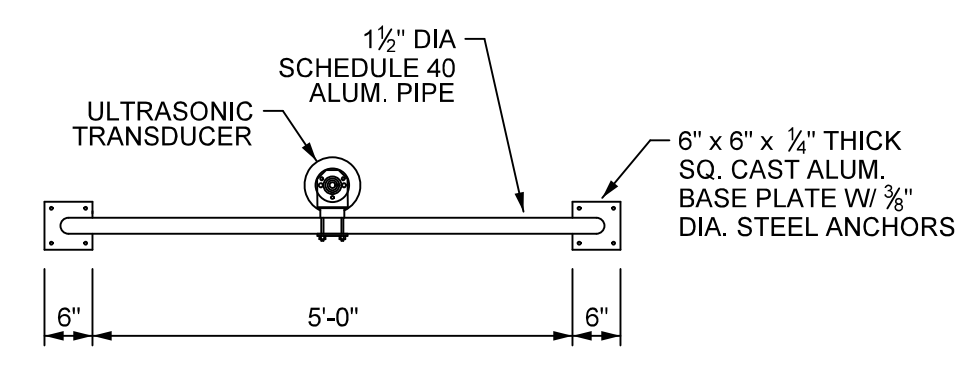


**SECTION B**  
30-C-04 SCALE: 1/2" = 1'-0"

**MATERIALS LIST \***

ITEM NO.	DESCRIPTION
1	8" PVC 90° BEND
4	8" D.I. BASE 90° BEND FLG.
5	8" KNIFE VALVE
6	8" x 8" PVC COUPLING
7	3" PVC 45° BEND
8	3" x 3" x 3" PVC TEE
9	3" BALL VALVE
10	3" PVC 90° BEND
15	8" D.I. 90° BEND FLG.
16	8" x 8" x 8" D.I. TEE FLG.
17	3" x 3" D.I. FLG. 90° BEND
18	8" D.I. BLIND FLG.

\* SEE COATING REQUIREMENTS FOR EXPOSE PVC PIPE THIS SHEET



**ULTRASONIC TRANSDUCER MOUNTING DETAIL**  
SCALE: NOT TO SCALE

NOTE A : ULTRASONIC TRANSDUCER TO BE PROVIDED BY SCADA INTEGRATOR



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
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**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

FILTRATION AND DISINFECTION UNITS SECTIONS C AND D

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026

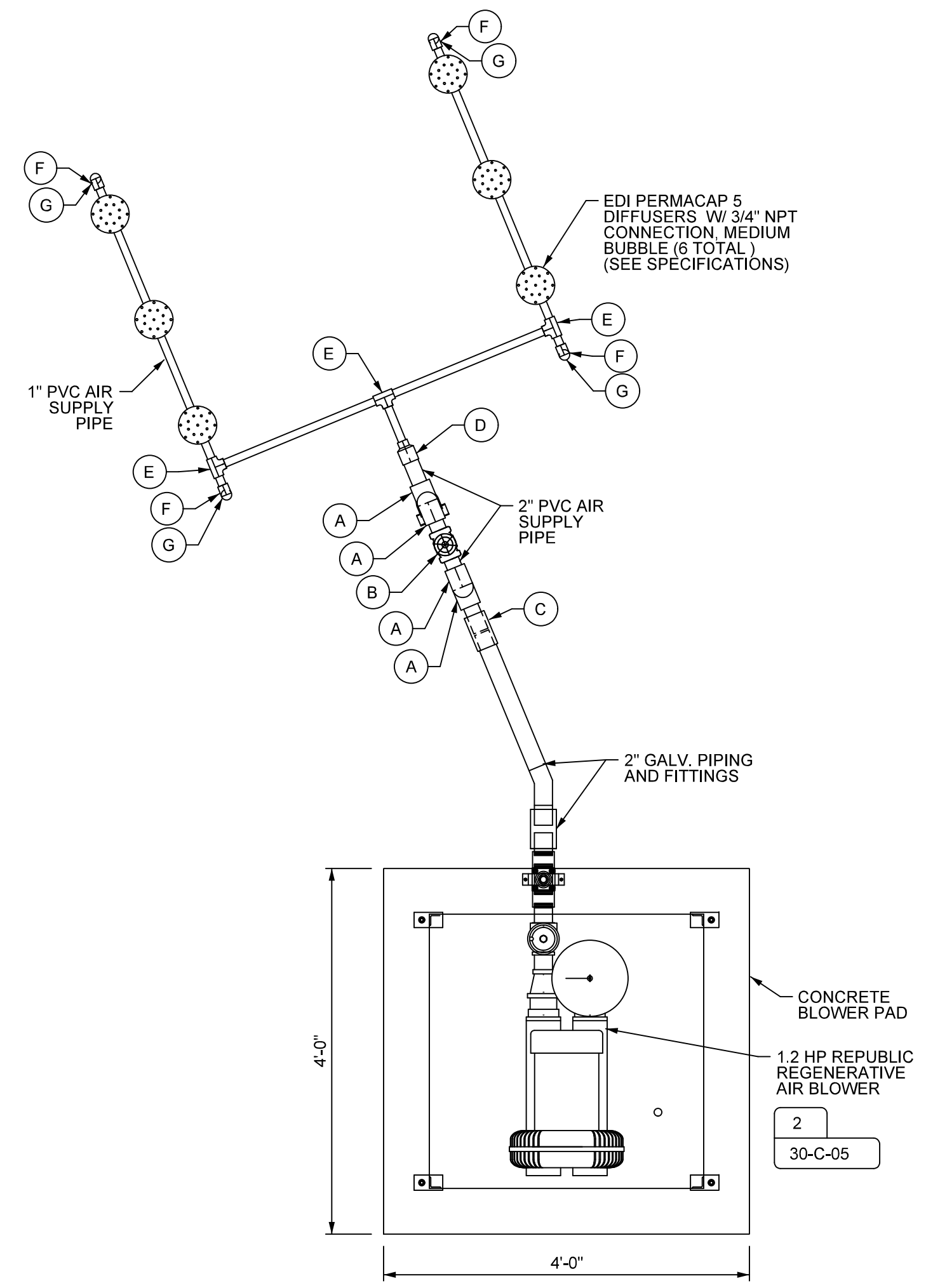
DATE: JUNE, 2023

DESIGNED BY: WEC

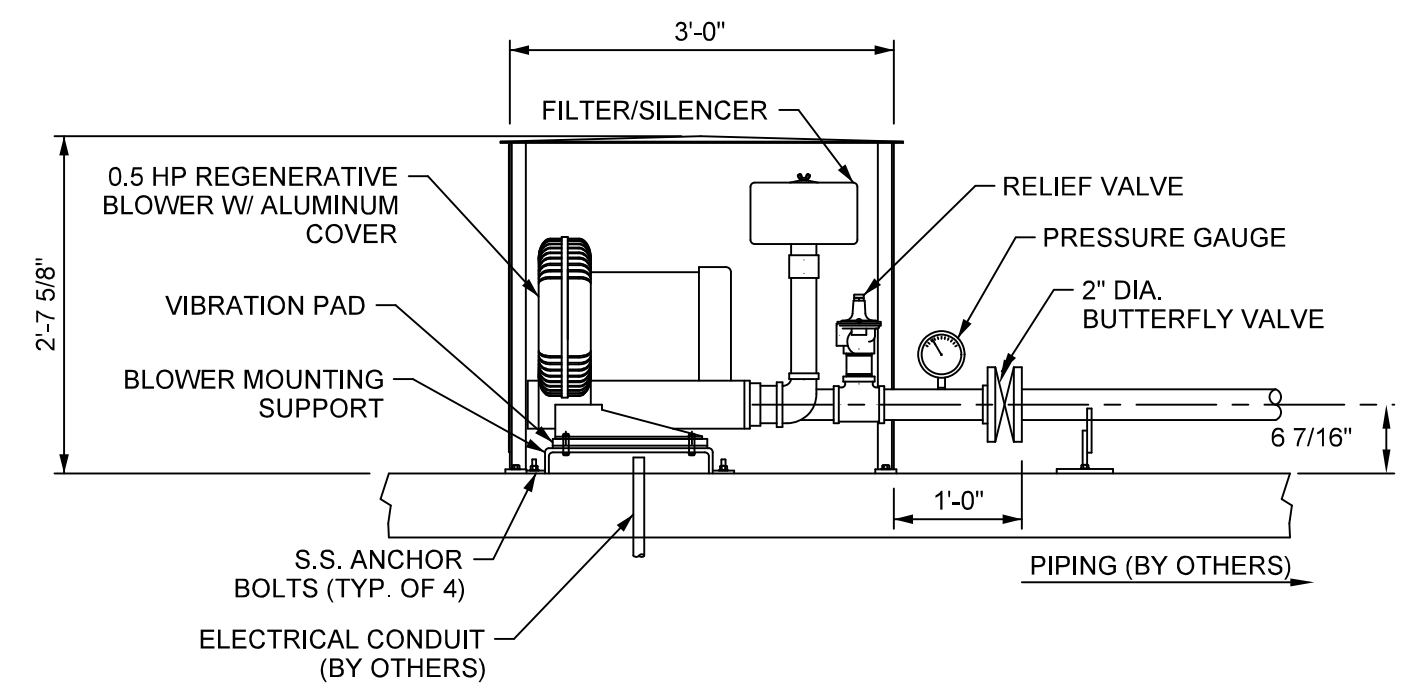
DRAWN BY: LEE

DWG: 30-C-05

SHEET NUMBER **23**



1 AIR PIPING LAYOUT  
30-C-05 SCALE: NOT TO SCALE



2 1.2 HP AIR BLOWER DETAIL  
30-C-05 SCALE: NOT TO SCALE

- BLOWER AND CONTROLS**
- BLOWER SHALL BE A REGENERATIVE BLOWER WITH A OPERATING NOISE LEVEL LESS THAN 75 DBA AT A DISTANCE OF 1 METER.
  - BLOWER SHALL INCLUDE THE FOLLOWING OPTIONS/ACCESSORIES:
    - CHECK VALVE
    - INLET FILTER/ SILENCER
    - VIBRATION MOUNTS
    - 1.25" I.D. FLEXIBLE DISCHARGE HOSE
    - STAINLESS STEEL HOSE CLAMPS
    - PRESSURE GAUGE (0-15PSI)
    - 1.25" NPT PRESSURE RELIEF VALVE
    - LIQUID TIGHT CONDUIT
  - BLLOWERS SHALL BE REPUBLIC REGENERATIVE BLOWER PACKAGE w/ ENCLOSURE MODEL KPHRC202/1, 1.2 HP 230V, 1 PHASE, USA BLUEBOOK STOCK NO. 23475
  - BLLOWER CONTROLS SHALL BE:
    - SIMPLEX SINGLE PHASE BLOWER PANEL WITH TIMER. BLOWER SHALL BE USA BLUEBOOK STOCK NO. 24789 OR EQUAL.

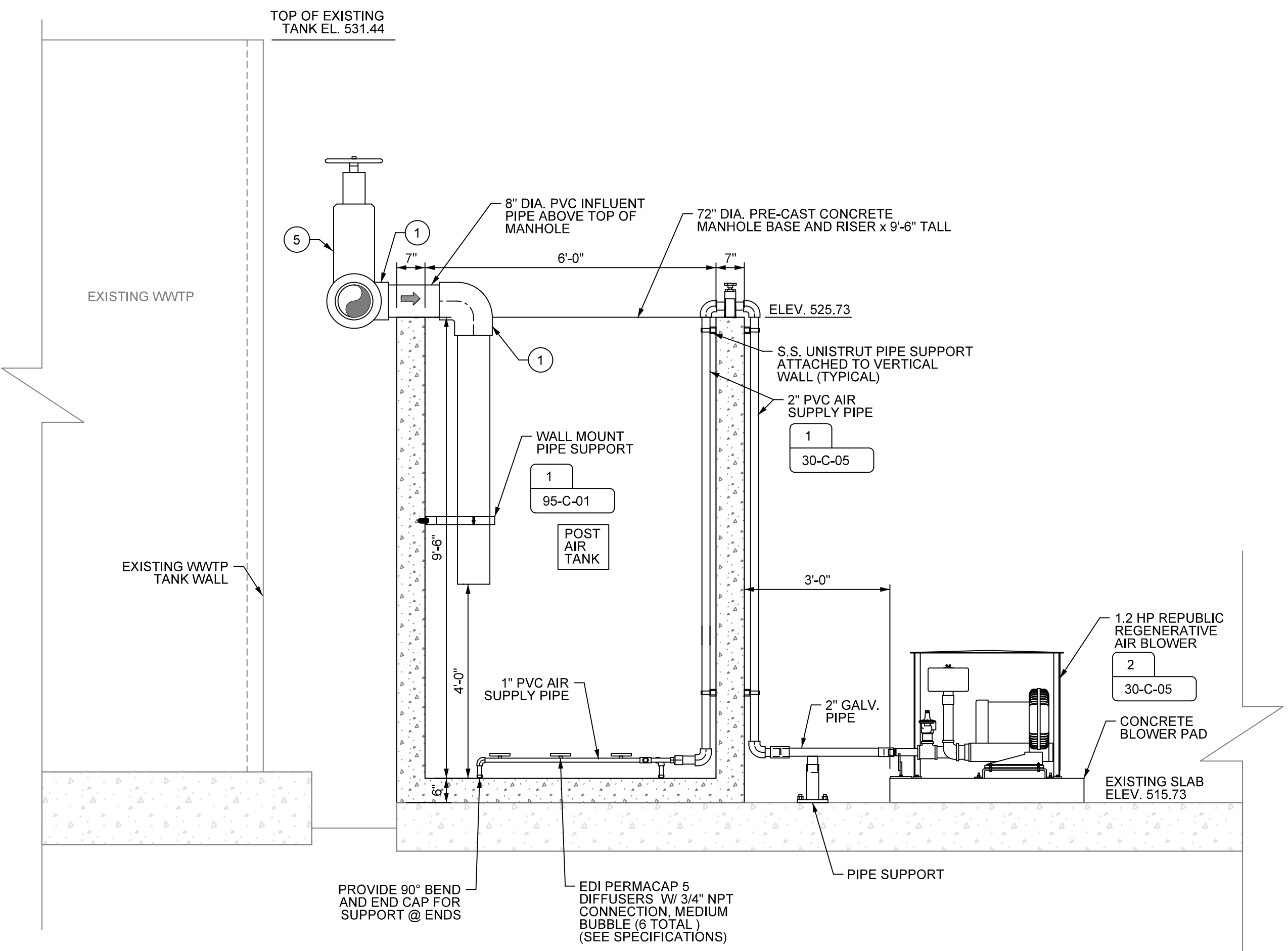
**MATERIALS LIST \***

ITEM NO.	DESCRIPTION
①	8" PVC 90° BEND
⑤	8" KNIFE VALVE
⑥	8" x 8" PVC COUPLING
②③	8" x 8" x 8" PVC TEE

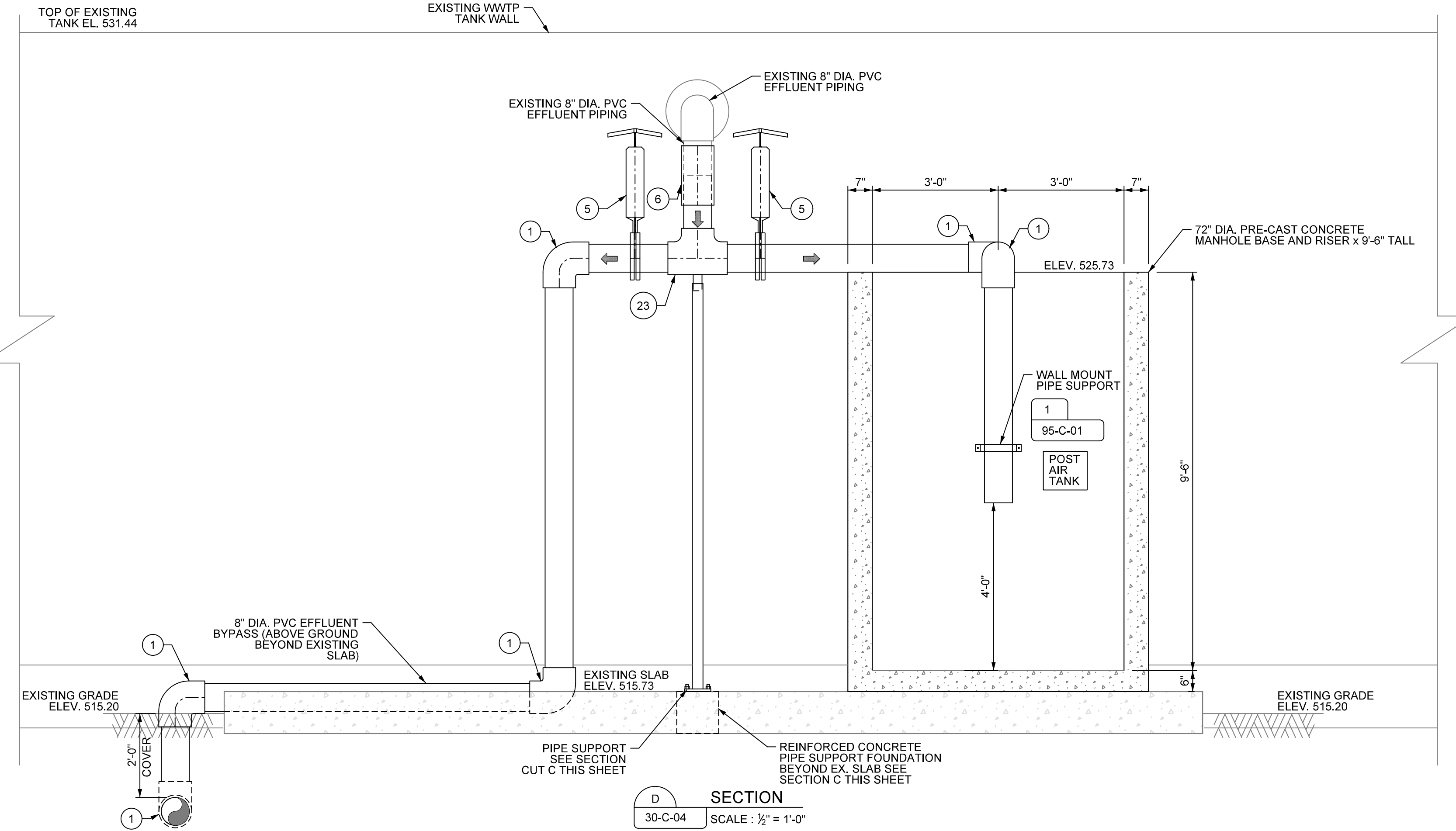
\* SEE COATING REQUIREMENTS FOR EXPOSED PVC PIPE ON DRAWING #30-C-04

**AIR PIPE MATERIALS LIST**

ITEM NO.	DESCRIPTION
Ⓐ	2" PVC 90° BEND
Ⓑ	2" BALL VALVE
Ⓒ	2" PVC TRANSITION SLEEVE
Ⓓ	2" x 1" PVC REDUCER
Ⓔ	1" x 1" x 1" PVC TEE
Ⓕ	1" PVC 90° BEND
Ⓖ	1" PVC CAP



C SECTION  
30-C-05 SCALE: 1/2" = 1'-0"



D SECTION  
30-C-04 SCALE: 1/2" = 1'-0"



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Alabama Water Utilities**  
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**BROOKWOOD**  
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TUSCALOOSA COUNTY, ALABAMA

FILTRATION AND  
DISINFECTION UNITS  
SECTION E

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

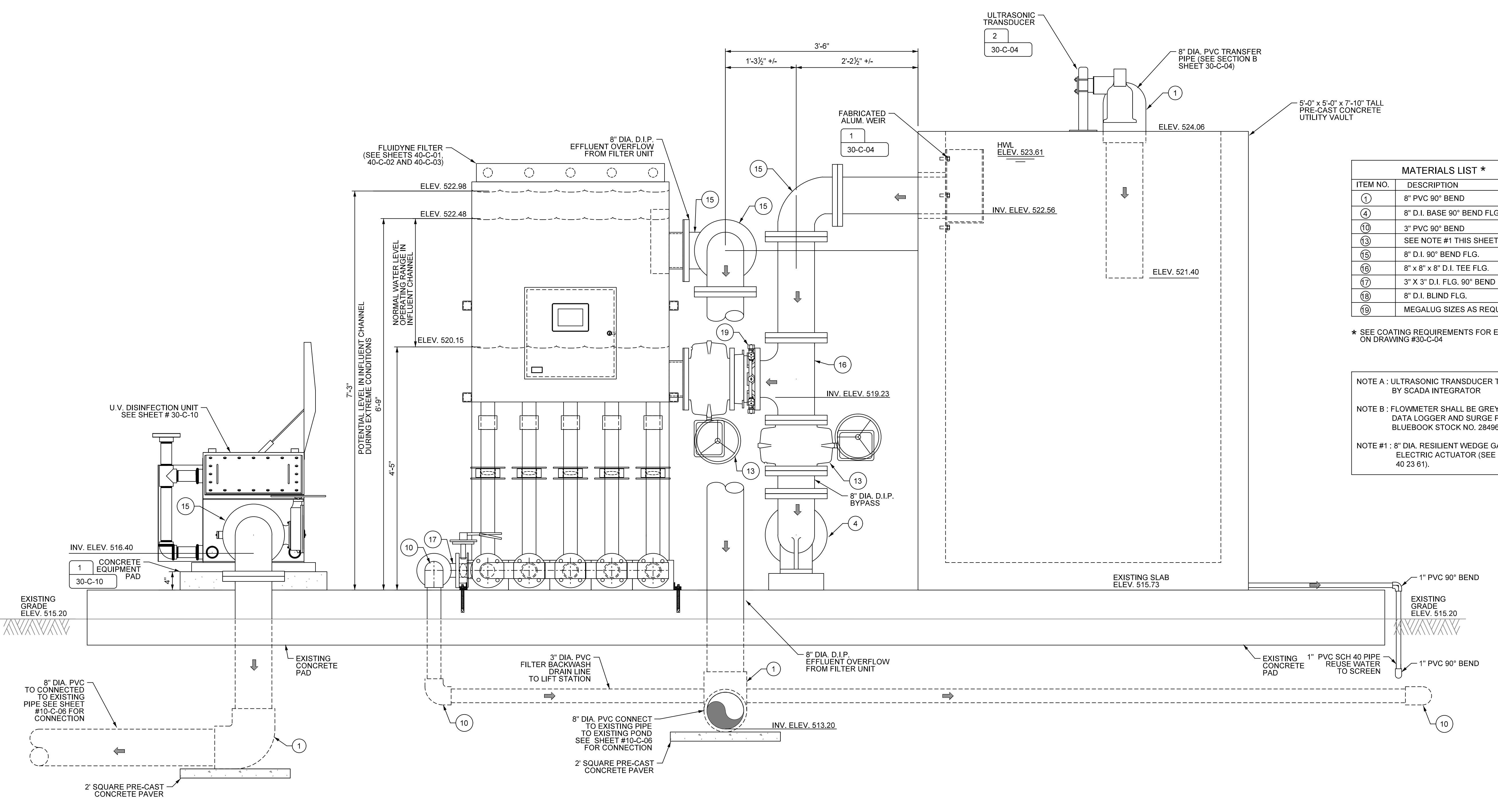
DATE: JUNE, 2023

DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 30-C-06

SHEET NUMBER **24**



**MATERIALS LIST \***

ITEM NO.	DESCRIPTION
①	8" PVC 90° BEND
④	8" D.I. BASE 90° BEND FLG.
⑩	3" PVC 90° BEND
⑬	SEE NOTE #1 THIS SHEET
⑮	8" D.I. 90° BEND FLG.
⑯	8" x 8" x 8" D.I. TEE FLG.
⑰	3" x 3" D.I. FLG. 90° BEND
⑱	8" D.I. BLIND FLG.
⑲	MEGALUG SIZES AS REQUIRED

\* SEE COATING REQUIREMENTS FOR EXPOSED PVC PIPE ON DRAWING #30-C-04

NOTE A : ULTRASONIC TRANSDUCER TO BE PROVIDED BY SCADA INTEGRATOR

NOTE B : FLOWMETER SHALL BE GREYLINE OCF 5.0 WITH DATA LOGGER AND SURGE PROTECTION, USA BLUEBOOK STOCK NO. 28496

NOTE #1 : 8" DIA. RESILIENT WEDGE GATE VALVE WITH ELECTRIC ACTUATOR (SEE SPEC. SECTION 40 23 61).

**E SECTION**  
30-C-06 SCALE: 1" = 1'-0"



SMALL PIPING MATERIALS LIST	
ITEM NO.	DESCRIPTION
(A)	1 1/2" BALL VALVE
(B)	1" DIA. UNION
(C)	1" x 1" x 1/2" PVC TEE W/ 1/2" BALL VALVE
(D)	1" PVC 90° BEND

MATERIALS LIST *	
ITEM NO.	DESCRIPTION
(1)	8" PVC 90° BEND
(4)	8" D.I. BASE 90° BEND FLG.
(10)	3" PVC 90° BEND
(13)	SEE NOTE #1 THIS SHEET
(15)	8" D.I. 90° BEND FLG.
(17)	3" X 3" D.I. FLG. 90° BEND
(18)	8" D.I. BLIND FLG.
(19)	MEGALUG SIZES AS REQUIRED

\* SEE COATING REQUIREMENTS FOR EXPOSED PVC PIPE ON DRAWING #30-C-04

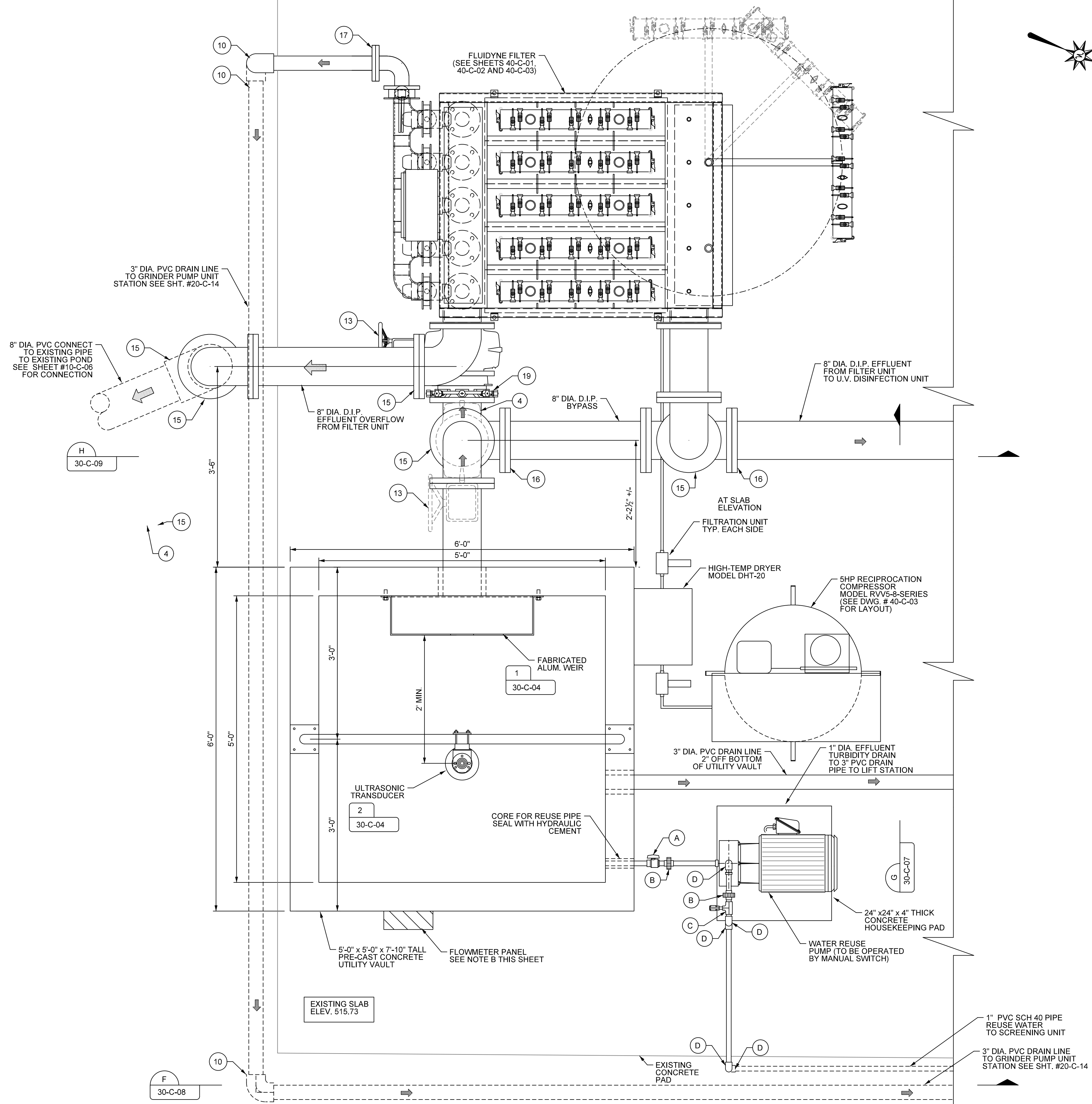
NOTE A : ULTRASONIC TRANSDUCER TO BE PROVIDED BY SCADA INTEGRATOR

NOTE B : FLOWMETER SHALL BE GREYLINE OCF 5.0 WITH DATA LOGGER AND SURGE PROTECTION, USA BLUEBOOK STOCK NO. 28496

NOTE #1 : 8" DIA. RESILIENT WEDGE GATE VALVE WITH ELECTRIC ACTUATOR (SEE SPEC. SECTION 40 23 61).

**WATER REUSE PUMP NOTES:**

- PUMP SHALL BE GOULDS MCC SERIES CENTRIFUGED PUMP MODEL 1MC1D1DO 3/4" HP, 115V, 1-PHASE USA BLUEBOOK STOCK NO. 14751
- PUMP SHALL OPERATE MANUALLY WITH SWITCH MOUNTED ON SIDE OF EFFLUENT TANK.



LOWER PLAN VIEW  
SCALE : 1" = 1'-0"

NO	DATE	DESCRIPTION	CONSTRUCTION	
			AS-BID	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
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**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

FILTRATION AND DISINFECTION UNITS  
REUSE PUMP PLAN

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

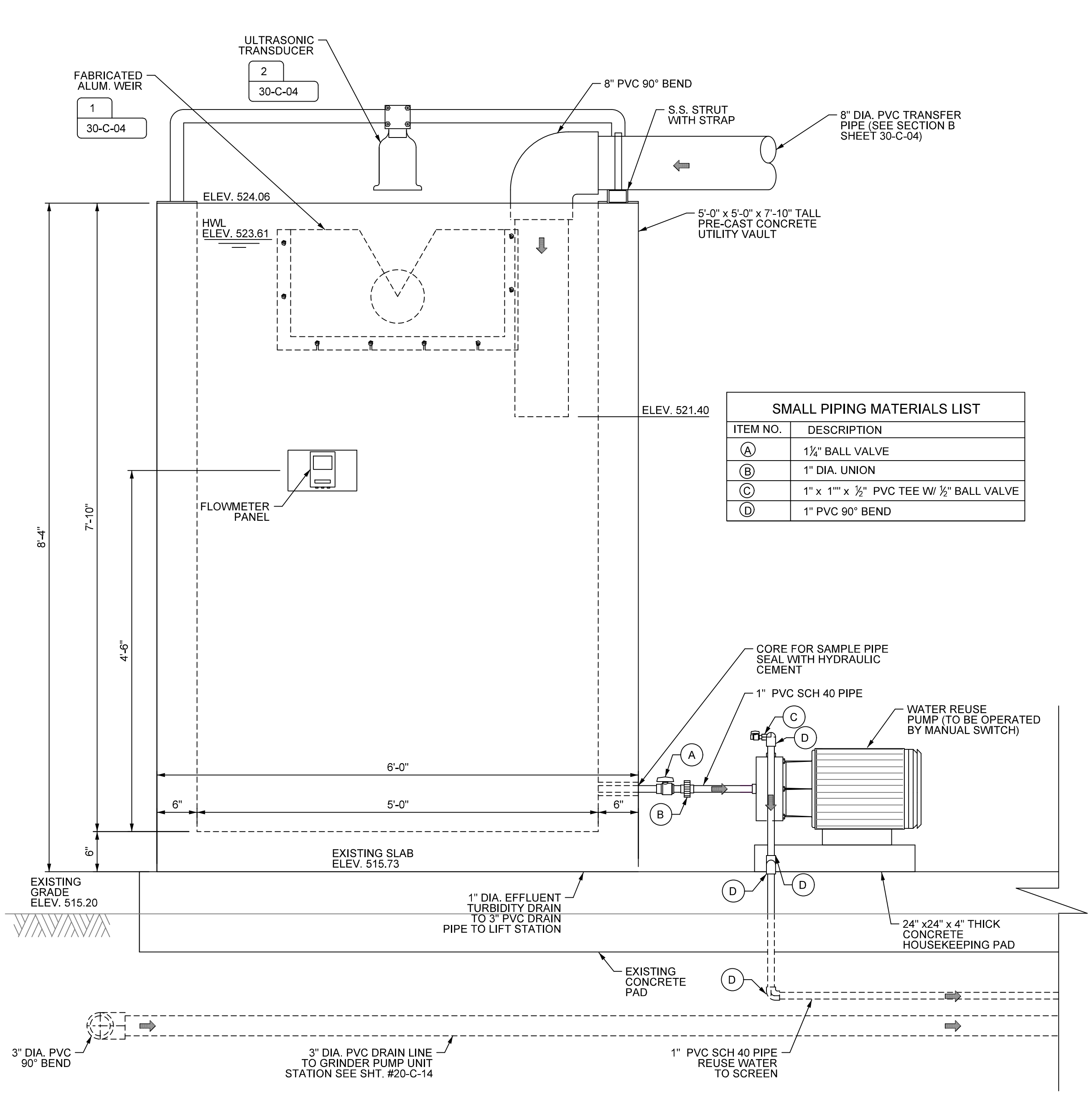
DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 30-C-07

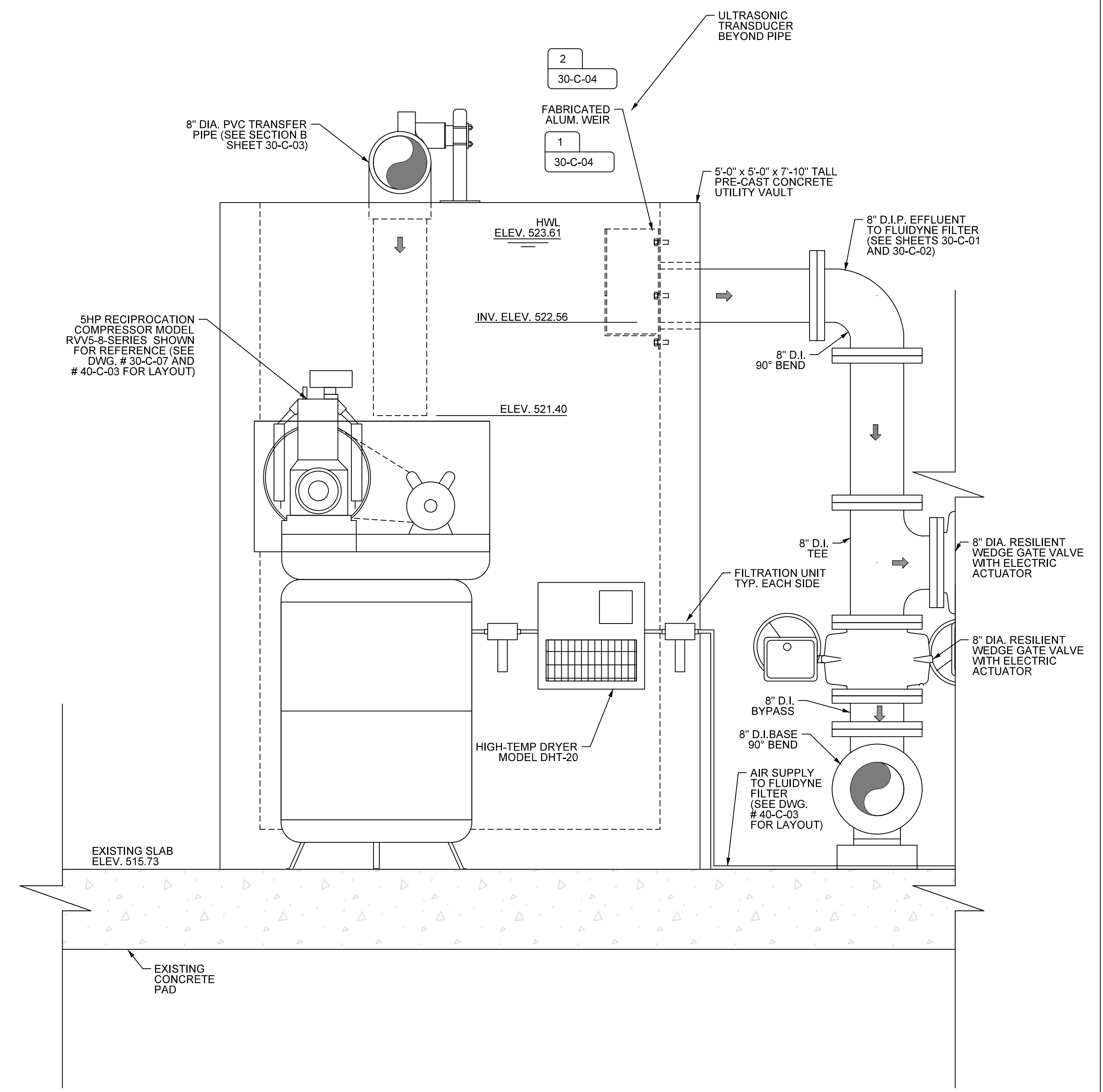
SHEET NUMBER **25**





SMALL PIPING MATERIALS LIST	
ITEM NO.	DESCRIPTION
(A)	1 1/2" BALL VALVE
(B)	1" DIA. UNION
(C)	1" x 1" x 1/2" PVC TEE W/ 1/2" BALL VALVE
(D)	1" PVC 90° BEND

**SECTION F**  
30-C-08 SCALE: 1" = 1'-0"



**SECTION G**  
30-C-08 SCALE: 1" = 1'-0"

NO.	DATE	DESCRIPTION	FOR REVIEW AND COMMENT		CONSTRUCTION REVISIONS	
			AS-BID	AS-BUILT	AS-BID	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
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FILTRATION AND DISINFECTION UNITS SECTIONS F AND G

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026  
DATE: JUNE, 2023  
DESIGNED BY: WEC  
DRAWN BY: LEE  
DWG: 30-C-08

SHEET NUMBER **26**

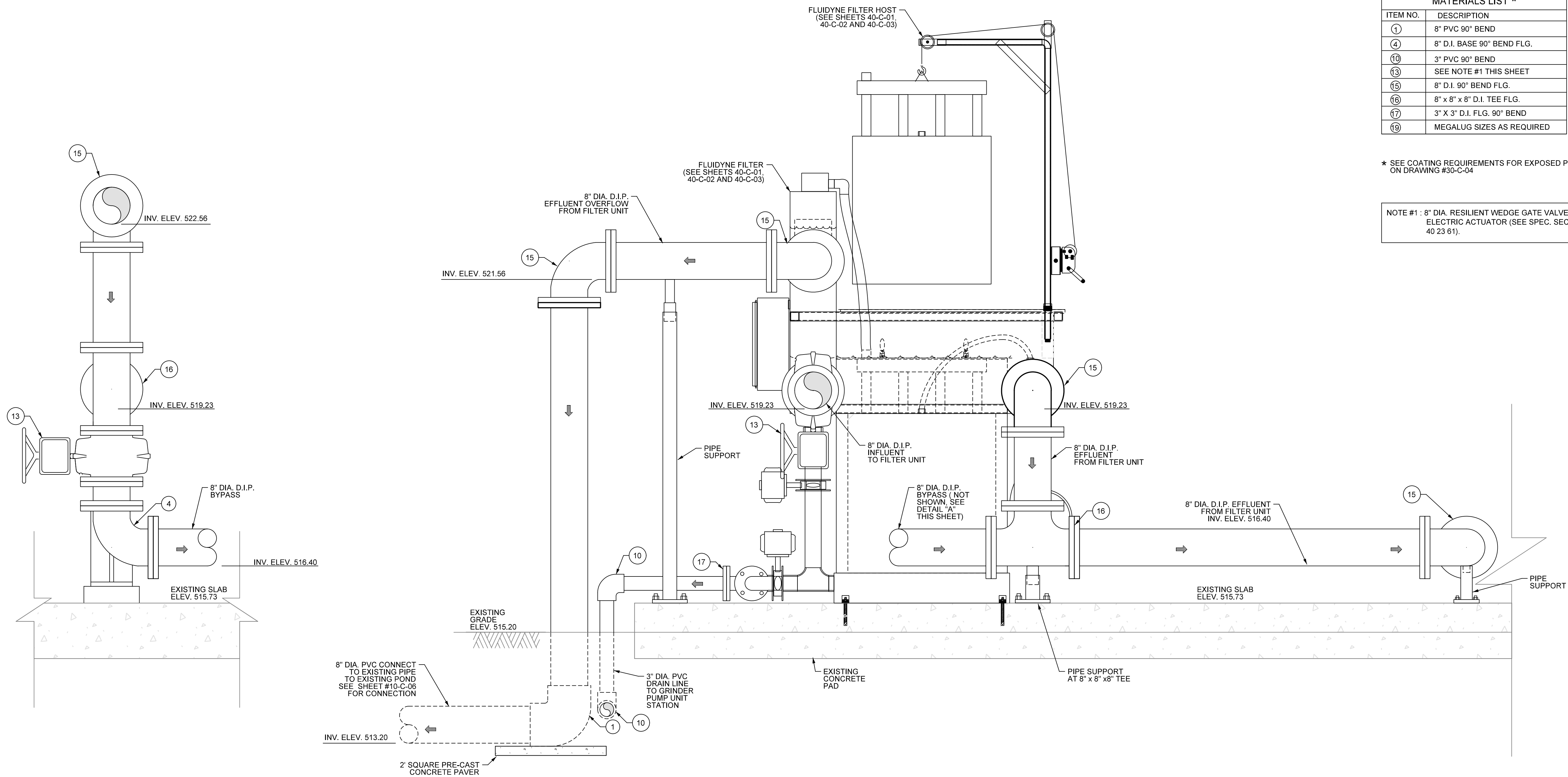


MATERIALS LIST *	
ITEM NO.	DESCRIPTION
①	8" PVC 90° BEND
④	8" D.I. BASE 90° BEND FLG.
⑩	3" PVC 90° BEND
⑬	SEE NOTE #1 THIS SHEET
⑮	8" D.I. 90° BEND FLG.
⑯	8" x 8" x 8" D.I. TEE FLG.
⑰	3" X 3" D.I. FLG. 90° BEND
⑲	MEGALUG SIZES AS REQUIRED

\* SEE COATING REQUIREMENTS FOR EXPOSED PVC PIPE ON DRAWING #30-C-04

NOTE #1 : 8" DIA. RESILIENT WEDGE GATE VALVE WITH ELECTRIC ACTUATOR (SEE SPEC. SECTION 40 23 61).

NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



**A** BYPASS PIPING DETAIL  
30-C-09 SCALE : 1" = 1'-0"

**H** SECTION  
30-C-09 SCALE : 1" = 1'-0"

Alabama Water Utilities  
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**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

FILTRATION AND DISINFECTION UNITS SECTION H

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 30-C-09

SHEET NUMBER **27**



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

U.V. DISINFECTION UNIT PLAN AND SECTIONS

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026

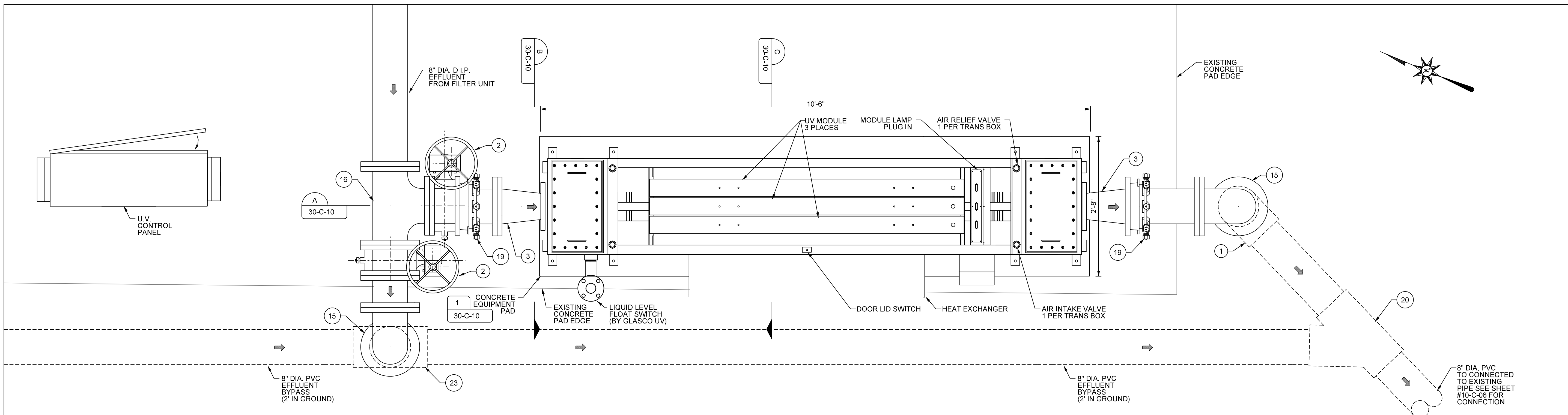
DATE: JUNE, 2023

DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 30-C-10

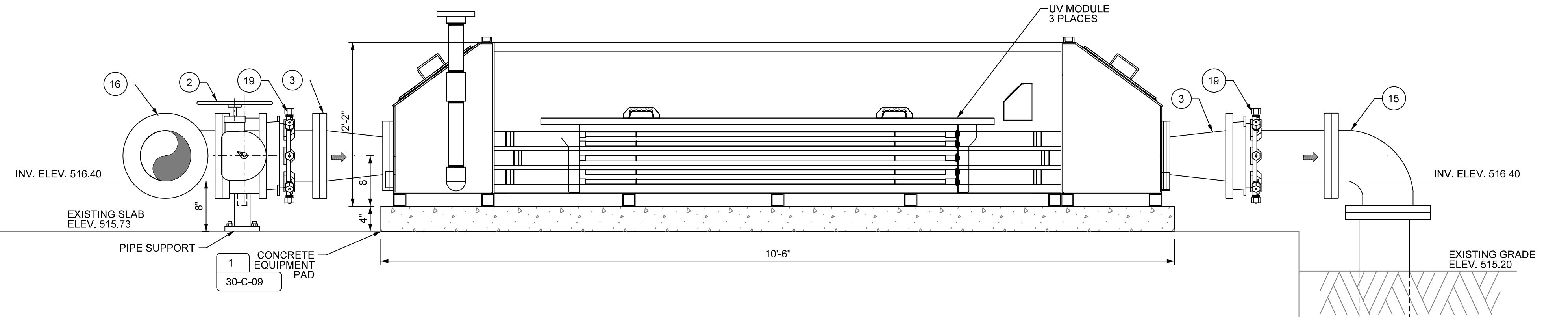
SHEET NUMBER **28**



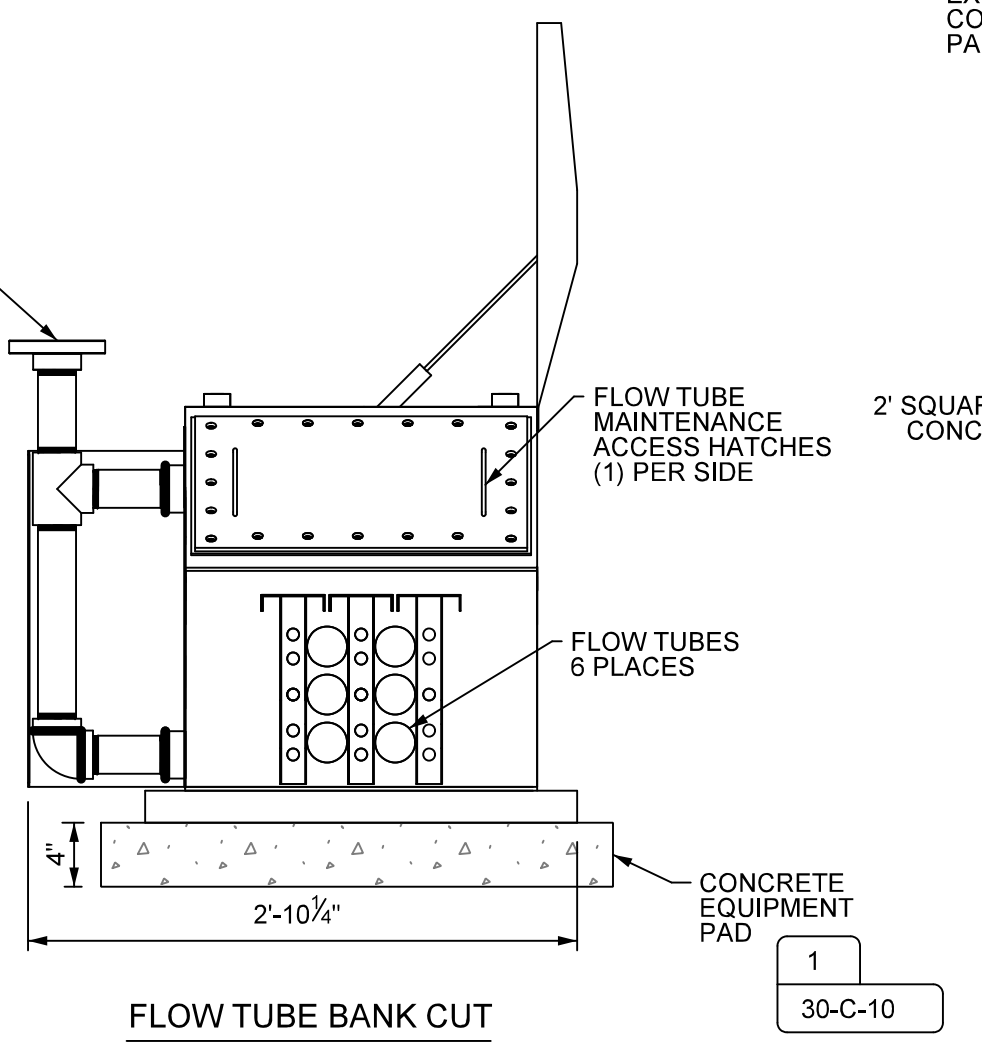
**U.V. DISINFECTION UNIT PLAN**  
SCALE: 1" = 1'-0"

MATERIALS LIST *	
ITEM NO.	DESCRIPTION
①	8" PVC 90° BEND
②	8" BUTTERFLY VALVE
③	8" x 6" REDUCER FLG. x FLG.
⑮	8" D.I. 90° BEND FLG.
⑯	8" x 8" x 8" D.I. TEE FLG.
⑰	MEGALUG SIZES AS REQUIRED
⑳	8" x 8" x 8" PVC TEE

\* SEE COATING REQUIREMENTS FOR EXPOSED PVC PIPE ON DRAWING #30-C-04

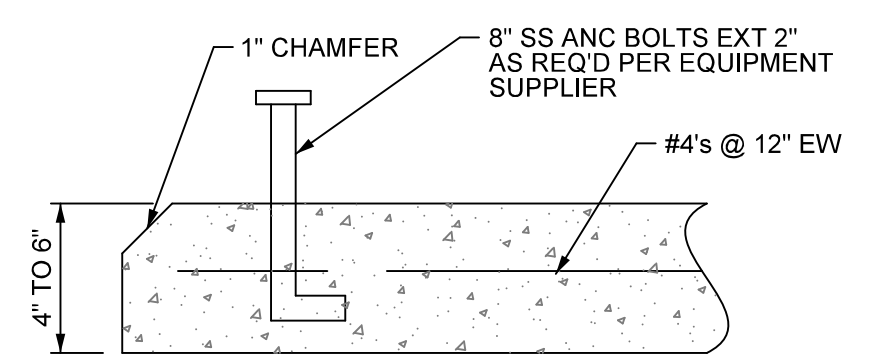


**SECTION A**  
SCALE: 1" = 1'-0"

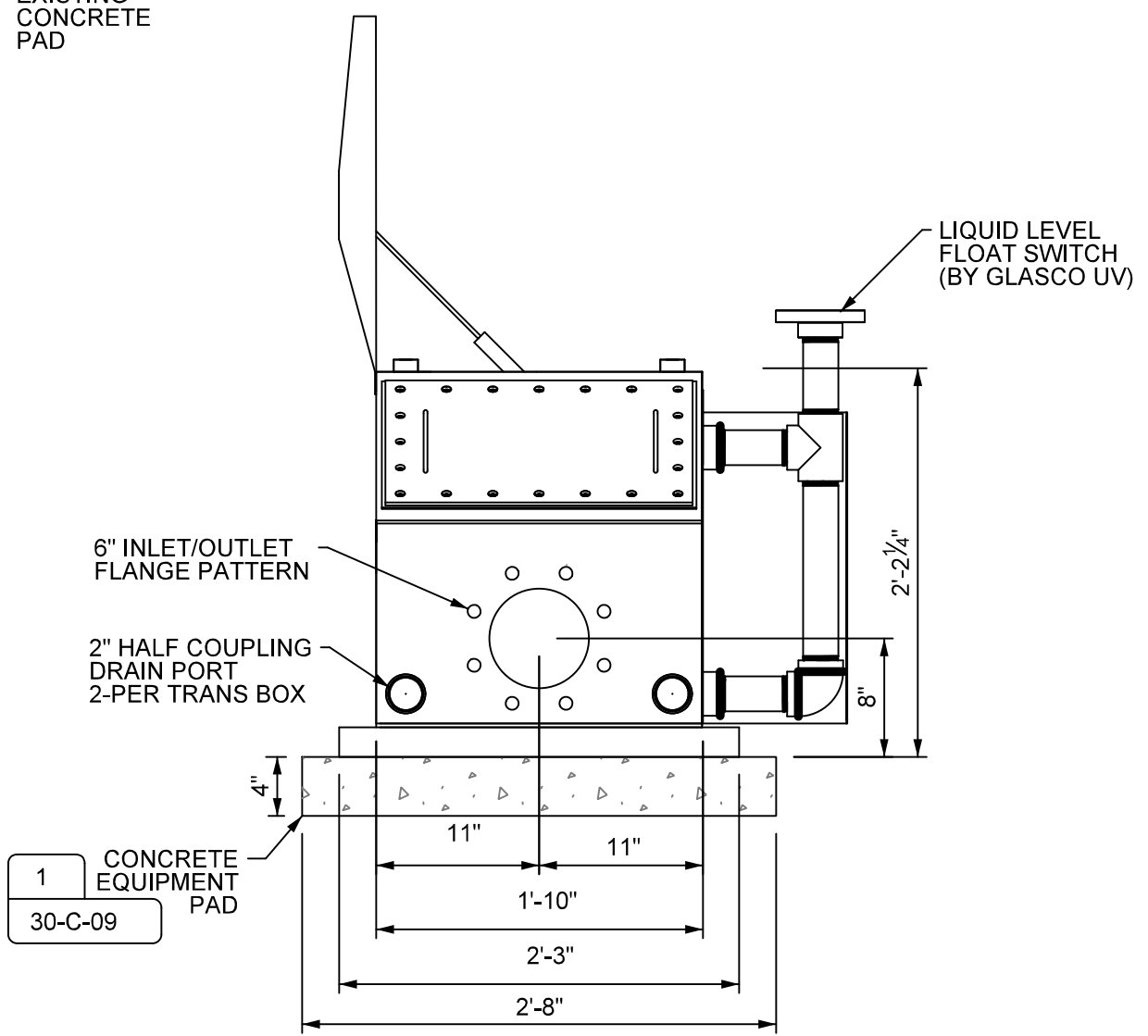


**SECTION C**  
SCALE: 1" = 1'-0"

**NOTE:**  
1. COORDINATE SIZE OF EACH PAD WITH EQUIPMENT OR PANEL PROVIDED.



**1 CONCRETE EQUIPMENT PAD**  
SCALE: NOT TO SCALE



**SECTION B**  
SCALE: 1" = 1'-0"



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

FLUIDYNE FILTER  
PLAN AND ANCHOR  
PLACEMENT

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

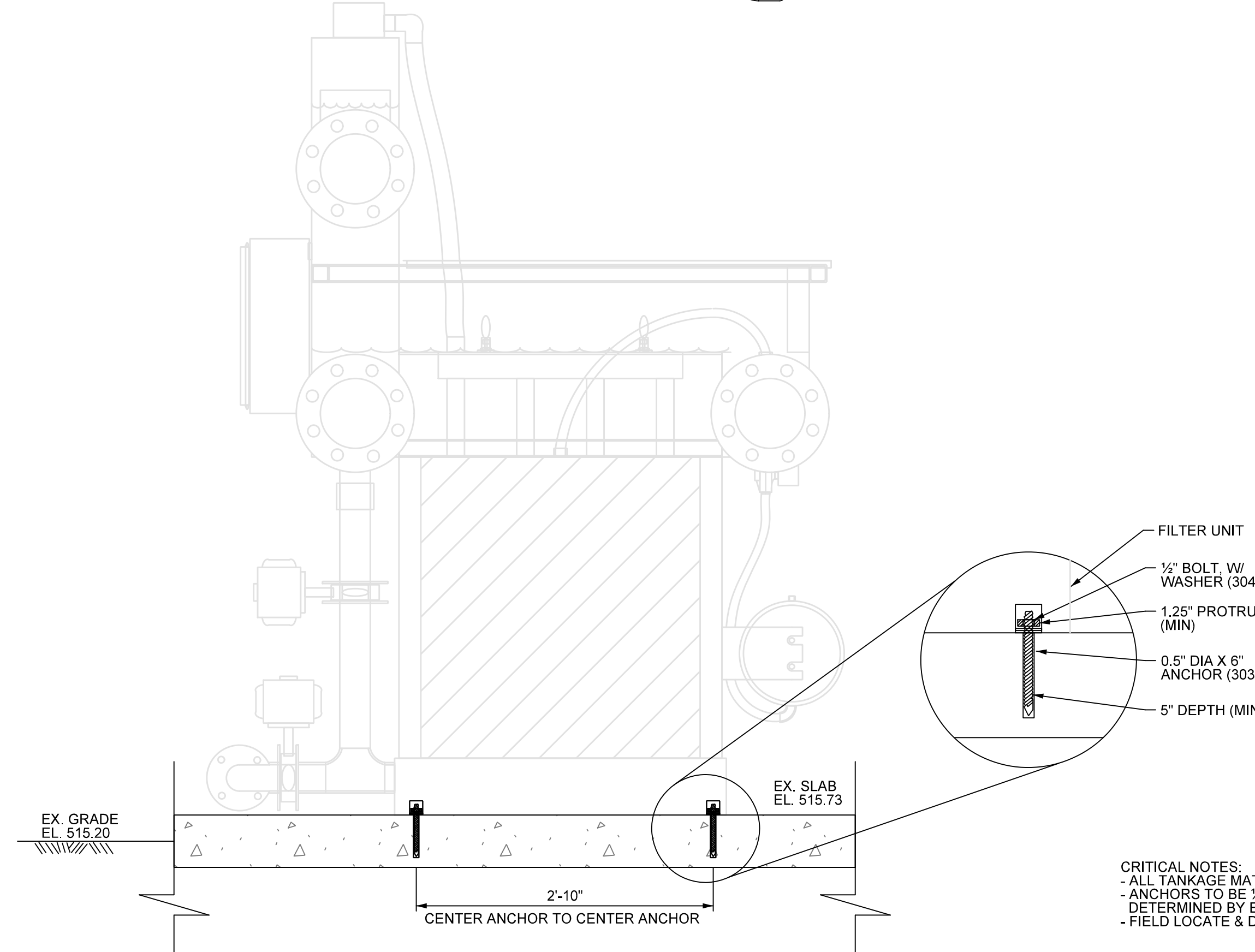
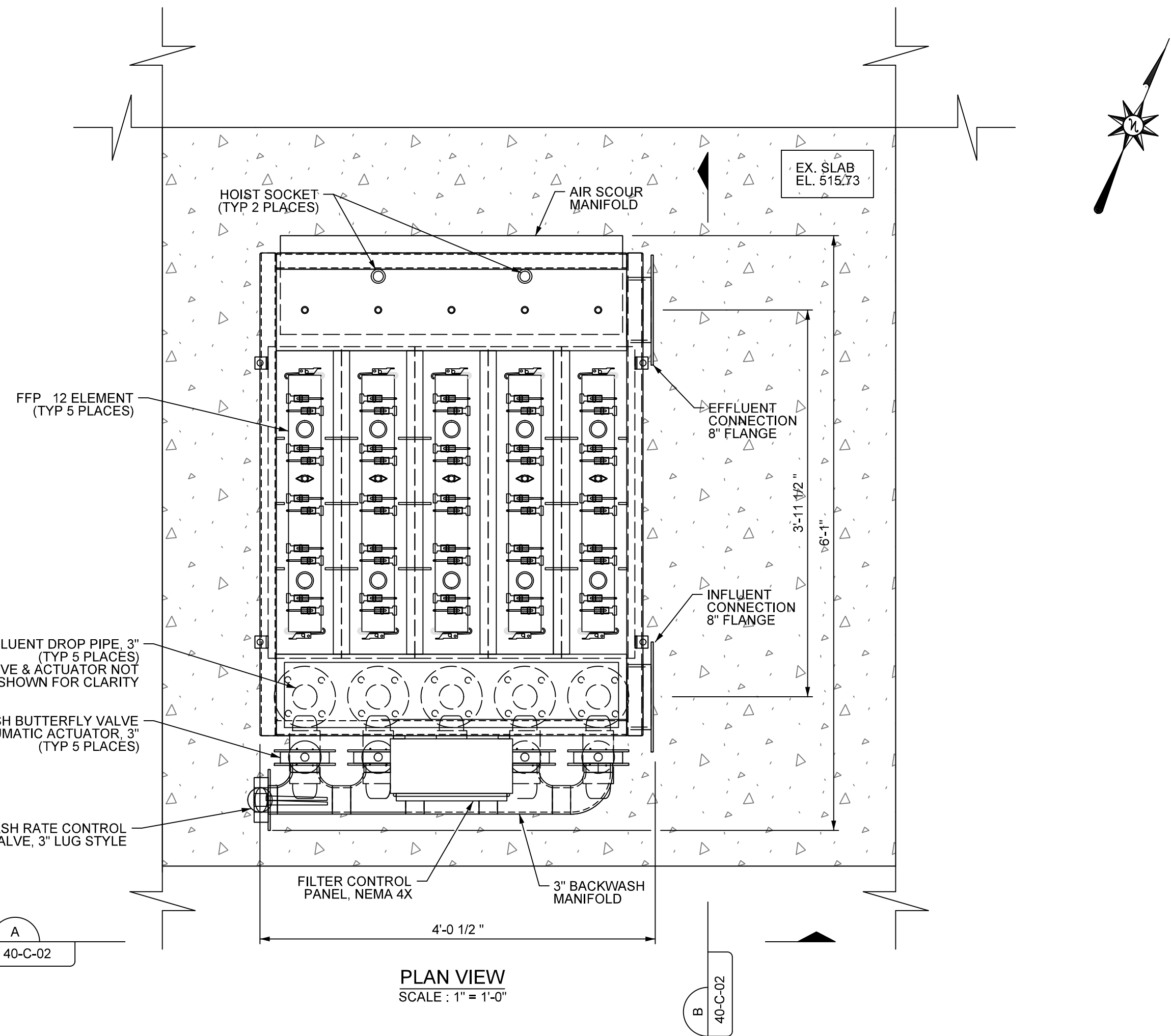
DATE: JUNE, 2023

DESIGNED BY: WEC

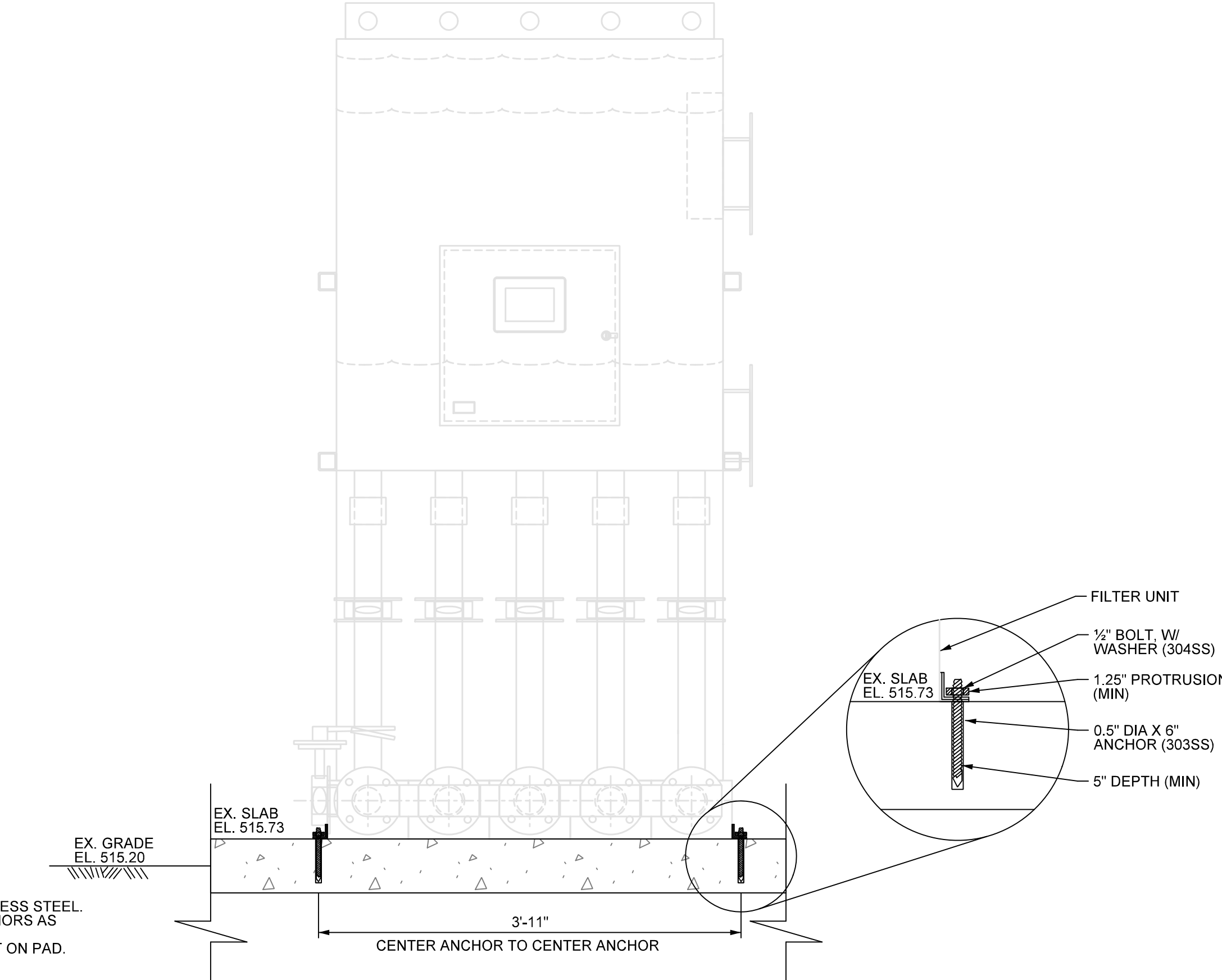
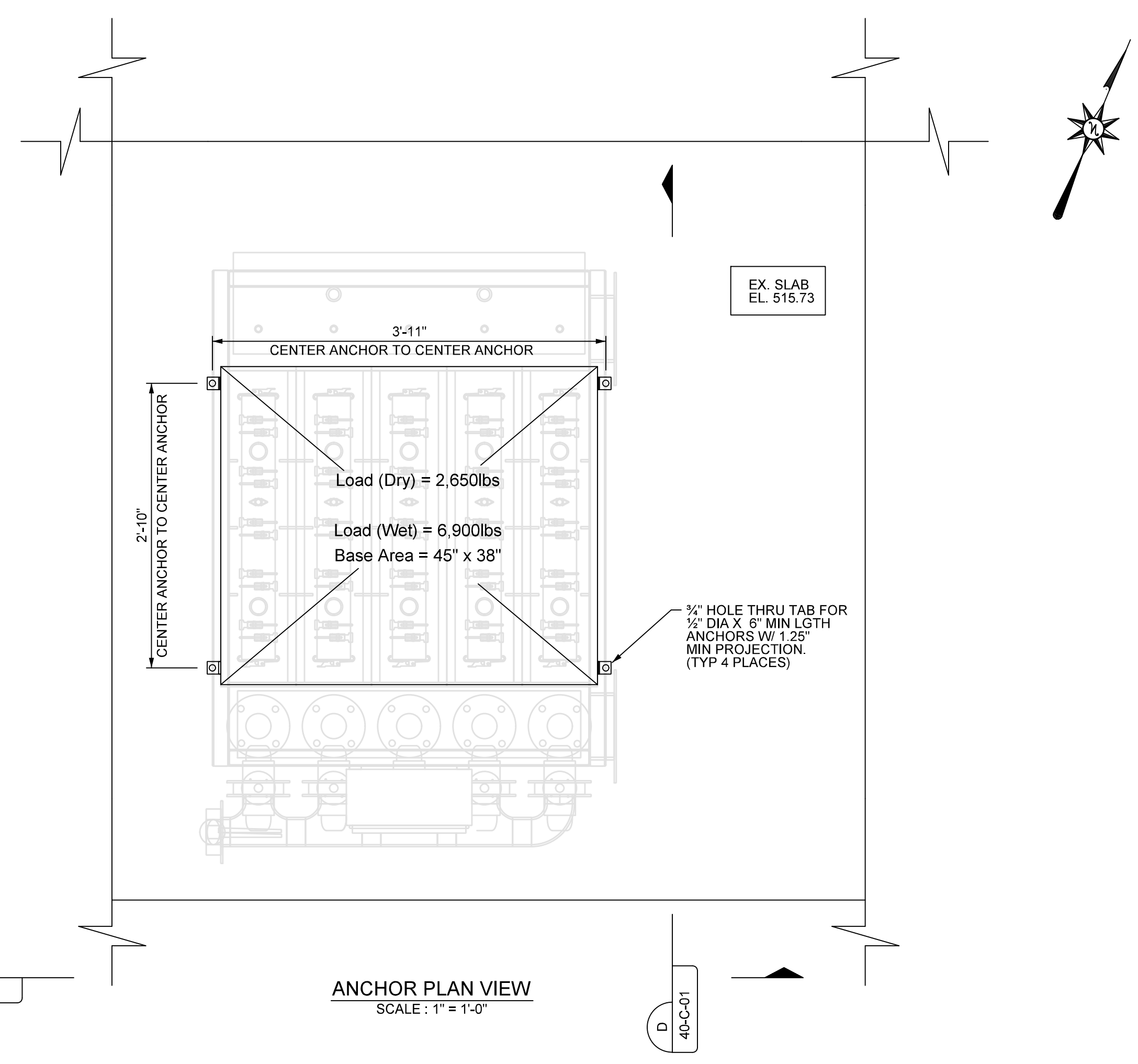
DRAWN BY: LEE

DWG: 40-C-01

SHEET NUMBER **29**



**CRITICAL NOTES:**  
- ALL TANKAGE MATERIALS & FASTENERS TO BE TYPE 304 STAINLESS STEEL.  
- ANCHORS TO BE 1/2" DIAMETER MINIMUM CINCH OR EPOXY ANCHORS AS DETERMINED BY ENGINEER OR CONTRACTOR.  
- FIELD LOCATE & DRILL ANCHORS FOLLOWING TANK PLACEMENT ON PAD.

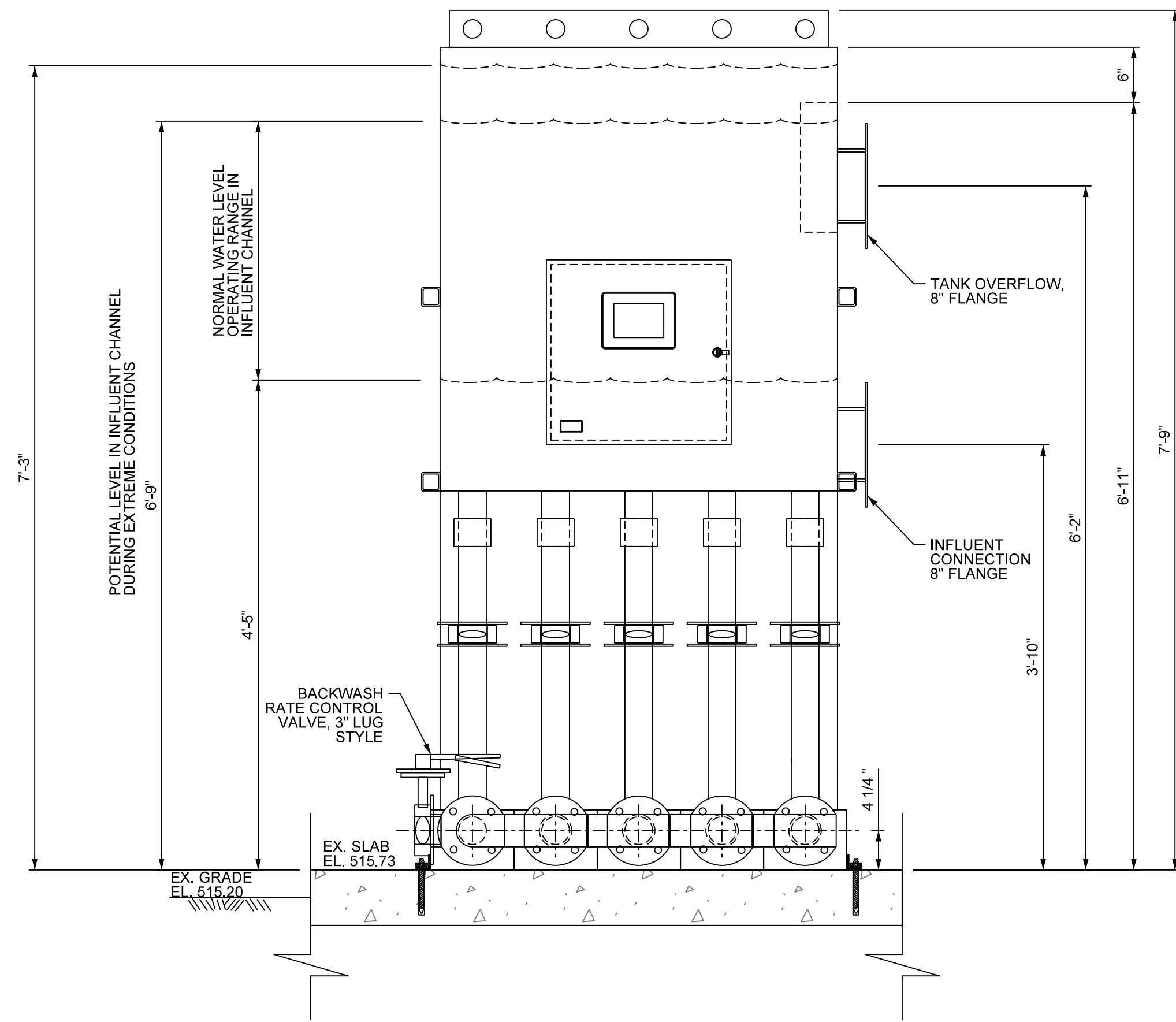


**SECTION C**  
40-C-01 SCALE: 1" = 1'-0"

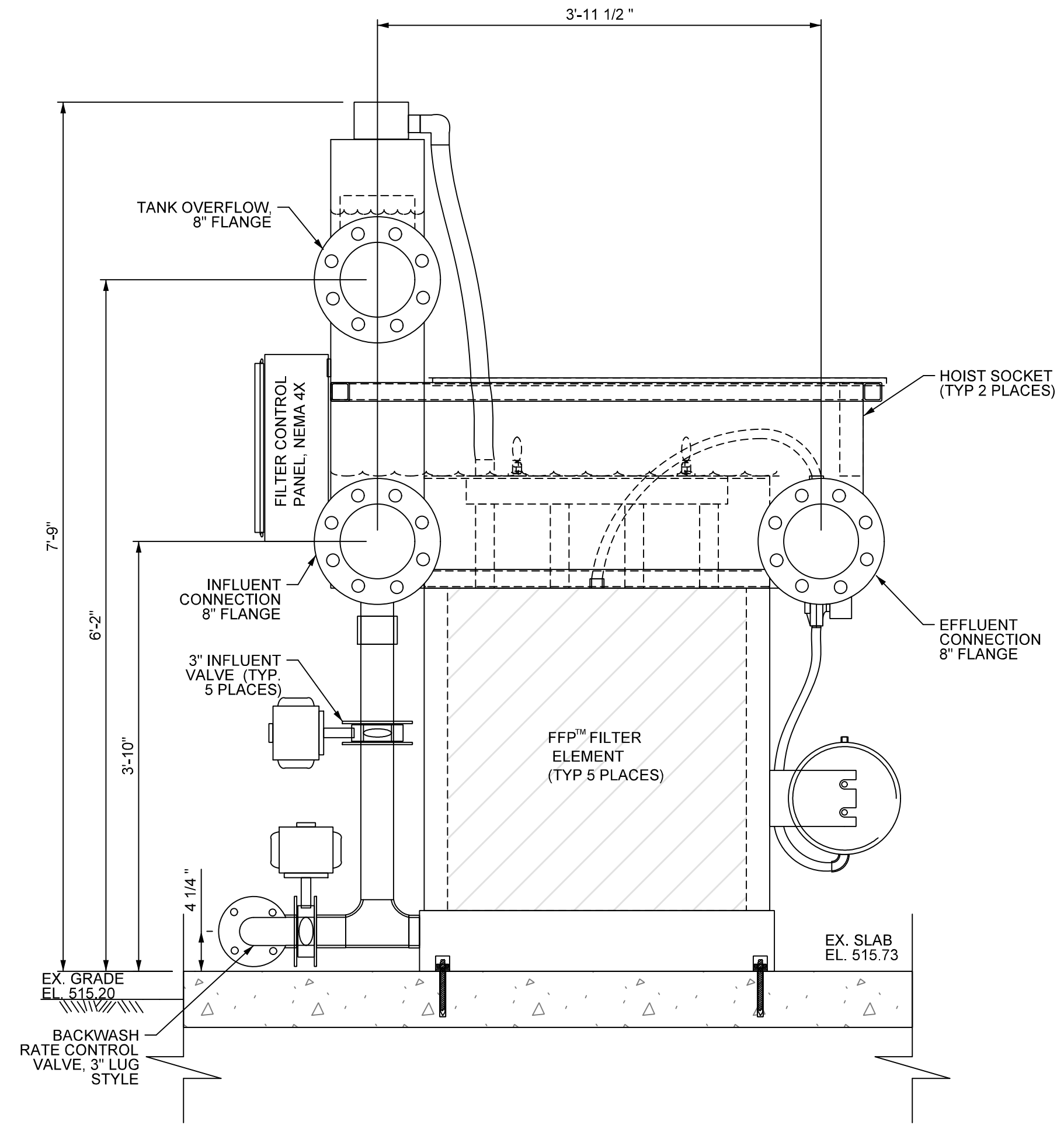
**SECTION D**  
40-C-01 SCALE: 1" = 1'-0"



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



**A SECTION**  
40-C-02 SCALE: 1" = 1'-0"



**B SECTION**  
40-C-02 SCALE: 1" = 1'-0"

**CRITICAL NOTES:**

- FILTER INFLUENT CHANNEL BACKWASH INITIATION FLOAT LEVEL IS SET APPROXIMATELY 2" BELOW THE OVERFLOW WEIR. LEVEL IN THE INFLUENT CHANNEL MAY BE UP TO AND OVER THE OVERFLOW WEIR DURING EXTREME CONDITIONS. ENGINEER SHALL DESIGN ALL UPSTREAM ELEVATIONS AND HYDRAULICS TO ACCOMMODATE ALL WATER LEVELS EXPECTED IN THE FILTER INFLUENT CHANNEL, INCLUDING LEVELS UP TO AND OVER THE OVERFLOW WEIR.
- OVERFLOW BOX DIMENSIONS & PIPE/FLANGE DIAMETER ARE SHOWN TO MATCH INFLUENT PIPING. ENGINEER SHALL DESIGN ALL OVERFLOW PIPING, FLANGE SIZES, ELEVATIONS, AND DOWN-STREAM HYDRAULICS TO ACCOMMODATE 100% OF INFLUENT FLOW IN THE EVENT OF ATYPICAL OR EXTREME OPERATIONAL CIRCUMSTANCES WHERE FULL BYPASS OR OVERFLOW IS DESIRED. OVERFLOW PIPING MAY BE OPTIONALLY DIRECTED TO EFFLUENT, BACKWASH, OR OTHER LOCATION AS DETERMINED BY THE ENGINEER.

**NOTES:**

- ALL FILTER TANK MATERIALS & FASTENERS TO BE TYPE 304 STAINLESS STEEL OR OTHER NON-CORROSIVE MATERIALS.
- ALL INTERNAL PIPING TO BE SCHEDULE 10 STAINLESS STEEL. ALL CONNECTIONS TO BE ANSI STANDARD 125 LB FLANGES. ALL PIPING AND PIPING CONNECTIONS TO AND FROM FILTER BY OTHERS.
- NOMINAL ASSEMBLY / DRY WEIGHT: 2150 LBS. NOMINAL OPERATING / WET WEIGHT: 5550 LBS.
- STRUCTURAL STIFFENERS AND SOME TANKAGE COMPONENTS NOT SHOWN FOR CLARITY.
- FILTER SHALL BE MOUNTED TO CONCRETE FLOOR OR PAD AND ANCHORED WITH STAINLESS STEEL ANCHORAGE. CONCRETE, PAD, ANCHORS, DESIGN, AND INSTALLATION BY OTHERS.
- MANUAL HOIST INCLUDED FOR ELEMENT REMOVAL (NOT SHOWN THIS DRAWING).
- COVER INCLUDED FOR OUTDOOR INSTALLATIONS WHERE SUNLIGHT CAN CAUSE ALGAE GROWTH ON MEDIA.
- CLEAN COMPRESSED AIR SOURCE REGULATED TO 85-90PSI REQUIRED TO OPERATE VALVES & AIR SCOUR SYSTEM.
- FILTER CONTROL PANEL (FCP) FACTORY MOUNTED TO TANK AT INFLUENT SIDE. WIRING AND CONDUIT FOR FILTER POWER (120VAC, 1PH, 60HZ, 20AMP) BY OTHERS.

Alabama Water Utilities  
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**BROOKWOOD**  
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TUSCALOOSA COUNTY, ALABAMA

FLUIDYNE FILTER SECTIONS

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

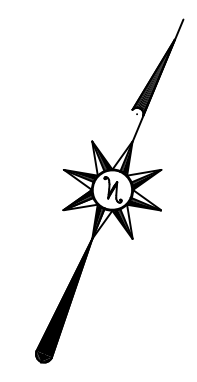
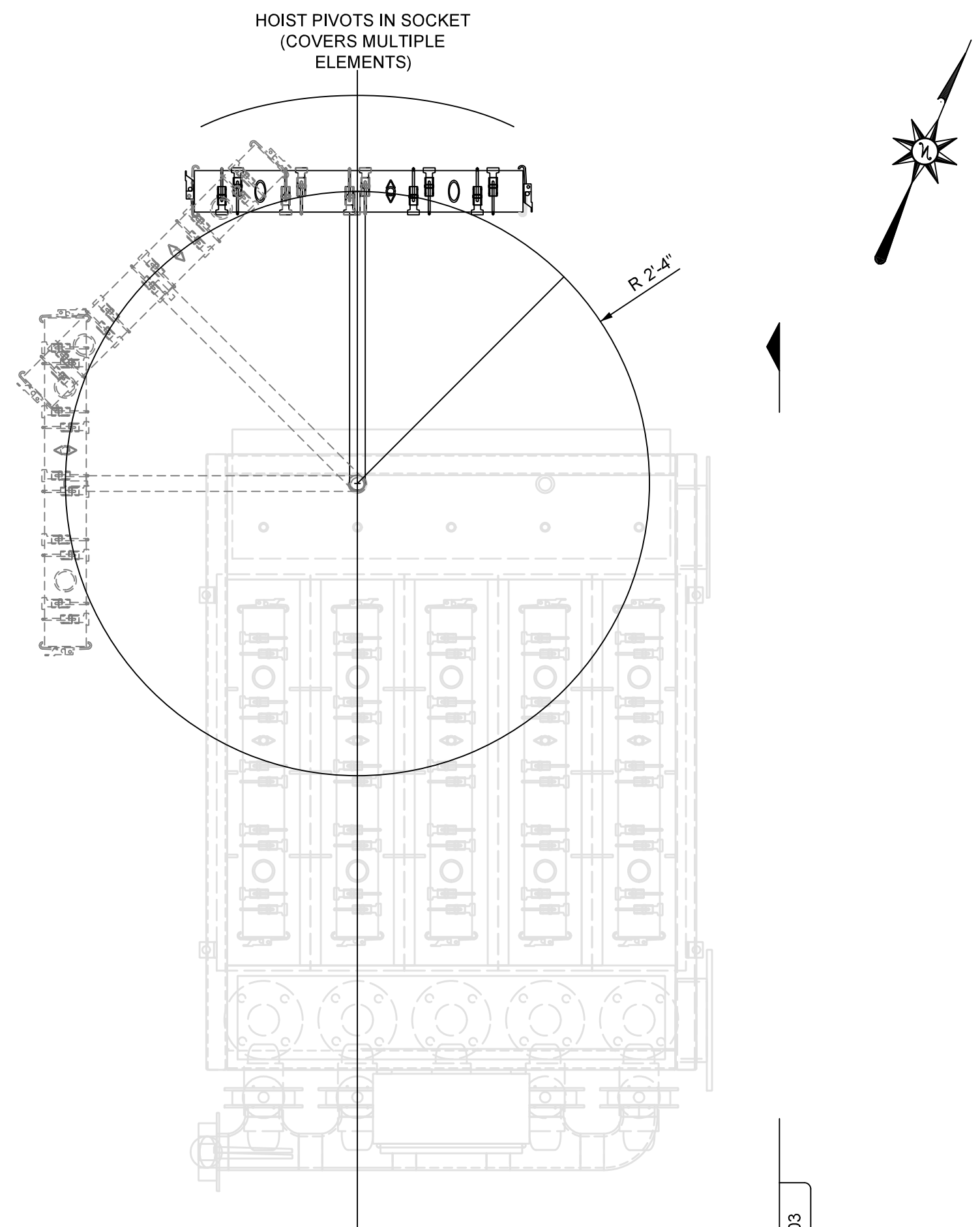
DESIGNED BY: WEC

DRAWN BY: LEE

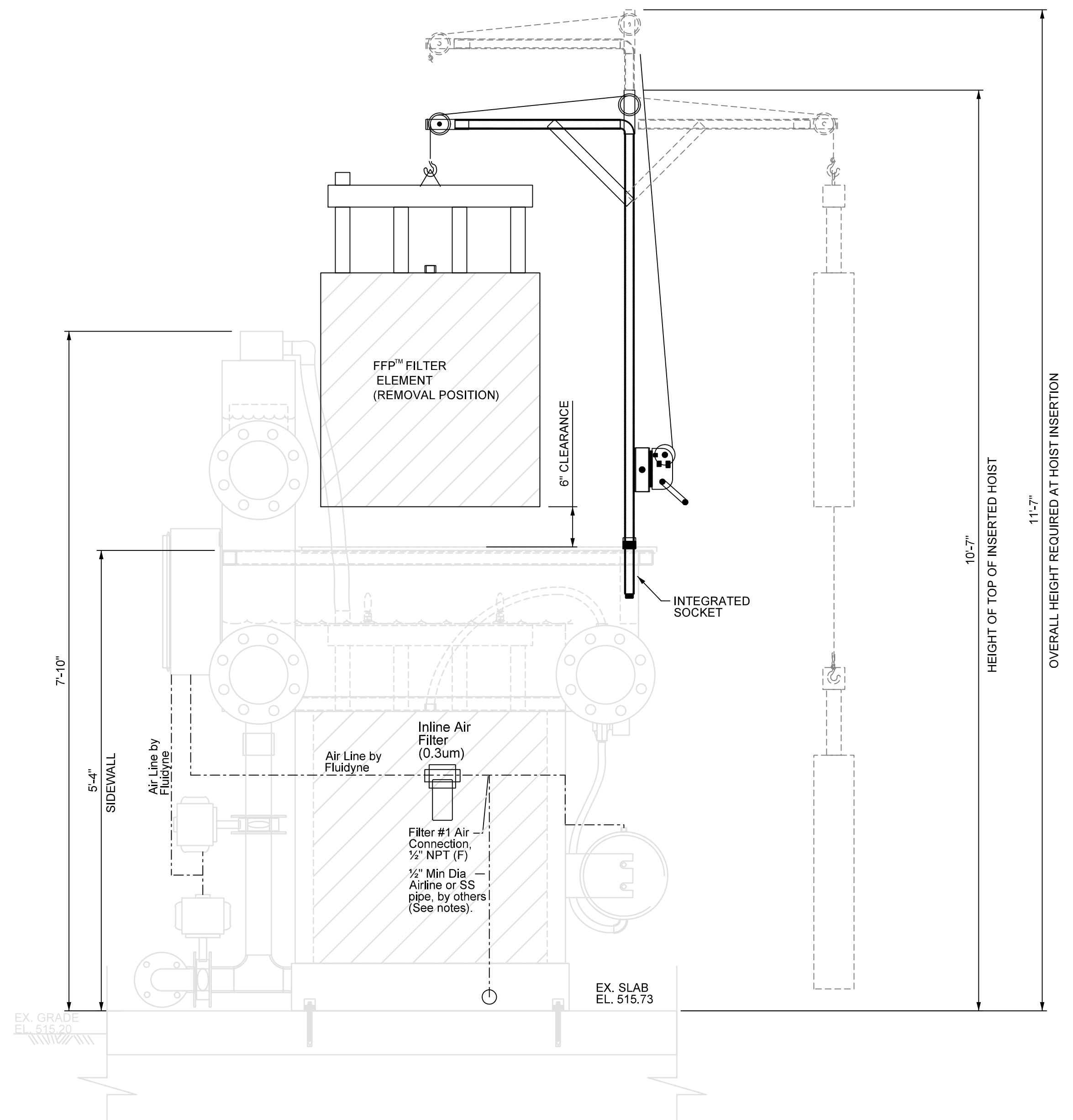
DWG: 40-C-02

SHEET NUMBER **30**

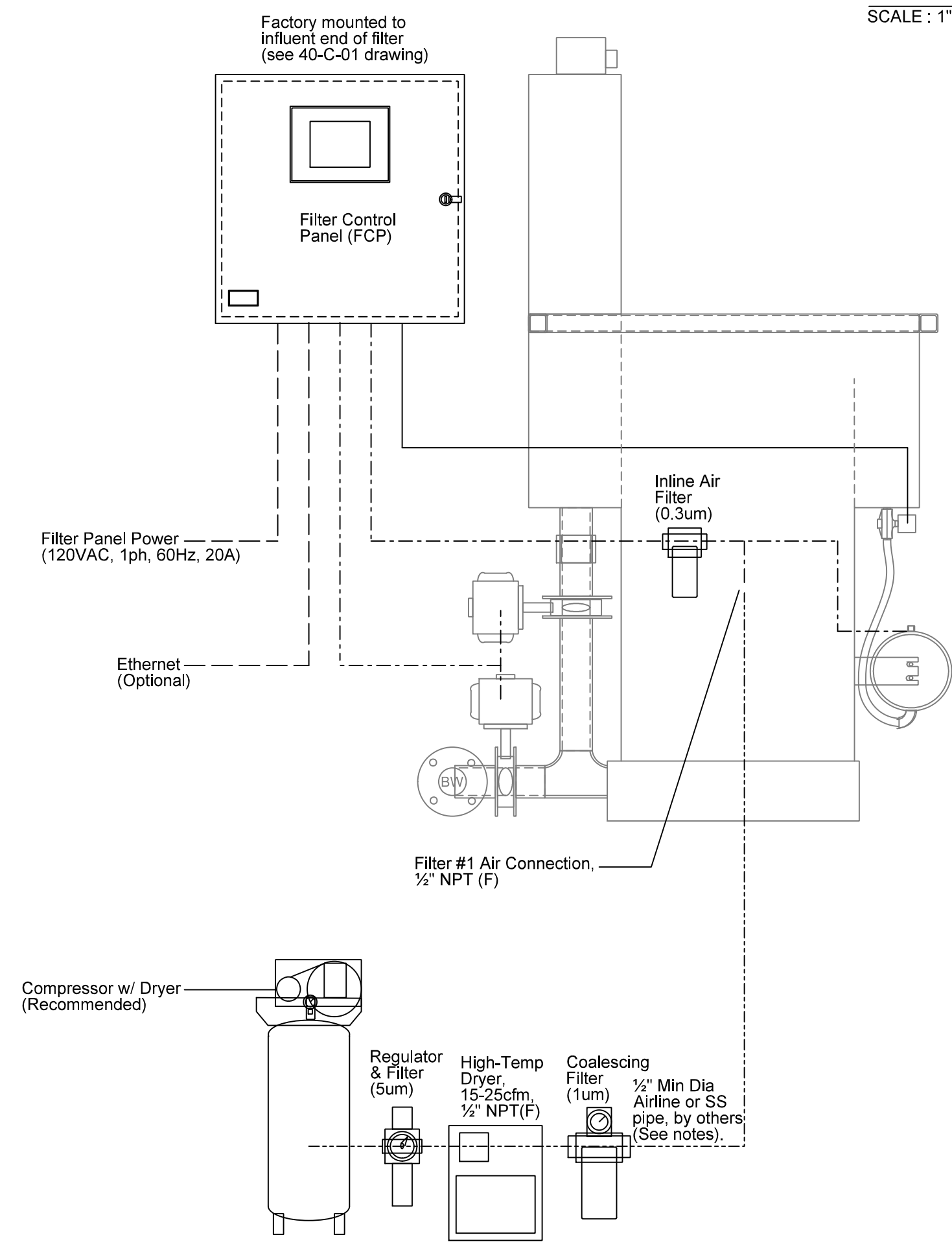




E  
40-C-03



E  
40-C-03 SECTION  
SCALE: 1" = 1'-0"



**Recommended Compressor System Components for FFP™ Packaged Filter Systems (Fx200000 Series):**

FFP™ Cloth Media filters use a combination of pneumatically operated butterfly valves and pressurized air scour to backwash filter elements, eliminating pumps, motors, mechanical moving parts & maintenance items. A small compressor or compressed air source (plant air) is required to provide clean/dry air @ 85-90 psi for these operations. Even though air requirements are minimal, a robust compressed air system is recommended to maintain the highest operational efficiencies possible.

**Compressor:**  
Recommend a 5.0 HP compressor:  
Minimum: Quincy 5 HP w/ 60gal Vert. Receiver, (230V, 1Ph operation) or equal.  
Recommended: Quincy QT-Max 5 HP w/ 80gal Vert. Receiver, (230V, 1Ph operation) or equal.

**NOTE:** Compressors should include automated condensate relief. Compressors are typically rated for indoor use and will require a shelter, cover, or be placed in a remote building (by others).

**Regulator:**  
Air pressure to FFP™ filters must be regulated to 85-90psi.  
Recommended: IR Model P-39344-600-VS Regulator w/ Integrated Filter (5um) or equivalent.

**Inline Air Filters:**  
In order to maintain proper operation of valve actuators & air scour solenoids, air to each filter should be clean & free from dust, debris, & excessive oil.  
Recommended: IR Model P-39344-600-VS Regulator / Filter (5um) followed by IR Grade G General Coalescing Filter (1um) or equivalent.

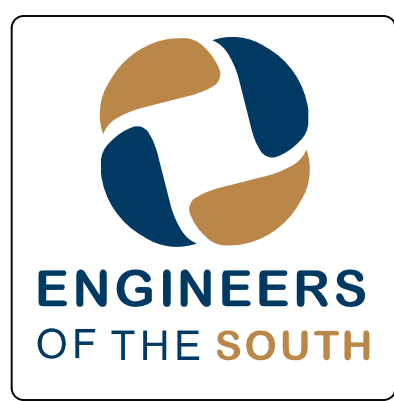
**Dryers:**  
Drying equipment is recommended in areas with high humidity or where freezing temperatures are possible (filters located outside).  
Recommended: Quincy QRHT25 High Temperature Refrigerated Air Dryer with automated condensate discharge or equivalent.

**Air Line/Piping (by others):**  
All airline, hose or piping between the compressor/dryer system and FFP™ filter(s) to be supplied by others. Recommend airline be 1/2" dia minimum stainless steel or copper pipe or rubber hose housed in conduit (150psi min).

**AIRLINE CRITICAL NOTE:** DO NOT USE Galvanized pipe, black pipe, or other corrosive material as this may cause damage to the filter's air scour system & components.

**NOTES:**

- ONE (1) SOCKET TYPICALLY WILL ALLOW ACCESS TO MULTIPLE ELEMENT LOCATIONS.
- MAX HOIST CAPACITY = 250 LBS.
- HOIST WEIGHT = 70 LBS
- HOIST-WINCH IS NOT TO BE USED TO MOVE PEOPLE OR LOADS ABOVE PEOPLE.
- INSPECT CABLE AND HOOK CONNECTIONS BEFORE EACH USE.



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

FLUIDYNE  
FILTER  
HOIST DETAILS

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

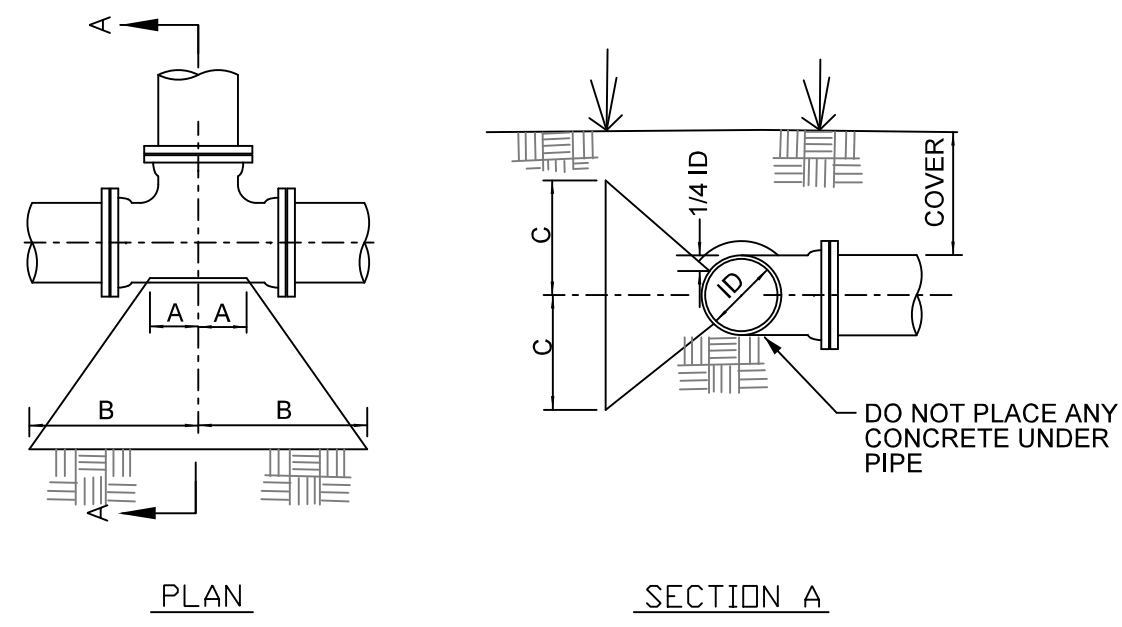
DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 40-C-03

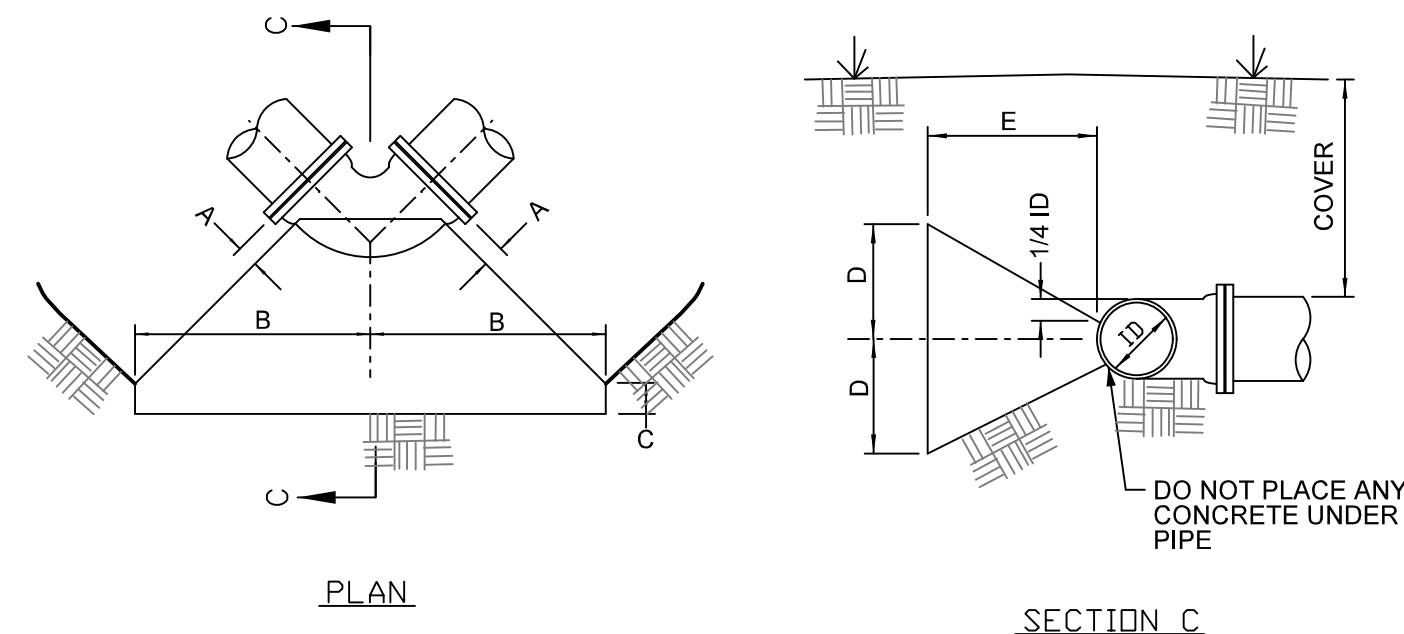
SHEET NUMBER **31**





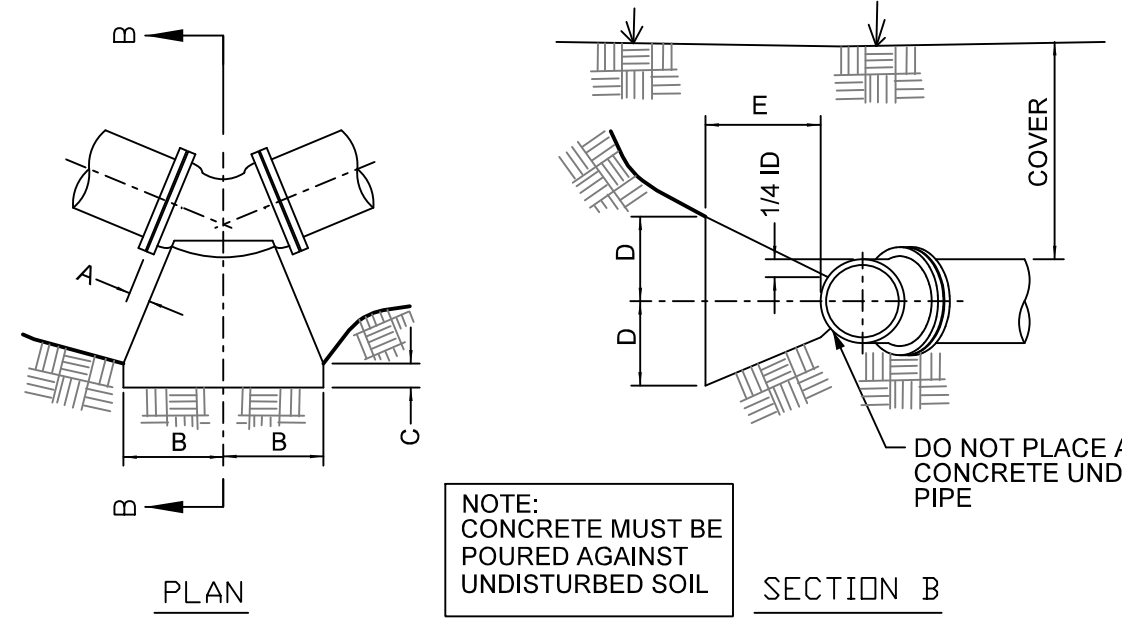
**TYPICAL CONCRETE BRACING FOR TEES**

PIPE DIA	A	B	C	MIN COVER
4"	5"	5"	6"	2'-6"
6"	6"	8"	9"	2'-6"
8"	7"	1'-1"	1'-0"	3"
10"	9"	1'-6"	1'-3"	3'-0"
12"	10"	1'-10"	1'-6"	3'-0"
14"	11 1/2"	1'-9"	1'-9"	3'-0"
16"	1'-0 1/2"	2'-0"	2'-0"	3'-0"
18"	1'-2"	2'-4"	2'-3"	3'-0"
20"	1'-3 1/2"	2'-6"	2'-6"	3'-6"
24"	1'-7 1/2"	3'-0"	3'-0"	3'-6"
30"	1'-10"	3'-4"	3'-9"	4'-0"
36"	2'-1"	3'-6"	4'-6"	4'-6"
48"	2'-7"	4'-0"	5'-0"	4'-6"
54"	3'-3"	4'-3"	5'-4"	5'-0"



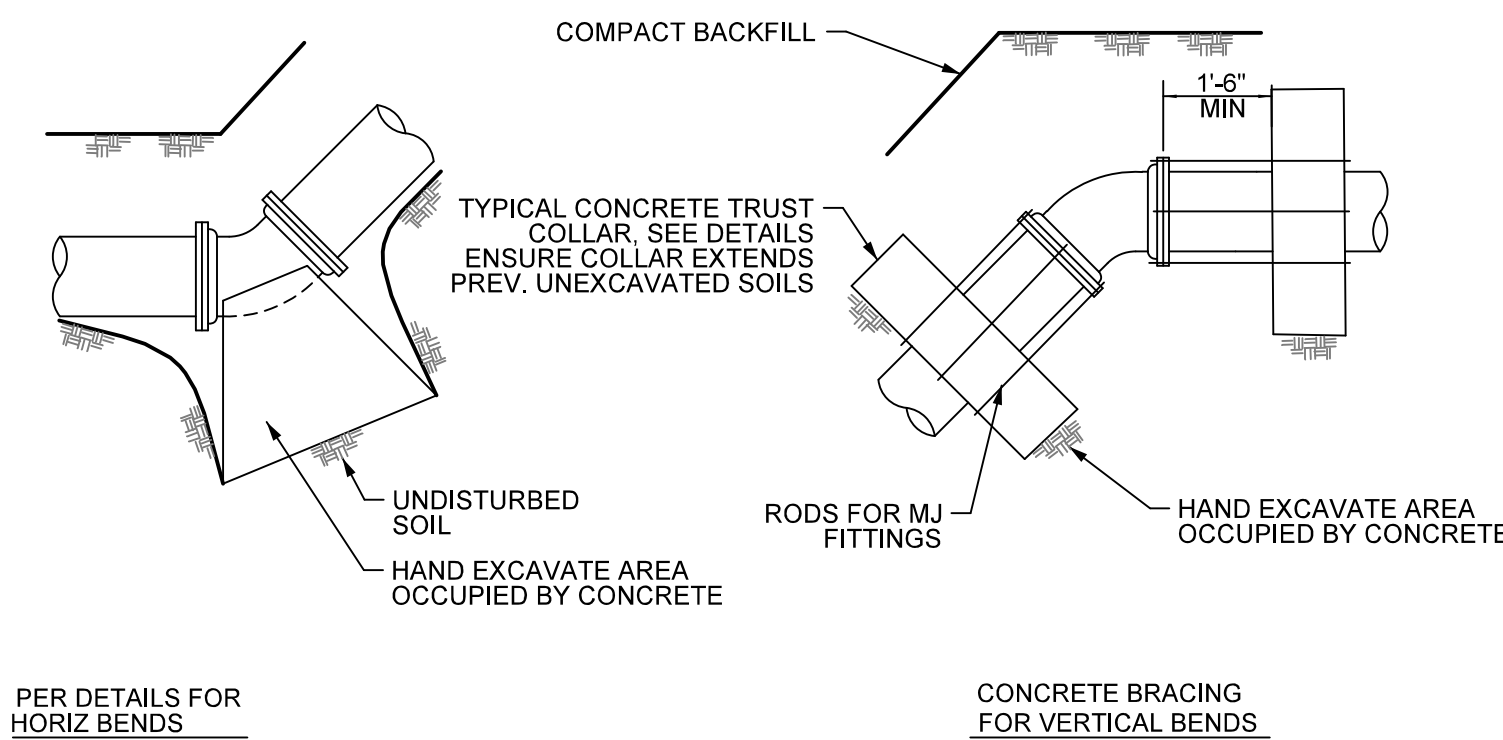
**TYPICAL CONCRETE BRACING FOR 90° BENDS**

PIPE DIA	A	B	C	D	E	MIN COVER
4"	4 1/2"	6"	1'-8"	6"	1'-10"	2'-6"
6"	4 1/2"	1'-0"	1'-7"	9"	1'-9"	2'-6"
8"	4 1/2"	1'-3"	1'-6"	1'-0"	1'-9"	2'-6"
10"	4 1/2"	2'-1"	1'-1"	1'-3"	1'-11"	3'-0"
12"	4 1/2"	2'-8"	1'-0"	1'-6"	1'-11"	3'-0"
14"	6"	2'-6"	1'-2"	1'-9"	2'-0"	3'-0"
16"	6"	2'-11"	1'-0"	2'-0"	2'-1"	3'-0"
18"	6"	3'-4"	1'-0"	2'-3"	2'-2"	3'-0"
20"	6"	3'-6"	1'-1"	2'-6"	2'-3"	3'-6"
24"	7"	4'-3"	8"	3'-0"	2'-5"	3'-6"
30"	8"	4'-7"	6"	3'-3"	2'-5"	4'-0"
36"	8"	5'-0"	6"	3'-6"	2'-10"	4'-6"
48"	9"	5'-4"	4"	3'-9"	3'-1"	4'-6"
54"	9"	5'-6"	4"	4'-0"	3'-7"	5'-0"

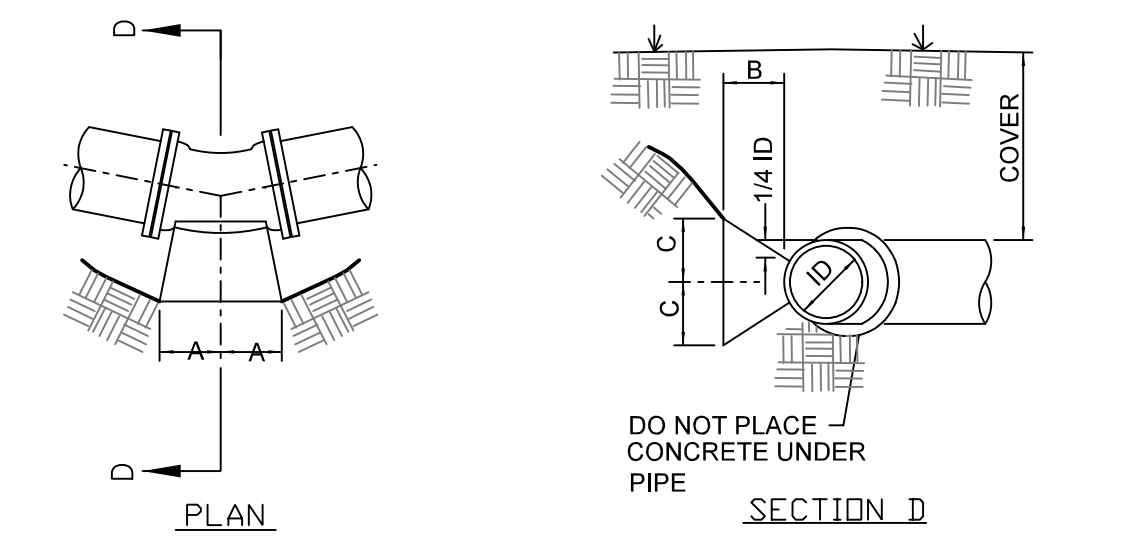


**TYPICAL CONCRETE BRACING FOR 45° BENDS**

PIPE DIA	A	B	C	D	E	MIN COVER
4"	4 1/2"	3 1/2"	1'-0"	6"	1'-1"	2'-6"
6"	4 1/2"	6 1/2"	9"	1'-2"	1'-2"	2'-6"
8"	4 1/2"	10"	1'-0"	1'-0"	1'-2"	2'-6"
10"	4 1/2"	1'-1 1/2"	3"	1'-3"	1'-4"	3'-0"
12"	6"	1'-4 1/2"	-	1'-6"	1'-8"	3'-0"
14"	6"	1'-4 1/2"	-	1'-9"	1'-8"	3'-0"
16"	6"	1'-7"	-	2'-0"	1'-10"	3'-0"
18"	6"	1'-5 1/2"	-	2'-3"	2'-4"	3'-0"
20"	6"	1'-11"	-	2'-6"	2'-4"	3'-6"
24"	7"	2'-3"	-	3'-0"	2'-10"	3'-6"
30"	8"	2'-6"	-	3'-3"	2'-10"	4'-0"
36"	8"	2'-10"	-	3'-6"	3'-3"	4'-6"
48"	8"	3'-1"	-	3'-9"	3'-6"	4'-6"
54"	9"	3'-4"	-	4'-0"	4'-0"	5'-0"



- GENERAL NOTES:**
- GENERAL DIMENSIONS SHALL BE CONSIDERED AS MINIMUMS. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADDITIONAL AS REQUIRED FOR ACTUAL FIELD CONDITIONS ENCOUNTERED. CONTRACTOR TO ENSURE ALL THRUST RESTRAINT IS ADEQUATE.
  - ALL CONCRETE FOR THRUST RESTRAINT SHALL BEAR AGAINST FIRM UNDISTURBED SOILS.
  - CONTRACTOR SHALL WRAP ALL ACCESSORIES BOLTS, NUTS, CONNECTIONS, ETC. IN PLASTIC SUCH THAT THEY CAN BE REMOVED WITHOUT THE NEED FOR CONCRETE REMOVAL.
  - UNLESS IND. OTHERWISE IN PLANS, ALL FITTINGS SHALL BE RJ OR MJ WITH RESTRAINING FOLLOWER GLANDS. RESTRAINING FOLLOWER GLANDS SHALL BE MEGA-LUG, ROMAC, OR EQUAL. RETAINER GLANDS NOT ALLOWED.



**TYPICAL CONCRETE BRACING FOR 11 1/4° & 22 1/2° BENDS**

PIPE DIA	22 1/2° BENDS				11 1/4° BENDS			
	A	B	C	MIN COVER	A	B	C	MIN COVER
4"	2"	1'-1"	4"	2'-6"	2"	1'-0"	3"	2'-6"
6"	4"	1'-0"	6"	2'-6"	2"	1'-0"	4"	2'-6"
8"	6"	1'-0"	8"	3'-0"	4"	1'-0"	5"	3'-0"
10"	8"	1'-1"	10"	3'-0"	5"	1'-0"	6"	3'-0"
12"	11"	1'-7"	1'-0"	5'-0"	6"	1'-0"	7"	3'-0"
14"	12"	2'-1"	1'-2"	5'-0"	8"	1'-0"	8"	3'-0"
16"	1'-1"	2'-5"	1'-8"	5'-0"	10"	1'-0"	9"	3'-0"
18"	1'-0"	2'-1"	1'-10"	5'-0"	1'-0"	1'-0"	10"	3'-6"
20"	1'-2"	2'-1"	2'-1"	5'-0"	1'-1"	1'-0"	1'-0"	3'-6"
24"	1'-5"	2'-10"	2'-6"	5'-0"	1'-3"	1'-0"	1'-3"	4'-0"
30"	1'-9"	2'-10"	2'-8"	5'-0"	1'-7"	1'-3"	1'-5"	4'-6"
36"	2'-0"	3'-2"	3'-1"	5'-0"	1'-10"	1'-3"	1'-9"	4'-6"
48"	2'-6"	3'-10"	3'-6"	5'-0"	2'-4"	1'-6"	2'-2"	5'-0"
54"	2'-10"	4'-0"	3'-10"	5'-0"	2'-8"	1'-6"	2'-5"	5'-0"

1 TYPICAL THRUST RESTRAINT FOR FITTINGS ON PRESSURE MAINS  
95-C-01 NOT TO SCALE

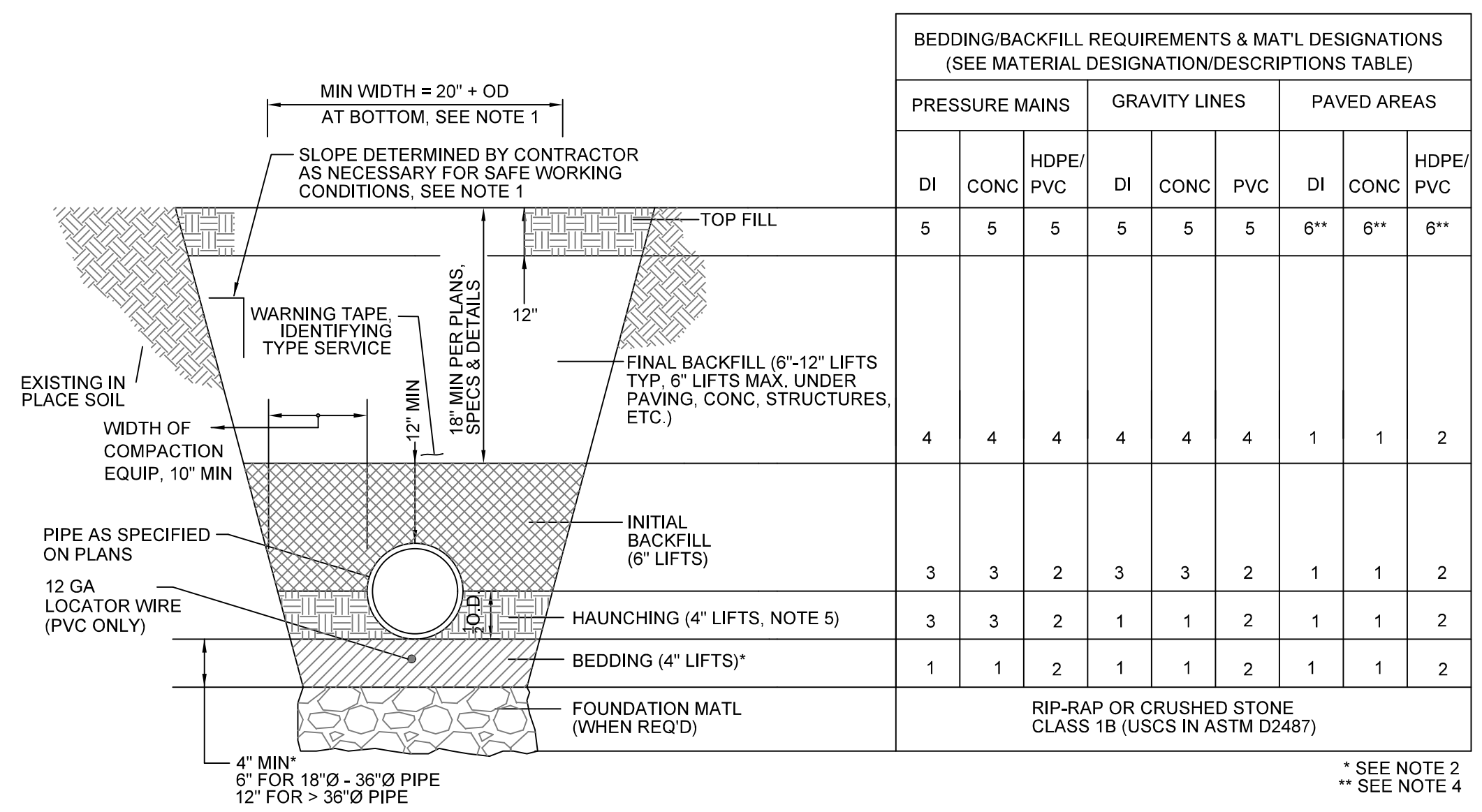
NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT

Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
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TUSCALOOSA COUNTY, ALABAMA

TYPICAL DETAILS  
THRUST RESTRAINT

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026  
DATE: JUNE, 2023  
DESIGNED BY: WEC  
DRAWN BY: LEE  
DWG: 95-C-01  
SHEET NUMBER **32**



**BEDDING/BACKFILL REQUIREMENTS & MATL DESIGNATIONS (SEE MATERIAL DESIGNATION/DESCRIPTIONS TABLE)**

PRESSURE MAINS	GRAVITY LINES			PAVED AREAS					
	DI	CONC	HDPE/PVC	DI	CONC	PVC	DI	CONC	HDPE/PVC
5	5	5	5	5	5	5	6**	6**	6**
4	4	4	4	4	4	4	1	1	2
3	3	2	3	3	2	2	1	1	2
3	3	2	1	1	2	1	1	1	2
1	1	2	1	1	2	1	1	1	2

RIP-RAP OR CRUSHED STONE CLASS 1B (USCS IN ASTM D2487)

\* NOTE: WHERE EXISTING LINES ARE DEEPER & REMOVED FOR THE INSTALLATION OF NEW LINES. THE BEDDING MATERIAL SHALL EXTEND TO THE FULL DEPTH AND WIDTH OF EXCAVATION. THESE COSTS SHALL BE INCLUDED IN THE "PER LF PRICED FOR PIPE."

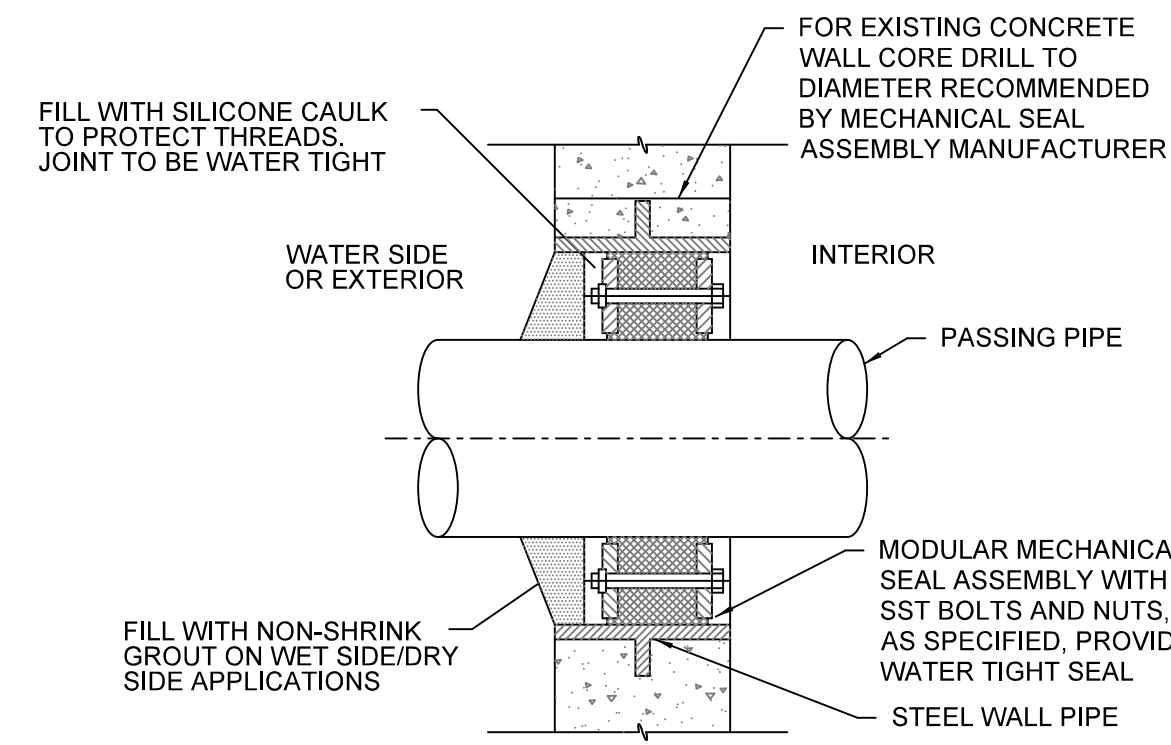
2 BEDDING AND BACKFILL FOR TRENCHES  
95-C-01 NOT TO SCALE

- NOTES:**
- SLOPE, BENCHING, SHORING, ETC. AS DETERMINED AND DESIGNED BY THE CONTRACTOR. CONTRACTOR IS SOLELY RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE OSHA REGULATIONS FOR "OPEN TRENCH EXCAVATIONS".
  - BEDDING REQ'D FOR ALL GRAVITY LINES. ALL PVC, ALL HDPE AND ALL CONCRETE LINES. BEDDING REQUIRED IN ALL AREAS OF ROCK EXCAVATION OR UNSUITABLE SOILS. BELL HOLES REQ'D FOR PIPES > 4" DIA. FOR DUCTILE IRON PRESSURE MAINS, SELECT EARTH MAY BE USED FOR BEDDING IN AREAS OF ROCK EXCAVATION.
  - ALL MATERIALS SHALL BE COMPACTED TO MINIMUM 95% STANDARD PROCTOR DENSITY AT 2% +/- OPTIMUM MOISTURE CONTENT. MATERIALS UNDER PAVING, CONCRETE, STRUCTURES, ETC. SHALL BE COMPACTED TO TO MIN 98%-100% STANDARD PROCTOR. MECHANICAL COMPACTION SHALL BE BY VIBRATORY SHEEPSFOOT OR OTHER EQUIP. SPECIFICALLY DESIGNED FOR THE COMPACTION OF EARTH. COMPACTION EQUIP. SHALL BE ON-SITE PRIOR TO BEGINNING OF WORK. MECHANICAL COMPACTION SHALL BE COMPLETED IN LOOSE LIFTS AS SHOWN ON THE DETAIL.
  - TEMPORARY COMPACTED PUG-MIX BACKFILL REQ'D UNTIL PAVEMENT PLACEMENT IS COMPLETE. THE CONTRACTOR SHALL CONTINUOUSLY MAINTAIN THIS PUGMIX TO KEEP IT FLUSH WITH THE ADJACENT PAVING, ETC. UNTIL THE FINAL PAVING IS PLACED. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING TEMPORARY ASPHALT OR CONCRETE PATCHES WHEN NEEDED FOR PUBLIC SAFETY AND/OR CONVENIENCE.
  - THE CONTRACTOR SHALL BE RESPONSIBLE FOR SELECTING AND UTILIZE APPROPRIATE MEANS AND METHODS OF CONSTRUCTION TO ENSURE THAT THE ENTIRE AREAS UNDER THE HAUNCHES OF THE PIPE ARE FILLED WITH THE REQUIRED MATERIALS AND COMPACTED APPROPRIATELY.
  - ADDITIONAL AND/OR SPECIAL REQUIREMENTS MAY BE REQ'D BY THE PLANS. SPECIFICATIONS AND/OR CONTRACT DOCUMENTS.
  - TO THE EXTENT POSSIBLE, AS DETERMINED BY THE CONTRACTOR, TRENCH WALL SHORING METHODS SHALL BE USED IN PAVED AREAS TO MINIMIZE PAVING REPAIR REQUIREMENTS.

**MATERIAL DESIGNATION/DESCRIPTIONS TABLE**

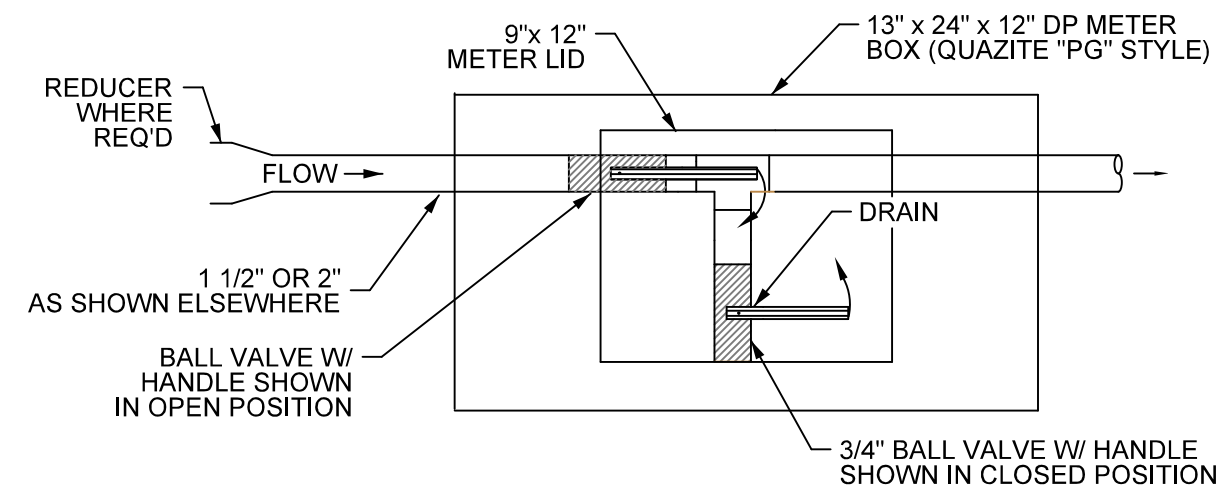
DESIGNATION/MATERIALS	DESCRIPTION
1.	CRUSHED STONE, ASTM-448 NO. 57 GRADATION
2.	CRUSHED STONE, ASTM-448 NO. 67 GRADATION. SAND SHALL BE USED AS SUBSTITUTE IN RESIDENTIAL LAWNS, YARDS, AND LANDSCAPED AREAS.
3.	SELECT EXCAVATED MAT'L REASONABLY DRY (WITHIN LIMITS REQ'D FOR COMPACTION) NO STONES > 1" DIA.
4.	EXCAVATED MAT'L REASONABLY DRY (WITHIN LIMITS REQ'D FOR COMPACTION) NO STONES > 12" DIA.
5.	SELECT TOPSOIL MAT'L TO SUPPORT VEGETATION, NO STONES OR ROCK ALLOWED
6.	CRUSHED STONE, MOIST "PUG-MIX" PER ALDOT SECTION 825





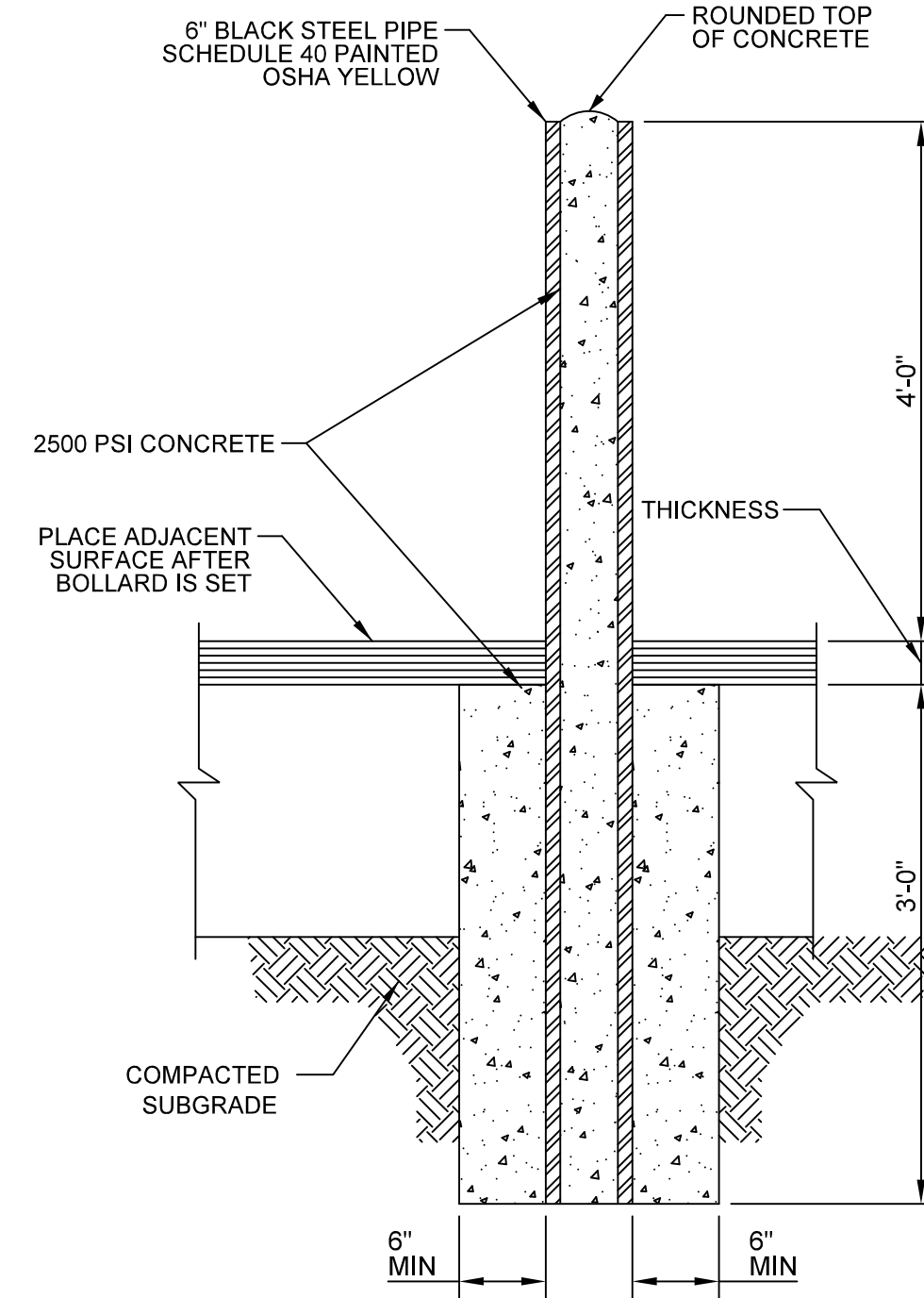
NOTE:  
WHERE EXISTING CONCRETE STRUCTURE IS TO BE CORE DRILLED THE CONTRACTOR SHALL ULTRASONIC TEST OR X-RAY THE AREA FOR EMBEDDED ITEMS BEFORE CORE DRILLING CAN PROCEED. IF EMBEDDED ITEMS ARE FOUND, NOTIFY THE ENGINEER IMMEDIATELY.

1 WALL PENETRATION SEAL  
95-C-02 SCALE : NOT TO SCALE

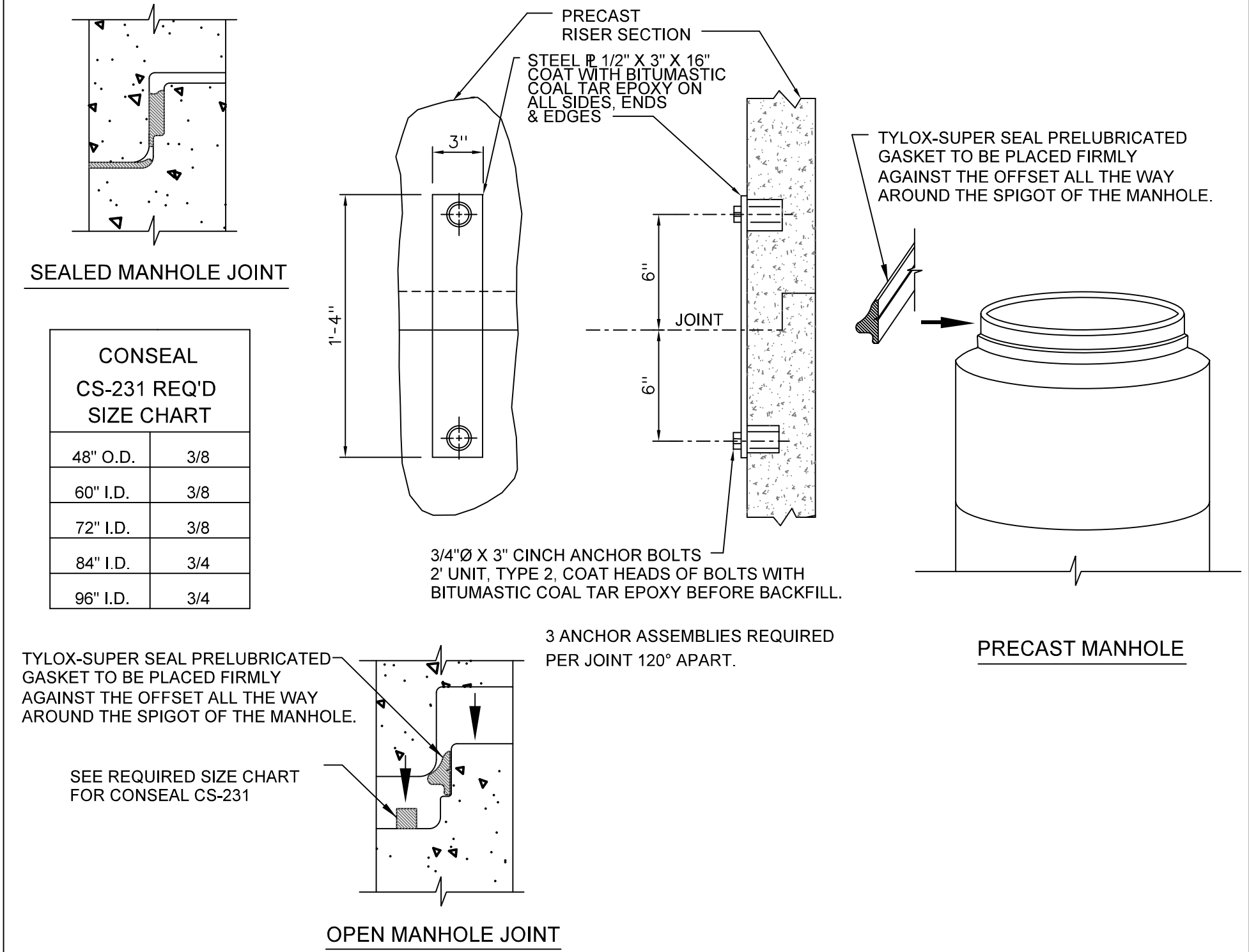


NOTES:  
A. 9" X 12" METER LID TO LIFT MORE THAN 90°  
B. ASSEMBLE VALVES WITH NIPPLES AS NEEDED FOR HANDLE CLEARANCE AND EASE OF OPERATION  
C. USE COPPER PIPE  
D. PROVIDE 1 CY ROCK NEST UNDER BOX FOR DRAIN

2 SHUTOFF/RAIN ASSEMBLY  
95-C-02 SCALE : NOT TO SCALE

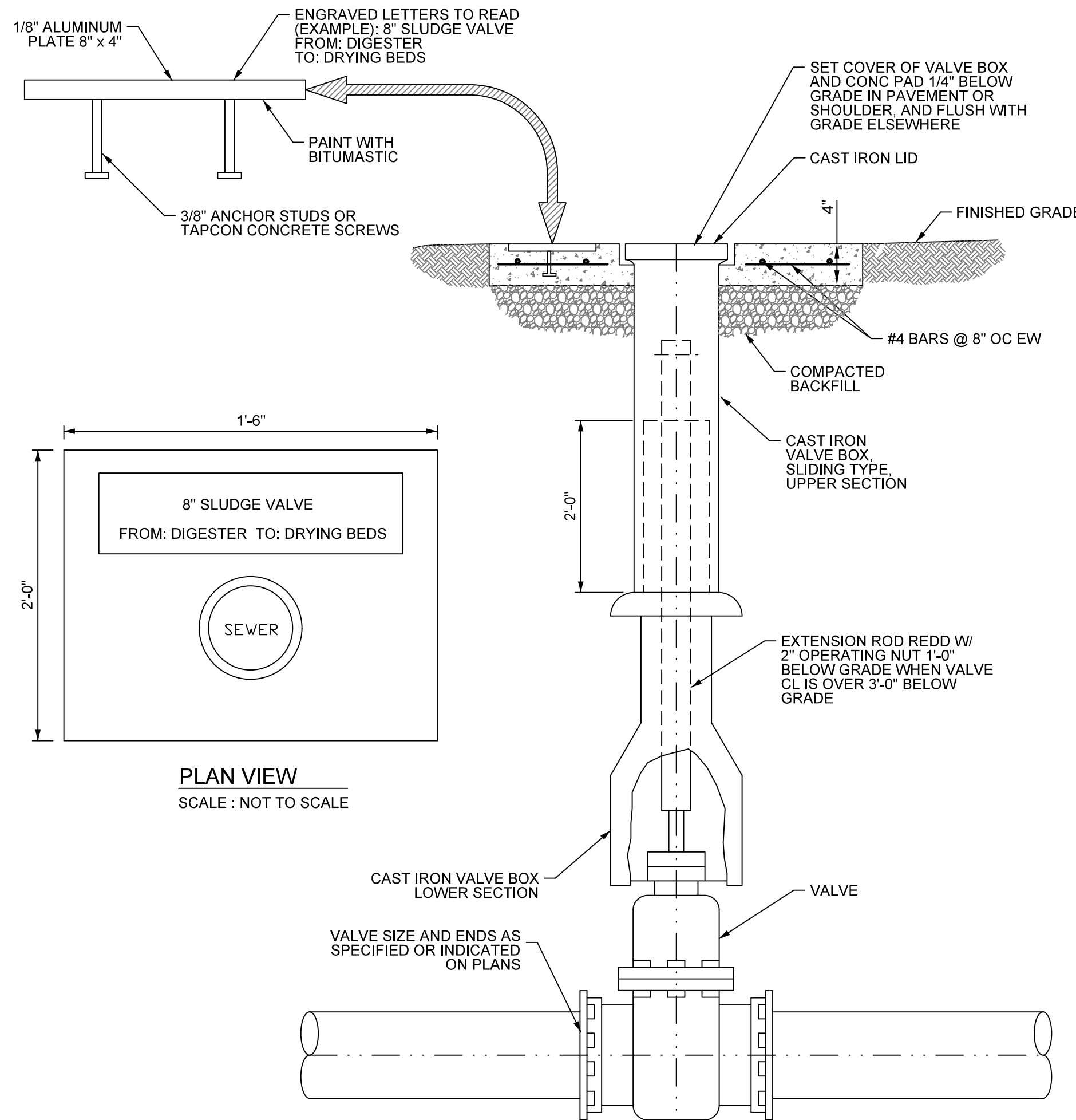


3 TYPICAL BOLLARD DETAIL  
95-C-02 SCALE : NOT TO SCALE

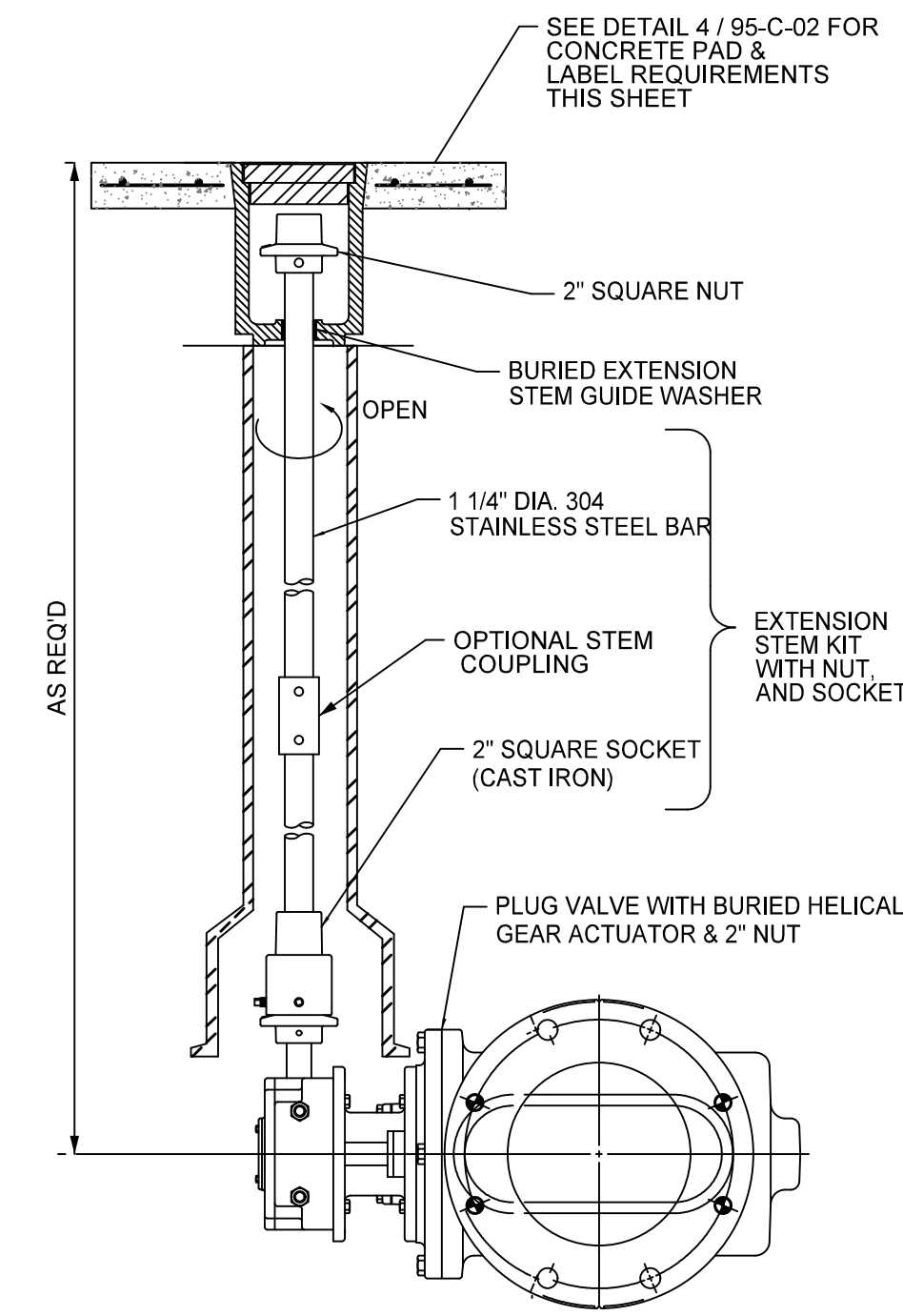


CONSEAL CS-231 REQ'D SIZE CHART	
48" O.D.	3/8
60" I.D.	3/8
72" I.D.	3/8
84" I.D.	3/4
96" I.D.	3/4

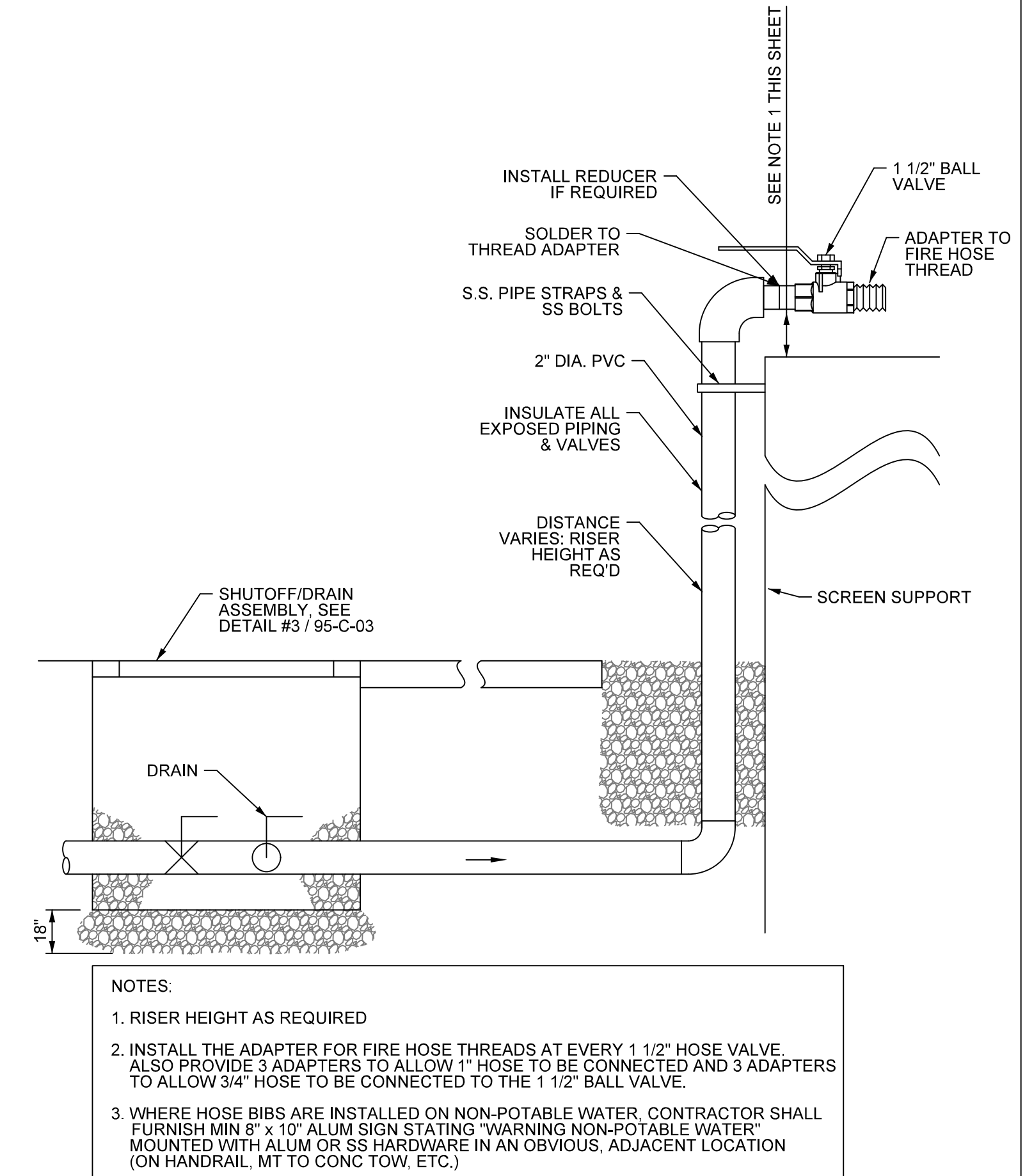
6 WETWELL JOINT AND ANCHOR ASSEMBLY DETAIL  
95-C-02 SCALE : NOT TO SCALE



4 BURIED VALVE BOX  
95-C-02 SCALE : NOT TO SCALE



5 BURIED MANUAL PLUG VALVE  
95-C-02 SCALE : NOT TO SCALE

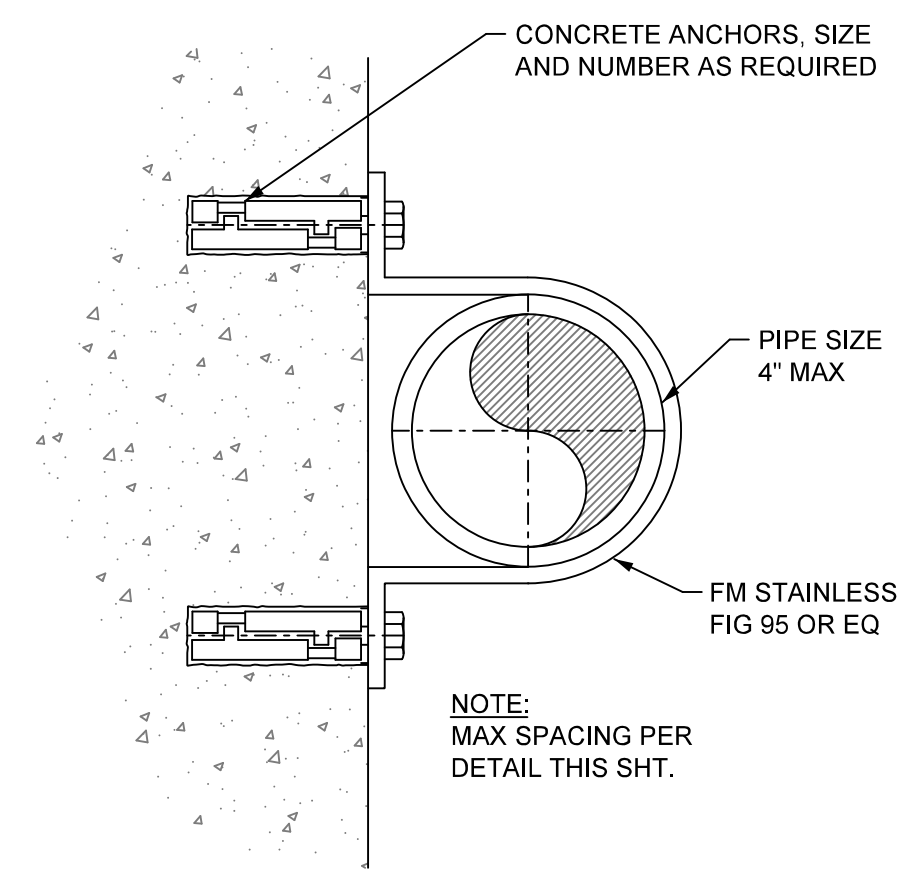


NOTES:  
1. RISER HEIGHT AS REQUIRED  
2. INSTALL THE ADAPTER FOR FIRE HOSE THREADS AT EVERY 1 1/2" HOSE VALVE. ALSO PROVIDE 3 ADAPTERS TO ALLOW 1" HOSE TO BE CONNECTED AND 3 ADAPTERS TO ALLOW 3/4" HOSE TO BE CONNECTED TO THE 1 1/2" BALL VALVE.  
3. WHERE HOSE BIBS ARE INSTALLED ON NON-POTABLE WATER, CONTRACTOR SHALL FURNISH MIN 8" x 10" ALUM SIGN STATING "WARNING NON-POTABLE WATER" MOUNTED WITH ALUM OR SS HARDWARE IN AN OBVIOUS, ADJACENT LOCATION (ON HANDRAIL, MT TO CONC TOW, ETC.)

7 TYP WASHDOWN HOSE CONNECTION  
95-C-02 SCALE : NOT TO SCALE

NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT





1 WALL PIPE SUPPORT  
95-C-03 SCALE: NOT TO SCALE

STEEL AND DUCTILE IRON SUPPORT SPACING (MAXIMUM)

PIPE SIZE	≤1"	1 1/2" - 2 1/2"	3"-4"	6"-8"	10"-12"	14"-18"	20"-24"
SPACING (FEET)	6	8	10	12	14	16	18

PVC SUPPORT SPACING (MAXIMUM)

	≤ 1/2"	3/4" - 1 1/2"	2" - 4"	6" - 12"
SCH 40	2'-0"	3'-0"	4'-0"	5'-3"
SCH 80	2'-9"	3'-6"	5'-0"	6'-6"

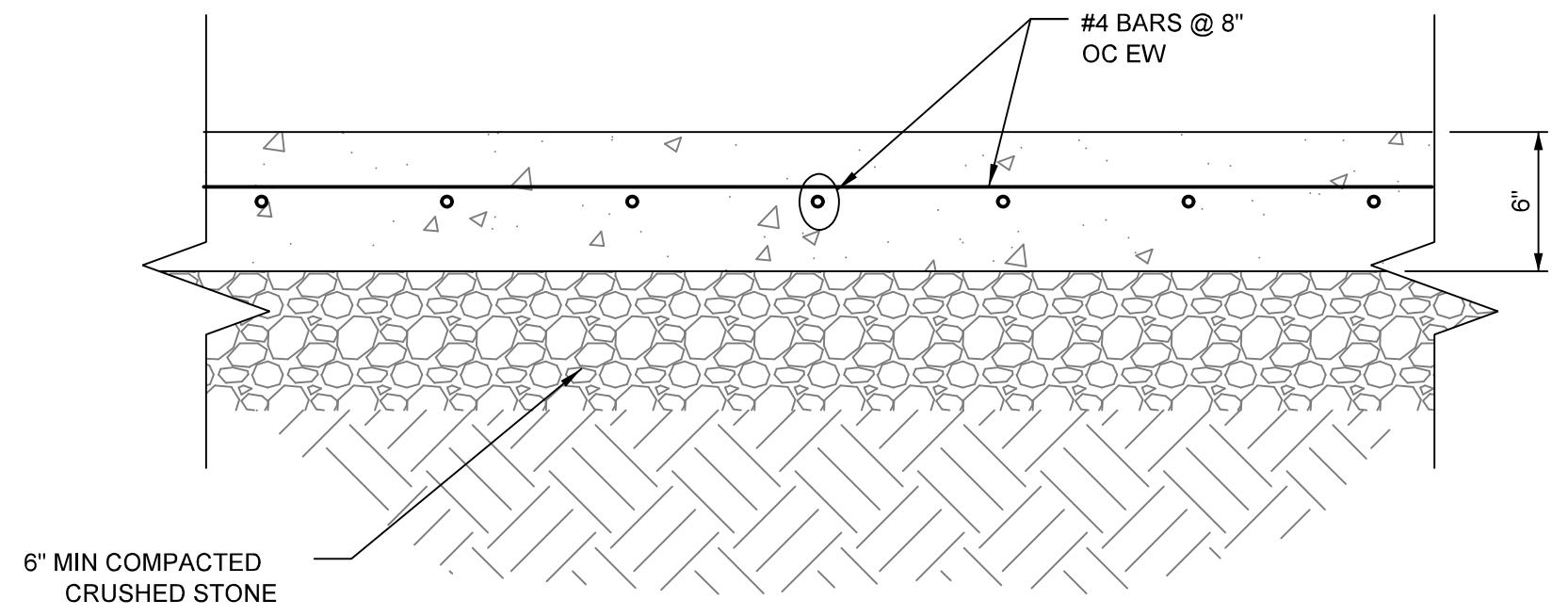
COPPER PIPE SUPPORT SPACING (MAXIMUM)

PIPE SIZE	≤1"	1 1/2" - 2 1/2"	3"-4"	6"-8"
SPACING (FEET)	5	6	8	10

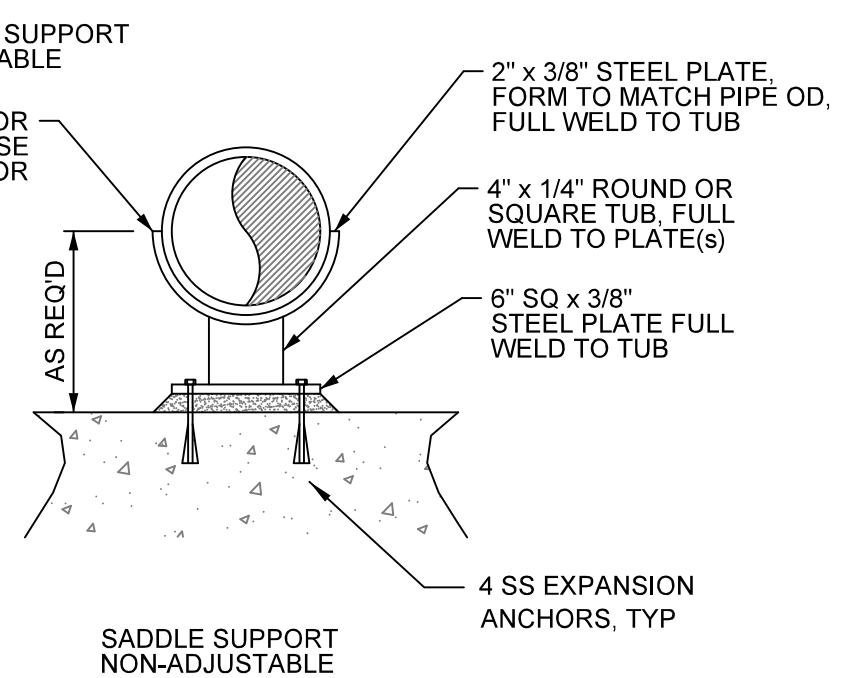
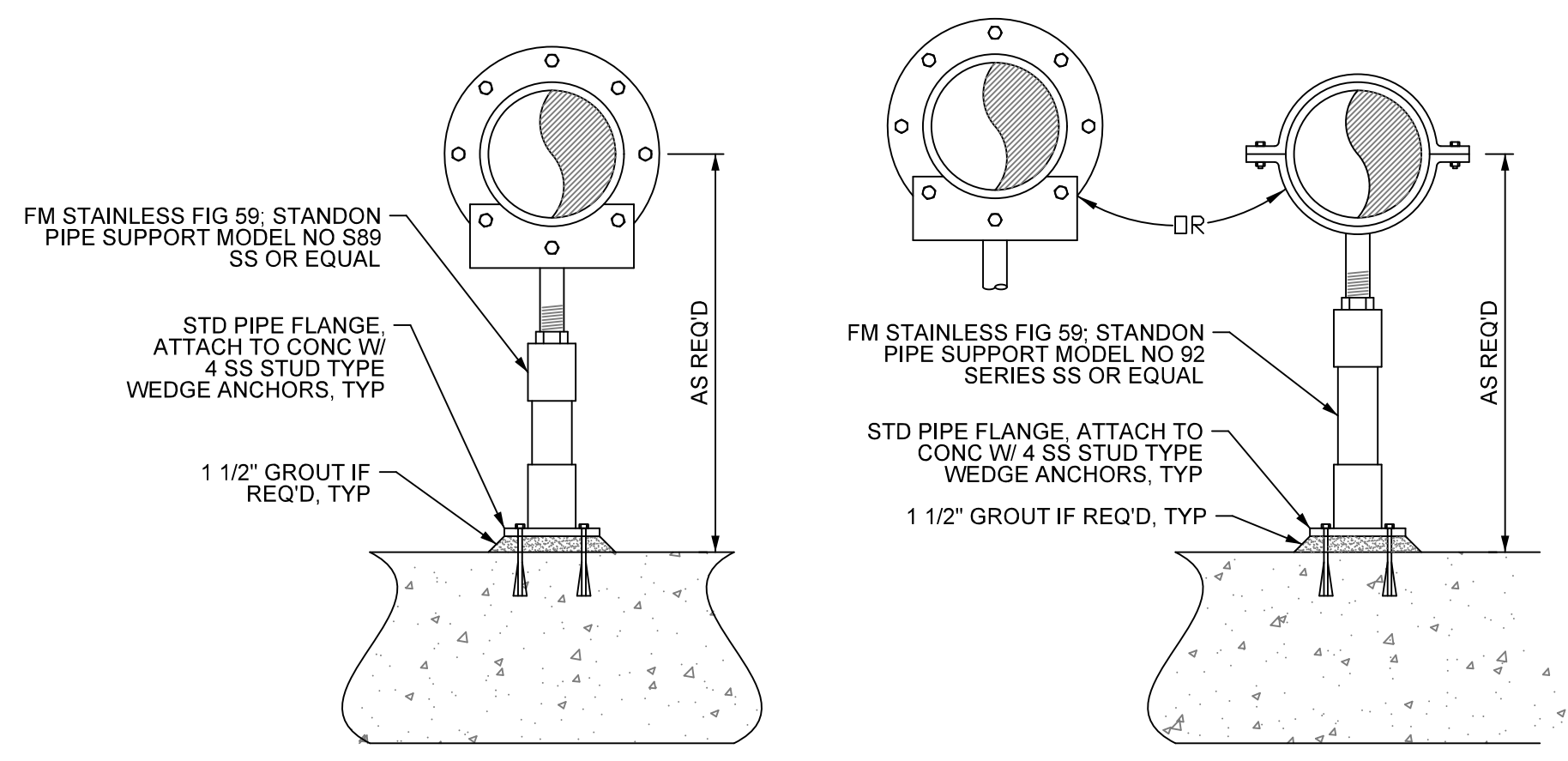
SS SUPPORT SPACING (MAXIMUM)

PIPE SIZE	1"-6"	8"-12"	14"-16"	18"-24"
SPACING (FEET)	8	10	12	14

2 TYP MAX. PIPE SUPPORT SPACING  
95-C-03 SCALE: NOT TO SCALE

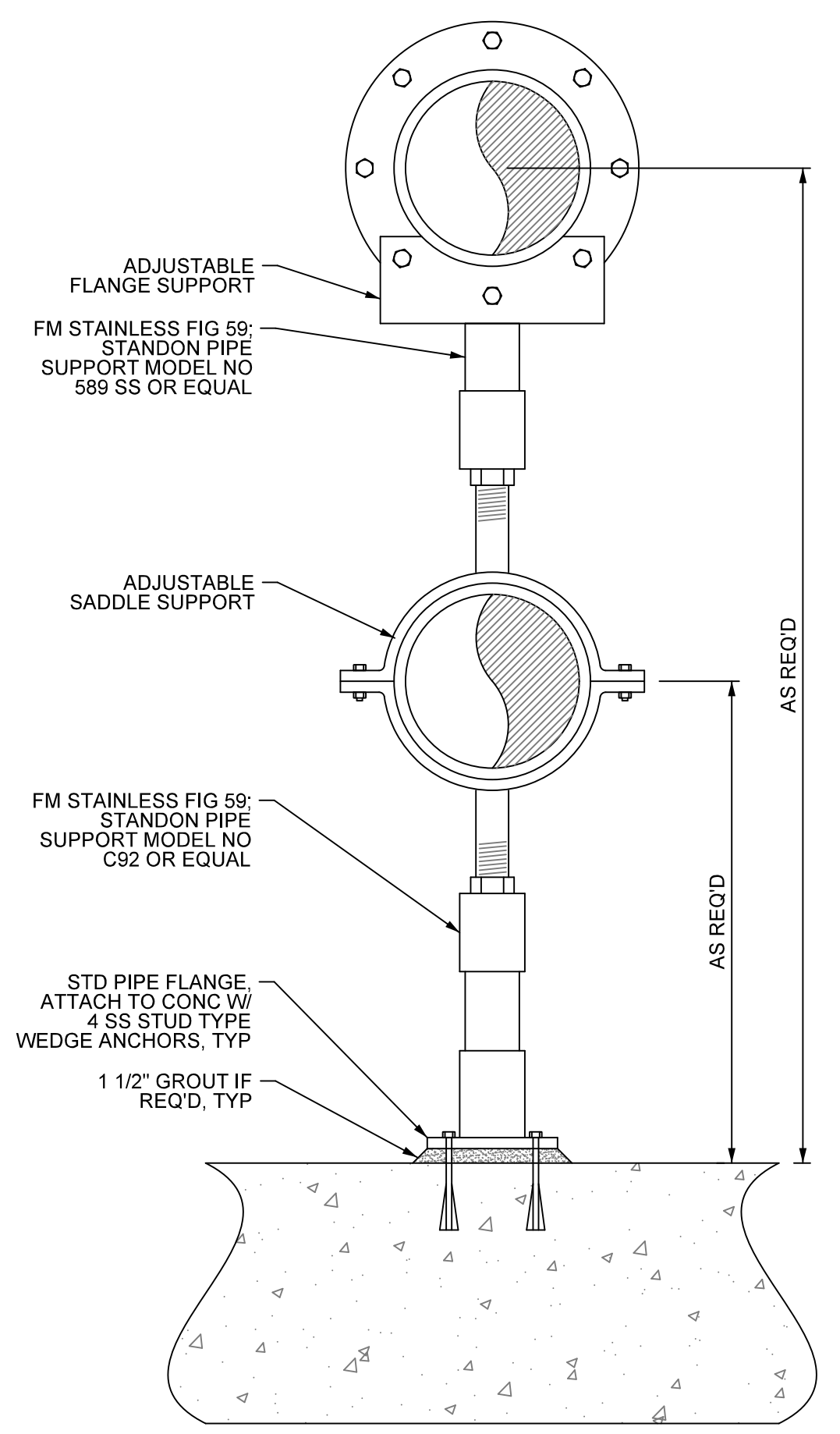


5 CONCRETE PAVING DETAIL  
95-C-03 SCALE: NOT TO SCALE



- NOTES:
- NON-ADJ SADDLE SUPPORTS SHALL BE HOT DIPPED GALV AFTER FABRICATION, ALL OTHER SHALL BE SS
  - PROVIDE HALF ROUND RIGID INSULATION AND INSULATION PROTECTION SHIELD WHERE PIPING IS INSULATED.
  - PROVIDE NEOPRENE WAFFLE INSULATION PAD, SIMILAR TO MASON TYPE "W" OR KORFUND KORPAD 40, UNDER SUPPORT FOOT WHEN PIPING IS ISOLATED OR SUPPORT IS ADJACENT TO MECHANICAL EQUIPMENT.
  - UNLESS DETAILED OTHERWISE IN PLANS. CLAMP SUPPORTS SHALL BE USED WHERE RESTRAINT FOR VERTICAL THRUST IS REQ'D.

3 FLOOR MOUNTED PIPE SUPPORT  
95-C-03 SCALE: NOT TO SCALE



4 DOUBLE PIPE SUPPORT DETAIL  
95-C-03 SCALE: NOT TO SCALE

NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

TYPICAL DETAILS  
PIPE SUPPORT

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: JUNE, 2023

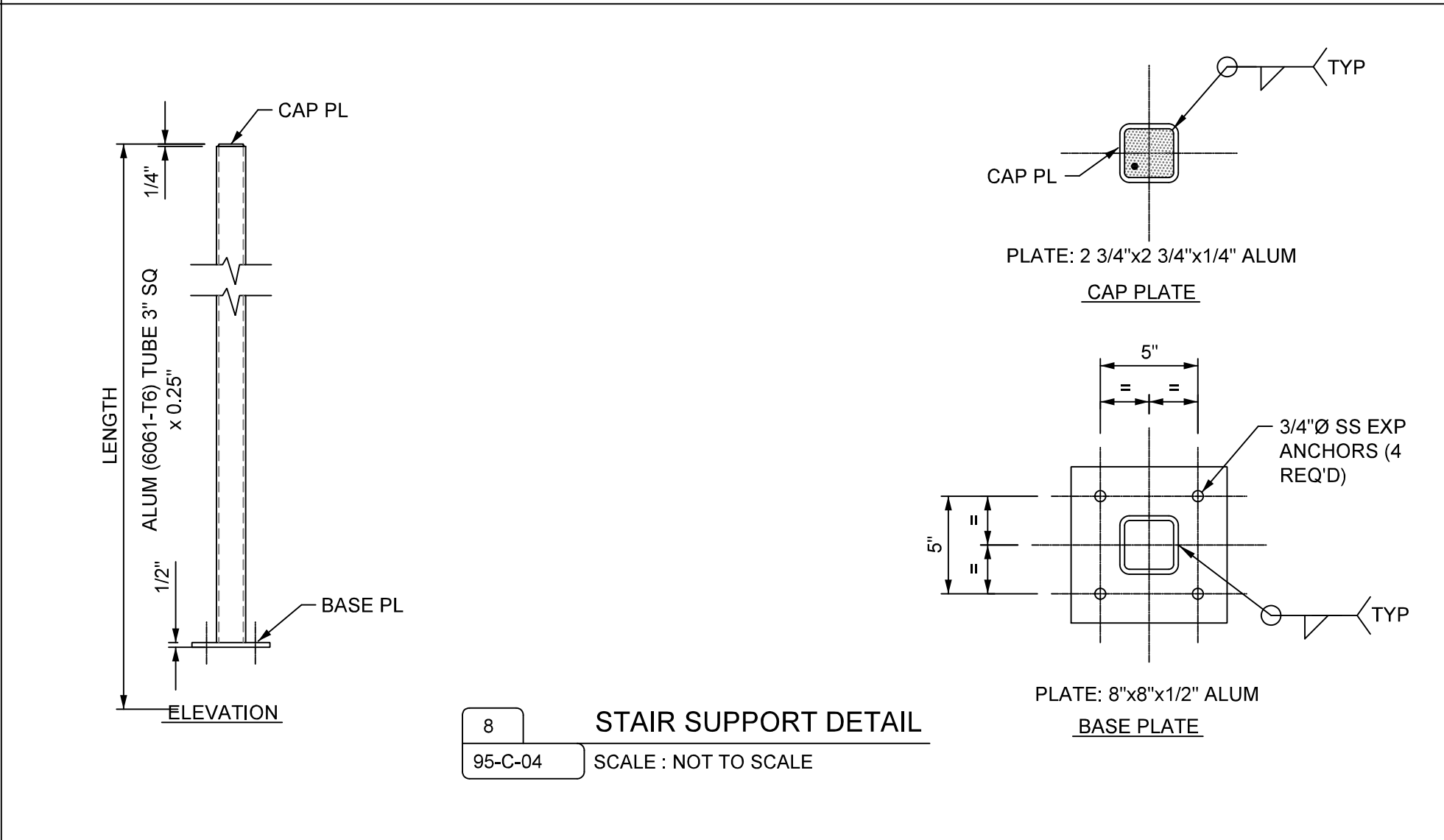
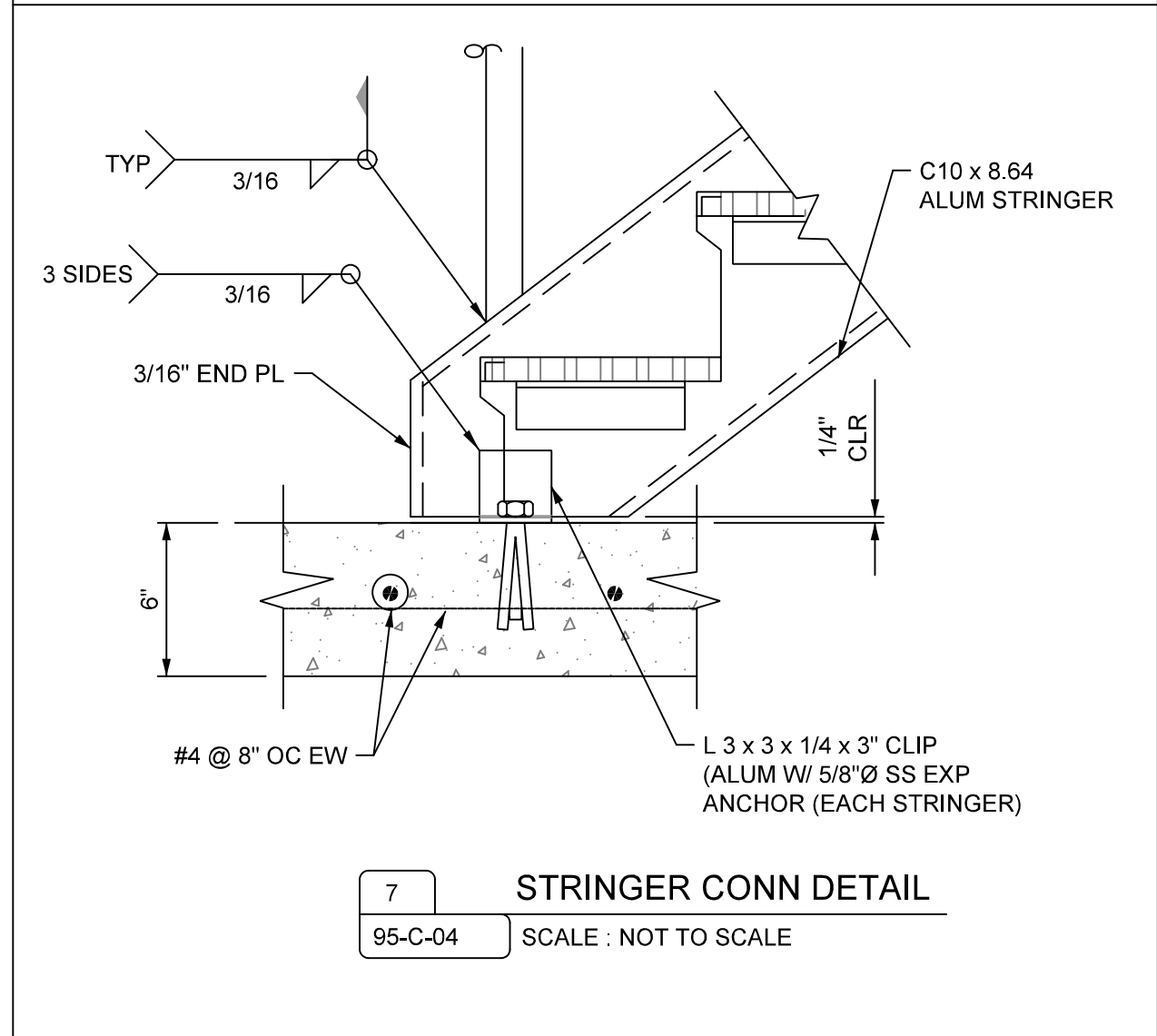
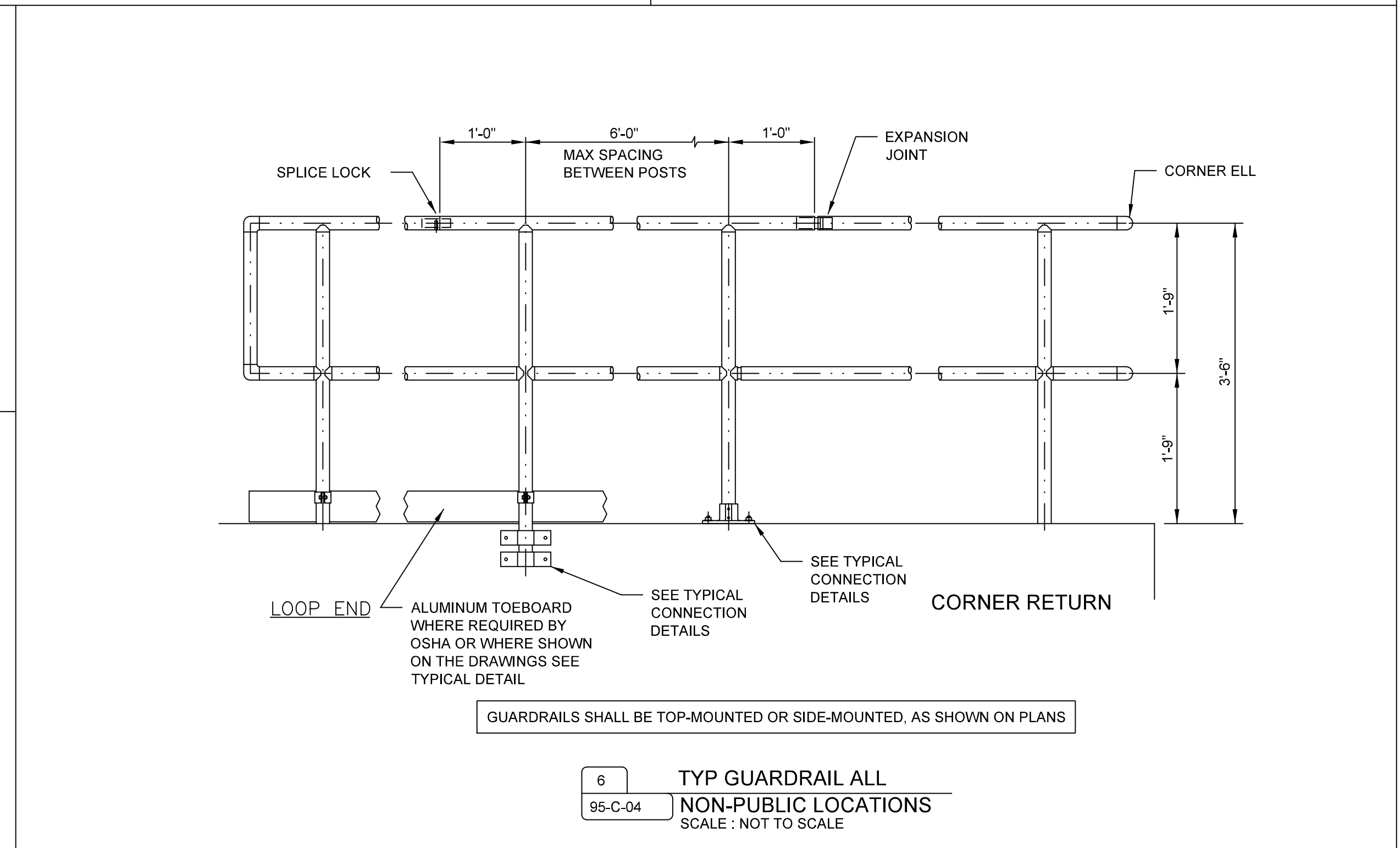
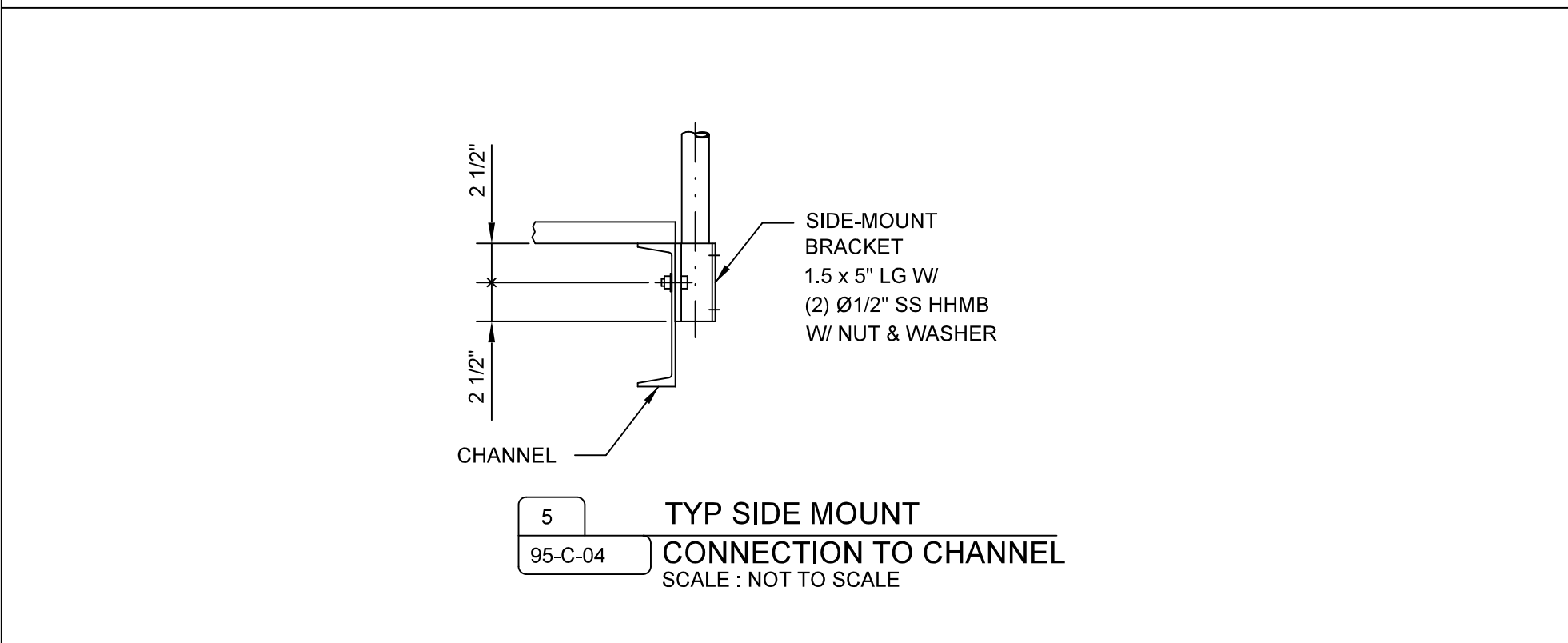
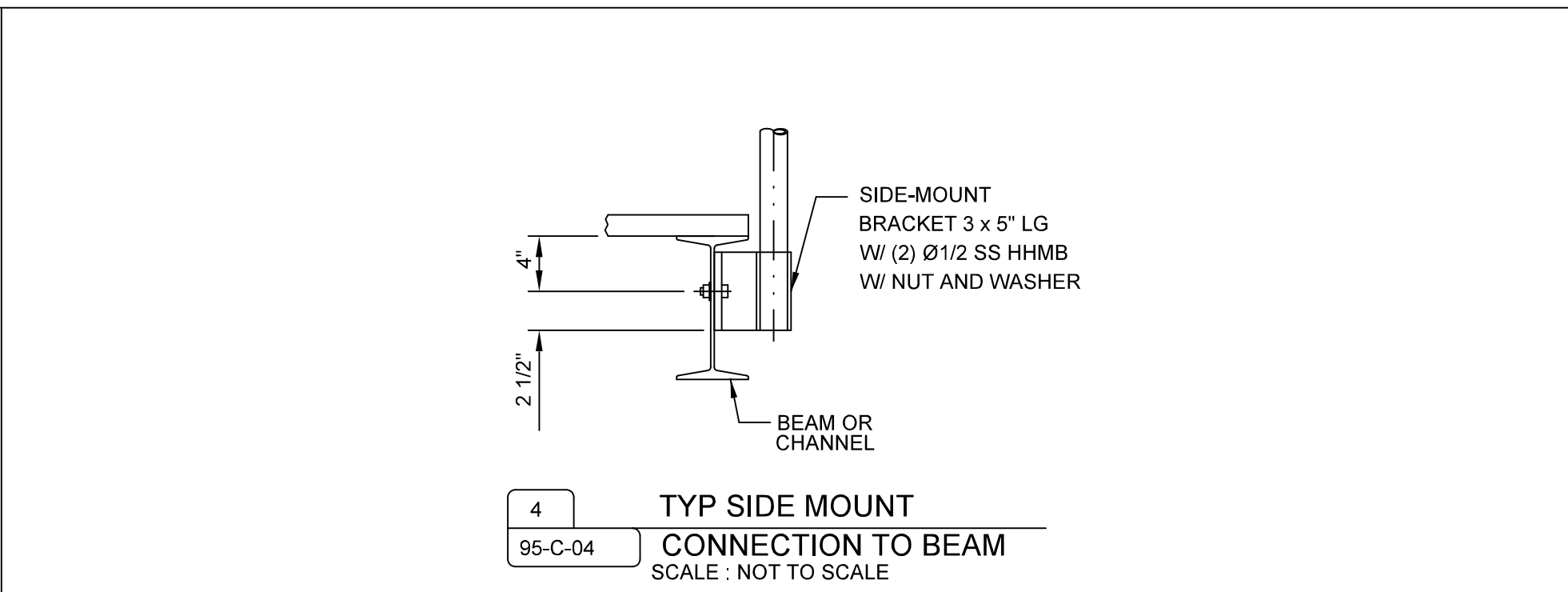
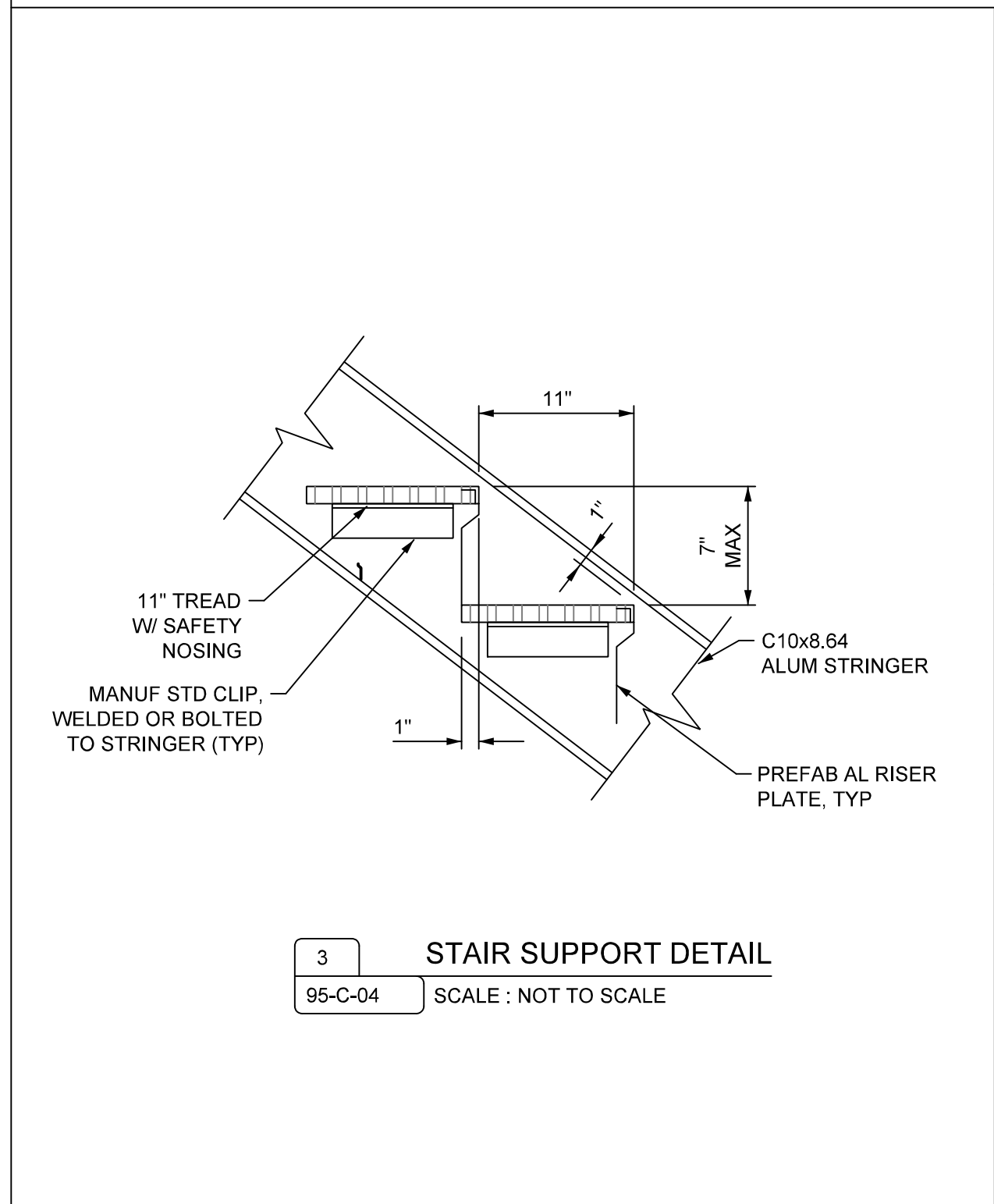
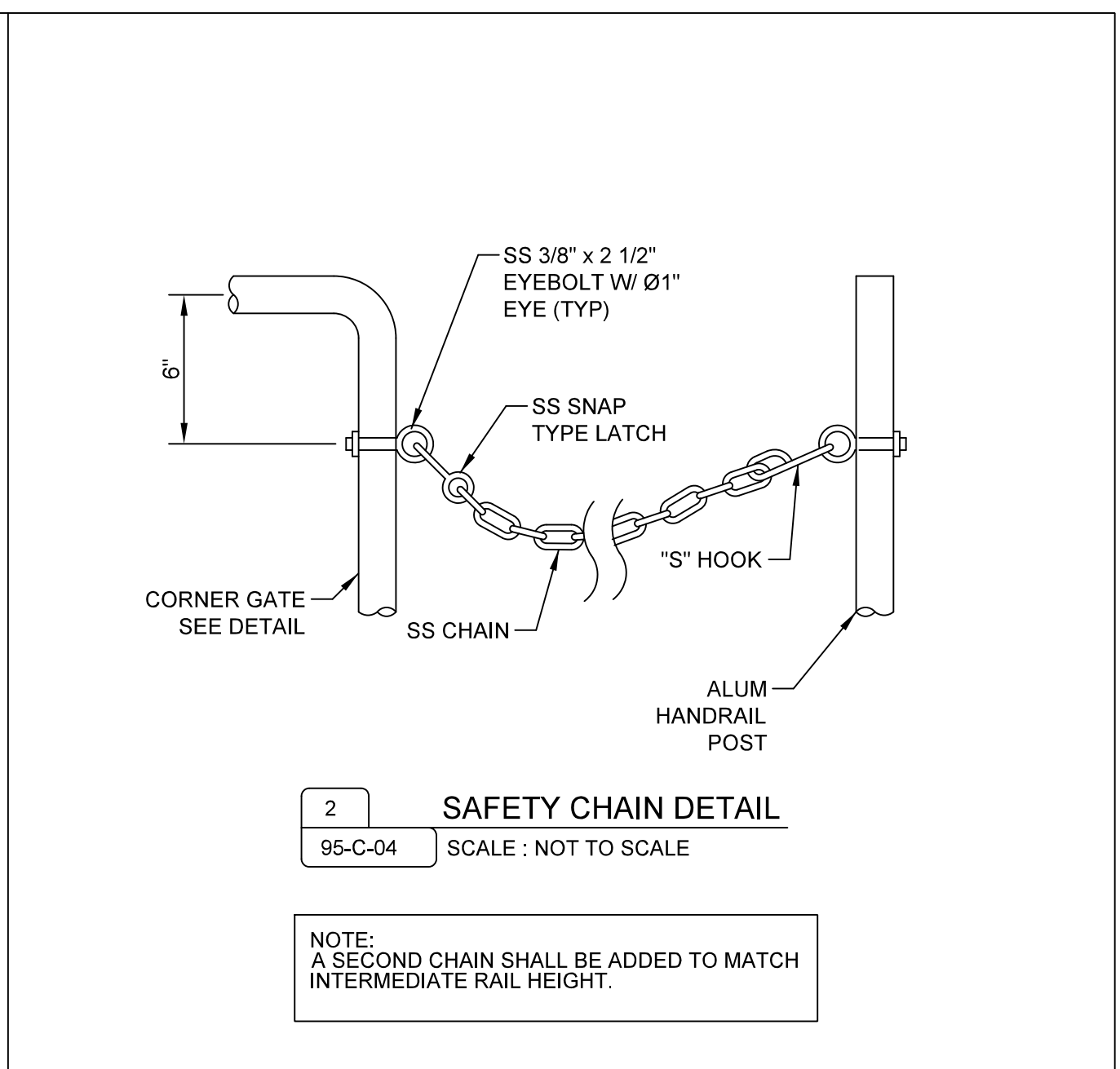
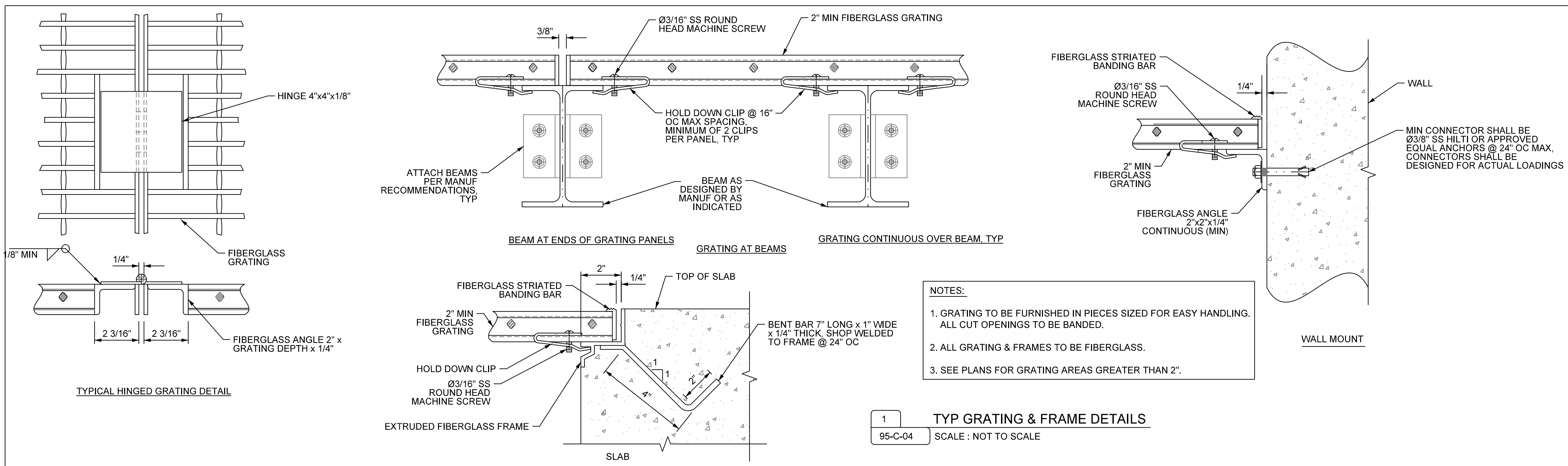
DESIGNED BY: WEC

DRAWN BY: LEE

DWG: 95-C-03

SHEET NUMBER **34**





NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

TYPICAL MISC. METALS DETAILS

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026  
DATE: JUNE, 2023  
DESIGNED BY: WEC  
DRAWN BY: LEE  
DWG: 95-C-04



GENERAL ELECTRICAL LEGEND

FIXTURE OUTLET – POLELIGHT – QUANTITY AND ORIENTATION(S) OF LUMINAIRES AS INDICATED ON PLANS.

FIXTURE DESIGNATIONS:

A FIXTURE TYPE "A" – MAY BE USED WITH OTHER TYPES.  
 b SWITCH LEG TO WHICH FIXTURE IS CONNECTED – MAY BE USED WITH OTHER LOWER-CASE LETTERS.  
 2 CIRCUIT NUMBER – MAY BE USED WITH OTHER NUMBERS.

§ SWITCH OUTLET – S.P.S.T. – 20A – 120-277VAC.

§o SWITCH OUTLET – CONTROLS OUTLET "o", ETC.

§x SWITCH OUTLET – MANUAL MOTOR STARTER – TOGGLE TYPE – 2 POLE – SQUARE "D" TYPE K01 WITH ENCLOSURE AS REQUIRED BY APPLICATION – PROVIDE LOCK-OFF HARDWARE.

§3x SWITCH OUTLET – MANUAL MOTOR STARTER – TOGGLE TYPE – 3 POLE – SQUARE "D" TYPE K02 WITH ENCLOSURE AS REQUIRED BY APPLICATION – PROVIDE LOCK-OFF HARDWARE.

§W SWITCH OUTLET – WEATHERPROOF WITH PILOT LIGHT (CLEAR LIGHT ON WITH LOAD ON) – S.P.S.T. – 20A – 120-277VAC – HUBBELL #HBL1221PLC TOGGLE SWITCH WITH #HBL1795 CLEAR BUBBLE WEATHERPROOF PLATE – LABEL FUNCTION WITH ENGRAVED NAMEPLATE.

HZ§3x SWITCH OUTLET – MANUAL MOTOR STARTER – TOGGLE TYPE – 3 POLE – CLASS 1 DIVISION 1 HAZARDOUS LOCATION RATED – WEATHERPROOF – CORROSION RESISTANT – APPLETON EDSC SERIES – PROVIDE LOCK-OFF HARDWARE.

PHOTOELECTRIC CONTROL – S.P.S.T. – 120VAC OR 277VAC – 2000W – TORK 2101 FOR 120V CIRCUITS & TORK 2104 FOR 277V CIRCUITS – MOUNT FACING NORTH.

DOUBLE DUPLEX

WALL OUTLET – RECEPTACLE – 20A – 125V – 2P – 3W – GROUNDING – NEMA 5-20R – SINGLE PLATE.

WALL OUTLET – RECEPTACLE – 20A – 125V – 2P – 3W – GROUNDING – "GFI" TYPE – WEATHER RESISTANT – NEMA 5-20R – SINGLE PLATE.

OUTLET DESIGNATIONS (APPLY TO ALL OUTLETS, DEVICES & EQUIPMENT):

ES EQUIPMENT MOUNTED TO ALUMINUM SUPPORT FRAME – SEE DETAIL "E-ES".

HR DEVICE SHALL BE HANDRAIL MOUNTED (AT TOP RAIL UNLESS NOTED OTHERWISE) – SEE DETAIL "E-HR".

SRS PROVIDE SUN/RAIN SHIELD FOR DEVICE/EQUIPMENT PER DETAIL "E-SRS".

VL VERIFY EXACT OUTLET LOCATION PRIOR TO ROUGH-IN.

W WEATHER PROOF – OUTLET SHALL BE INSTALLED WITH WEATHERPROOF, IN-USE, CAST COVER.

FLOOR OR SURFACE-MOUNTED OUTLET – JUNCTION BOX.

BRANCH/FEEDER CIRCUIT – CONCEALED IN WALLS OR CEILING.

BRANCH/FEEDER CIRCUIT – EXPOSED ON WALLS OR CEILING.

BRANCH/FEEDER CIRCUIT – CONCEALED IN FLOOR SLAB OR DIRT FILL.

BRANCH/FEEDER CIRCUIT – OVERHEAD BETWEEN POLES.

BRANCH/FEEDER CIRCUIT – TO BE DEMOLISHED – MAY BE USED WITH OTHER LINE TYPES.

BRANCH/FEEDER CIRCUIT – HOMERUN – CAN BE USED WITH OTHER BRANCH/FEEDER TYPES.

BRANCH/FEEDER CIRCUIT MODIFIERS:

: 2#12 & 1#12G UNLESS NOTED OTHERWISE.

: 3#12 & 1#12G, ETC. UNLESS NOTED OTHERWISE (TICK MARKS INDICATE CONDUCTOR QUANTITY NOT INCLUDING GROUND WIRE).

: 2#10 & 1#10G UNLESS NOTED OTHERWISE (NUMBER INDICATES WIRE AWG).

SIZE CONDUIT PER N.E.C. OR AS NOTED (WHICHEVER IS GREATER).

OVERHEAD PRIMARY POWER SERVICE CABLING (WITH TELECOMMUNICATIONS CABLING WHERE APPLICABLE).

OVERHEAD SECONDARY POWER SERVICE CABLING (WITH TELECOMMUNICATIONS CABLING WHERE APPLICABLE).

POWER/TELECOMMUNICATIONS POLE WITH GUYING AS REQUIRED.

FLEXIBLE CONNECTION TO EQUIPMENT.

POWER AND INSTRUMENTATION DUCT BANK – SEE DETAIL "E-DR".

POWER DISTRIBUTION EQUIPMENT.

LIGHTING PANEL – SURFACE MOUNTED.

TRANSFORMER – POWER.

TYPICAL SCADA CONTROL & INSTRUMENTATION WIRING MARK (WHERE "\*\*\*\*" REPRESENTS A UNIQUE IDENTIFIER CONSISTING OF LETTERS AND NUMBERS) – SEE CONTROL & INSTRUMENTATION WIRING SCHEDULES.

MOTOR OUTLET – SIZE AS SHOWN.

CONTROL STATION – SEE DETAIL "E-CS".

MOTORIZED VALVE/GATE ACTUATOR.

BARE SUPPLEMENTAL GROUND WIRE – #4/0G IF NOT INDICATED OTHERWISE – INSTALLED A MINIMUM OF 24" BELOW GRADE AND 24" MINIMUM FROM STRUCTURES WHERE POSSIBLE.

SUPPLEMENTAL GROUNDING SYSTEM – GROUND ROD – 3/4" x10'-0" COPPER-CLAD – TOP DRIVEN A MINIMUM OF 24" BELOW GRADE.

SUPPLEMENTAL GROUNDING SYSTEM – GROUND CONNECTION – CADWELD WHERE BELOW GRADE OR CONCEALED.

SUPPLEMENTAL GROUNDING SYSTEM – CAST GROUND PLATE ASSEMBLY (ERICO OR EQUAL) – CAST FLUSH WITHIN CONCRETE WITH FLEXIBLE BARE COPPER GROUND WIRE CONNECTIONS VIA COMPRESSION LUGS TO EQUIPMENT.

SUPPLEMENTAL GROUNDING SYSTEM – GROUND CONNECTION – TO EQUIPMENT OR STRUCTURE AS FOLLOWS (UNLESS NOTED OTHERWISE):

GEQ #4/0 BARE COPPER GROUND WIRE – BOND TO EQUIPMENT/MOTOR/PANEL/TRANSFORMER, ETC.

GES #2 BARE COPPER GROUND WIRE – BOND TO EQUIPMENT STAND.

GHR #2/0G BARE COPPER GROUND WIRE – BOND TO HANDRAIL & WALKWAY STRUCTURE USING CAST GROUND PLATE & FLEXIBLE JUMPER – SEE DETAIL "E-MMG".

GS #4/0 BARE COPPER GROUND WIRE – BOND TO STRUCTURE/REBAR/WIRE MESH REINFORCEMENT.

FLOW ELEMENT.

FLOAT SWITCH(ES) – "x4" OR SIMILAR INDICATES QUANTITIES.

LEVEL PROBE.

LEVEL SWITCH OR LIMIT SWITCH.

SOLENOID VALVE.

TURBIDITY SENSOR.

ULTRASONIC LEVEL TRANSDUCER.

ANALOG INDICATING TRANSMITTER.

FLOW INDICATING TRANSMITTER.

LEVEL INDICATING TRANSMITTER.

PRESSURE INDICATING TRANSMITTER.

DETAIL DESIGNATOR – "A" INDICATED DETAIL MARK – "E-1" INDICATED SHEET NUMBER WHERE DETAIL IS LOCATED (TYPICAL).

GENERAL ABBREVIATIONS:

(EX) EXISTING TO REMAIN.

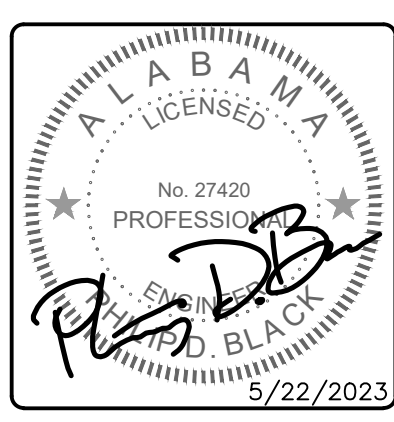
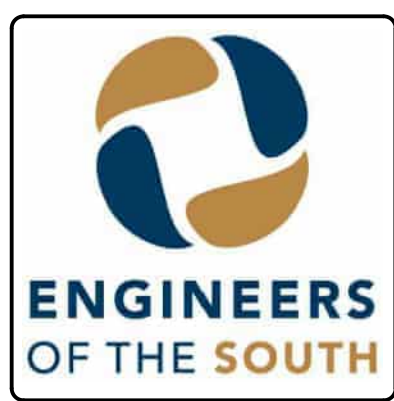
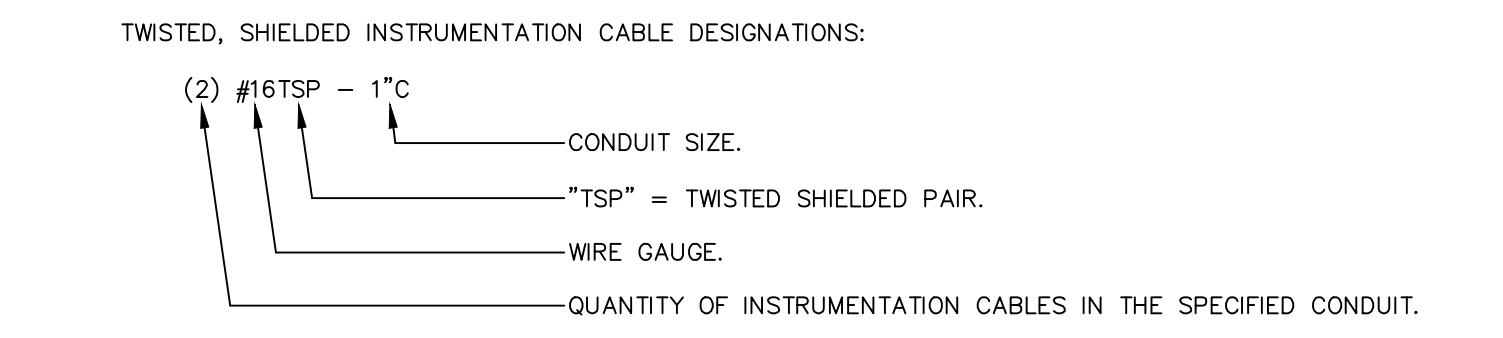
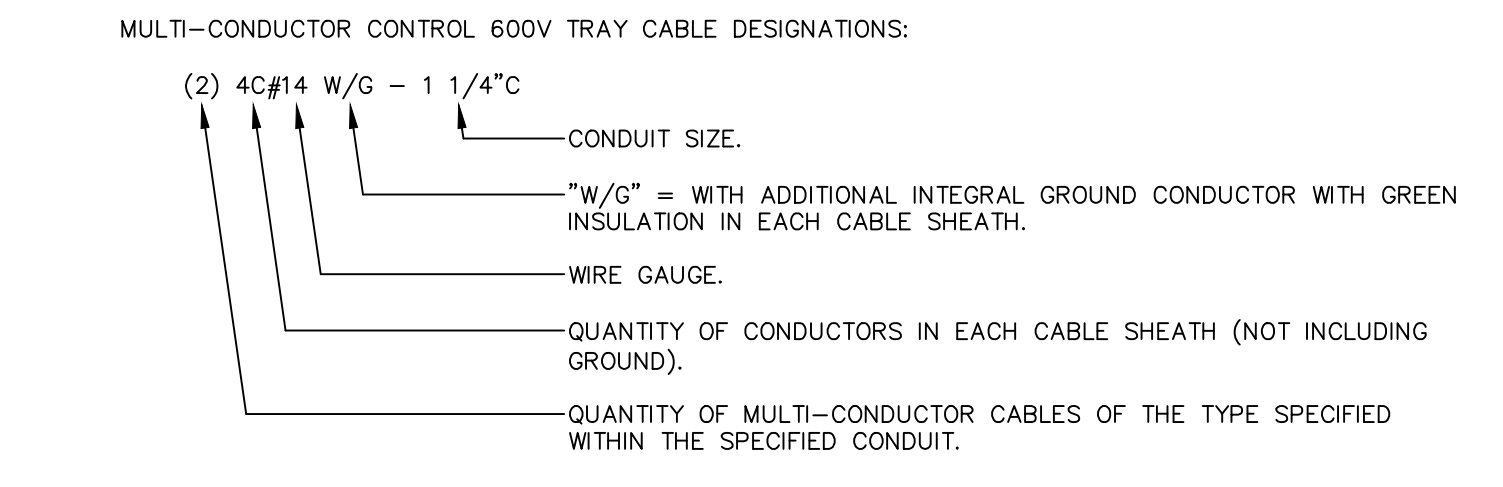
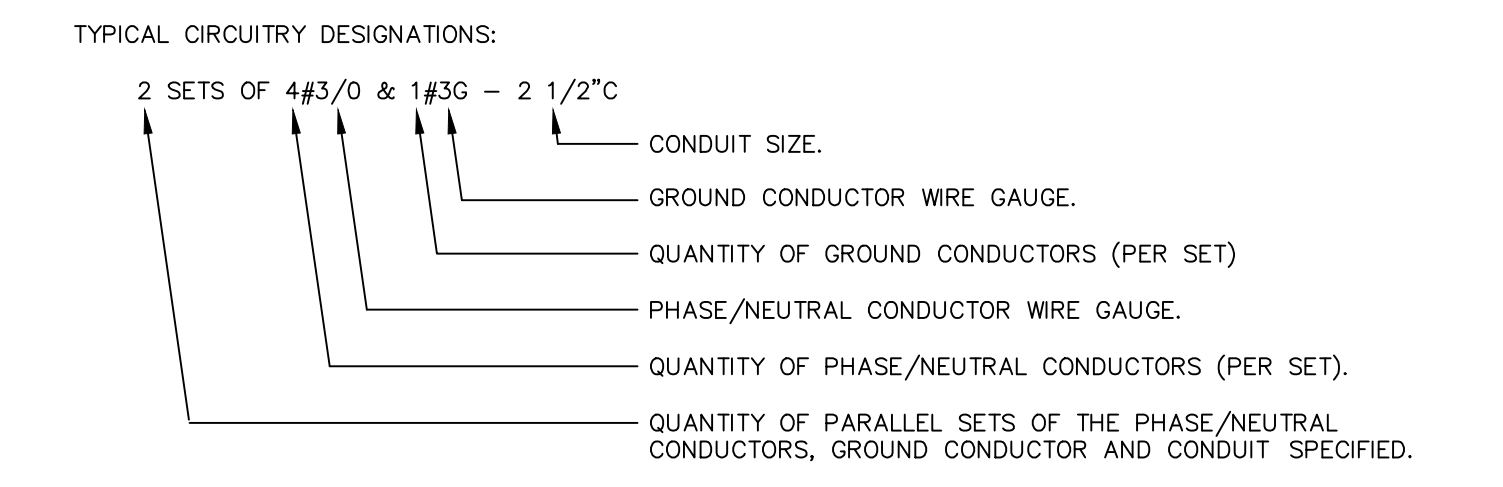
(EX-R) EXISTING TO BE REMOVED – REMOVE ALL ASSOCIATED ELECTRICAL EQUIPMENT, DEVICES, CONDUIT AND WIRING CONNECTIONS TO OTHER ELECTRICAL ITEMS.

(EX-RL) EXISTING TO BE RELOCATED – REMOVE ALL ASSOCIATED ELECTRICAL EQUIPMENT, DEVICES, CONDUIT AND WIRING AT EXISTING LOCATION. RELOCATE ITEM TO NEW LOCATION SHOWN ON ELECTRICAL PLANS.

(EX-RP) EXISTING TO BE REPLACED – EXTEND AND RECONNECT EXISTING CONDUIT AND WIRING TO REPLACED ITEM.

ELECTRICAL ABBREVIATIONS:

A	AMPERES.	NSV	NEW, SPARE OR VACATED. ON CENTER.
AIC	AMPERES INTERRUPTING CAPACITY.	OC	ON CENTER.
AFF	ABOVE FINISHED FLOOR.	P	POLES.
AL	ALUMINUM.	PF	POWER FACTOR.
ATS	AUTOMATIC TRANSFER SWITCH.	Ø	PHASE.
AWG	AMERICAN WIRE GAUGE.	PVC	POLYVINYL CHLORIDE.
C	CONDUIT.	SLD	SINGLE LINE DIAGRAM.
CU	COPPER.	SS	STAINLESS STEEL.
EC	EMPTY CONDUIT. OR ELECTRICAL CONTRACTOR	UL	UNDERWRITERS LABORATORY.
FPN	FUSE PER NAMEPLATE.	UNO	UNLESS NOTED OTHERWISE.
G	GROUND CONDUCTOR.	V	VOLTS.
KVA	KILOVOLT-AMPERES.	W	WIRES.
KW	KILOWATT.		
LV	LOW VOLTAGE.	CFCI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED.
MCM	THOUSAND CIRCULAR MILS.	CFOI	CONTRACTOR FURNISHED, OWNER INSTALLED.
MV	MEDIUM VOLTAGE.	OFOI	OWNER FURNISHED, OWNER INSTALLED.
N	NEUTRAL.	OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED.
NEC	NATIONAL ELECTRICAL CODE.		
NEMA	NATIONAL ELECTRICAL MANUFACTURER ASSOCIATION.		
NIC	NOT IN CONTRACT.		



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
 BIRMINGHAM, ALABAMA

**BROOKWOOD**  
 SEU WWTP IMPROVEMENTS  
 TUSCALOOSA COUNTY, ALABAMA

ELECTRICAL LEGEND

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026  
 DATE: MAY 2022  
 DESIGNED BY: PDB  
 DRAWN BY: ZJG  
 DWG: 00-E-01  
 SHEET NUMBER 36



LIGHTING FIXTURE SCHEDULE									
MARK	MANUFACTURER	CATALOG NUMBER	VOLTAGE	LAMPS			MOUNTING HEIGHT	MOUNTING TYPE	REMARKS
				WATTAGE	LUMENS	TYPE			
Y	LITHONIA COLUMBIA DAY-BRITE	RSX1-LED-P1-40K-R3-120-RPA- DDBTXD	120	51	7,096	LED	MOUNT TO 20" ROUND, STRAIGHT 4" ALUMINUM POLE - SEE DETAIL "E-LP1"	F50	
Z	HOLOPHANE	PXLH-5000LM-WD-MVOLT-40K- 80CRI-UNM-DGXD	120	35	4,856	LED	10' SWIVEL POLE - SEE DETAIL "E-LP2"	F50, XP	

**LIGHTING FIXTURE SCHEDULE GENERAL NOTES:**

- ALL LAMPS SHALL BE 4000K WITH A MINIMUM CRI OF 80 UNLESS NOTED OTHERWISE
- CONTRACTOR SHALL COORDINATE ALL FIXTURE MOUNTING PROVISIONS WITH THE ASSOCIATED STRUCTURE TYPE(S) PRIOR TO ORDERING FIXTURES.
- ALL FIXTURES AND DRIVERS SHALL BE RATED FOR OPERATION IN AMBIENT TEMPERATURES UP TO 55 DEGREES CELSIUS.

**LIGHTING FIXTURE SCHEDULE KEYED NOTES:**

F50 PROVIDE FINISH AS SELECTED BY OWNER.

XP INDICATED FIXTURE SHALL BE AN EXPLOSION-PROOF FIXTURE RATED FOR CLASS I, DIVISION II HAZARDOUS AREAS.

GENERAL ELECTRICAL NOTES	
1.	SPECIAL ATTENTION IS CALLED TO THE FACT THAT THIS IS AN OPERATING FACILITY, AND AS SUCH, NO UNNECESSARY SHUTDOWNS WILL BE ALLOWED. ANY NECESSARY SHUTDOWNS SHALL BE APPROVED IN WRITING BY THE PLANT MANAGER A MINIMUM OF TWO (2) WEEKS IN ADVANCE.
2.	ELECTRICAL PLANS & DETAILS INDICATE TYPICAL WIRING REQUIREMENTS FOR PROCESS EQUIPMENT. VERIFY EXACT WIRING REQUIREMENTS & ALL DEVICE LOCATIONS WITH APPROVED MANUFACTURERS SHOP DRAWINGS PRIOR TO ROUGH-IN. NO ADDITIONAL COMPENSATION WILL BE PAID FOR MINOR CIRCUITRY ADJUSTMENTS REQUIRED TO COMPLY WITH MANUFACTURERS INSTALLATION DETAILS.
3.	THIS CONTRACTOR SHALL VERIFY EXACT REQUIREMENTS FOR ALL PROCESS EQUIPMENT FROM MANUFACTURER'S RECOMMENDATIONS PRIOR TO ROUGHING IN CONDUIT AND SHALL ADJUST CONDUIT SIZE, WIRE SIZE AND CIRCUIT PROTECTION SIZE ACCORDINGLY. IF REQUIREMENTS ARE LARGER THAN CALLED FOR ON ELECTRICAL PLANS NOTIFY ENGINEER IMMEDIATELY.
4.	CONTRACTOR SHALL VISIT THE SITE OF THE WORK PRIOR TO SUBMITTING BID TO EXAMINE CAREFULLY LOCAL CONDITIONS AND DIFFICULTIES TO BE ENCOUNTERED. ANY DISCREPANCY BETWEEN PLANS AND EXISTING CONDITIONS SHALL IMMEDIATELY BE CALLED TO THE ATTENTION OF THE ENGINEER.
5.	ALL EQUIPMENT SHALL BE GROUNDED AND BONDED IN ACCORDANCE WITH NEC.
6.	THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLATION AND MOUNTING OF ALL INSTRUMENTATION DEVICES (EXCLUDING THOSE PRE-INSTALLED ON SKIDS BY THE MANUFACTURER). SEE INSTALLATION DETAILS ON CIVIL & ELECTRICAL DRAWINGS AND PROVIDED BY SUPPLIERS. COORDINATE ALL REQUIREMENTS WITH SUPPLIERS PRIOR TO ROUGH-IN.
7.	ALL INDICATING TRANSMITTER DEVICES (FLOW TRANSMITTERS, LEVEL TRANSMITTERS, ETC.) LOCATED IN EXTERIOR ENVIRONMENTS SHALL BE INSTALLED WITHIN SUN/RAIN SHIELDS PER DETAIL "E-SRS". CONTRACTOR SHALL PROVIDE SUN/RAIN SHIELDS (INCLUDING INSTRUMENTS FURNISHED BY EQUIPMENT SUPPLIERS, SUCH AS OVIVO). CONTRACTOR SHALL COORDINATE WITH INSTRUMENT SUPPLIER(S) PRIOR TO SUBMITTAL OF SHOP DRAWINGS.
8.	CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING 120V AND ANALOG SURGE PROTECTION DEVICES AT ALL INSTRUMENTS LOCATED IN EXTERIOR ENVIRONMENTS. CONTRACTOR SHALL COORDINATE WITH INSTRUMENT SUPPLIER(S) PRIOR TO SUBMITTAL OF SHOP DRAWINGS. <ul style="list-style-type: none"> <li>A. SURGE PROTECTION DEVICES AT 2-WIRE INSTRUMENTS SHALL BE DEHN DEHNPIPE SERIES (IP67 STAINLESS STEEL DEVICE WITH 10KA TOTAL NOMINAL DISCHARGE CURRENT PER LINE) OR EQUAL BY MTL TECHNOLOGIES.</li> <li>B. SURGE PROTECTION DEVICES AT 4-WIRE INSTRUMENTS SHALL BE EDCO SLAC SERIES (NEMA 4X DEVICE WITH VIEWING WINDOW, 10KA DISCHARGE CURRENT PER LINE FOR ANALOG, 15KA DISCHARGE CURRENT PER LINE FOR 120V POWER) OR EQUAL BY DEHN.</li> </ul>
9.	REMOVE ALL EXISTING ELECTRICAL EQUIPMENT AND WIRING MADE OBSOLETE BY THIS RENOVATION AND DISPOSE OF AS DIRECTED BY THE ENGINEER.
10.	EXISTING PANEL DIRECTORY CARDS MODIFIED BY THIS RENOVATION SHALL BE RETYPED TO INDICATE CONNECTED CIRCUITS.
11.	THIS CONTRACTOR SHALL FURNISH ALL MATERIALS AND LABOR NECESSARY TO EXTEND CIRCUITS AND MAKE RECONNECTIONS TO ANY ACTIVE ELECTRICAL DEVICES ON WHICH THE BRANCH CIRCUIT IS INTERRUPTED BY THIS ALTERATION. CARE SHALL BE TAKEN TO INSURE THAT EXISTING PANEL AND FEEDER RATINGS ARE NOT EXCEEDED.
12.	WET OR PROCESS AREAS (FOR USE IN DETERMINING TYPES OF MATERIALS REQUIRED PER ELECTRICAL SPECIFICATIONS) SHALL BE DEFINED AS ALL AREAS WITHIN THE PROJECT SCOPE.
13.	ENTIRE ELECTRICAL INSTALLATION WITHIN HAZARDOUS AREAS AS DEFINED BY NFPA 820 SHALL COMPLY WITH ALL APPLICABLE NEC REQUIREMENTS FOR CONDUIT SEALS, RACEWAY TYPES, MATERIAL/DEVICE TYPES, ETC. PLANS DO NOT ATTEMPT TO INDICATE CODE-REQUIRED LOCATIONS OF EACH CONDUIT SEAL. CONDUIT SEALS SHALL BE PROVIDED AT EACH CONDUIT TERMINATION IN HAZARDOUS AREAS AND WHERE CONDUITS PASS FROM HAZARDOUS TO NON-HAZARDOUS AREAS PER CODE REQUIREMENTS. ALL DISCONNECT SWITCHES, RECEPTACLES, LIGHT SWITCHES, CONTROL STATIONS, J-BOXES, INSTRUMENTS, ETC. THROUGHOUT THIS AREA SHALL BE INSTALLED FULLY OUTSIDE HAZARDOUS (CLASSIFIED) LOCATIONS UNLESS REQUIRED OR SHOWN OTHERWISE. ALL CONDUITS PASSING THROUGH HAZARDOUS (CLASSIFIED) LOCATIONS (BUT NOT TERMINATING WITHIN HAZARDOUS LOCATIONS) SHALL BE UNBROKEN, WITH NO COUPLINGS, ETC. WITHIN THE HAZARDOUS AREA. SEE DETAIL "E-HAOC".

NO	DATE	DESCRIPTION	CONSTRUCTION REVISIONS		FOR REVIEW AND COMMENT
			AS-BID	AS-BUILT	
			<input type="checkbox"/>	<input type="checkbox"/>	
			<input type="checkbox"/>	<input type="checkbox"/>	
			<input type="checkbox"/>	<input type="checkbox"/>	
			<input type="checkbox"/>	<input type="checkbox"/>	

**Alabama Water Utilities**  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

ELECTRICAL NOTES &  
LIGHTING FIXTURE  
SCHEDULE

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: MAY 2022

DESIGNED BY: PDB

DRAWN BY: ZJG

DWG: 00-E-02

SHEET NUMBER **37**



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT

**Alabama Water Utilities**  
 BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
 SEU WWTP IMPROVEMENTS  
 TUSCALOOSA COUNTY, ALABAMA

ELECTRICAL SCHEDULES AND DIAGRAMS

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026

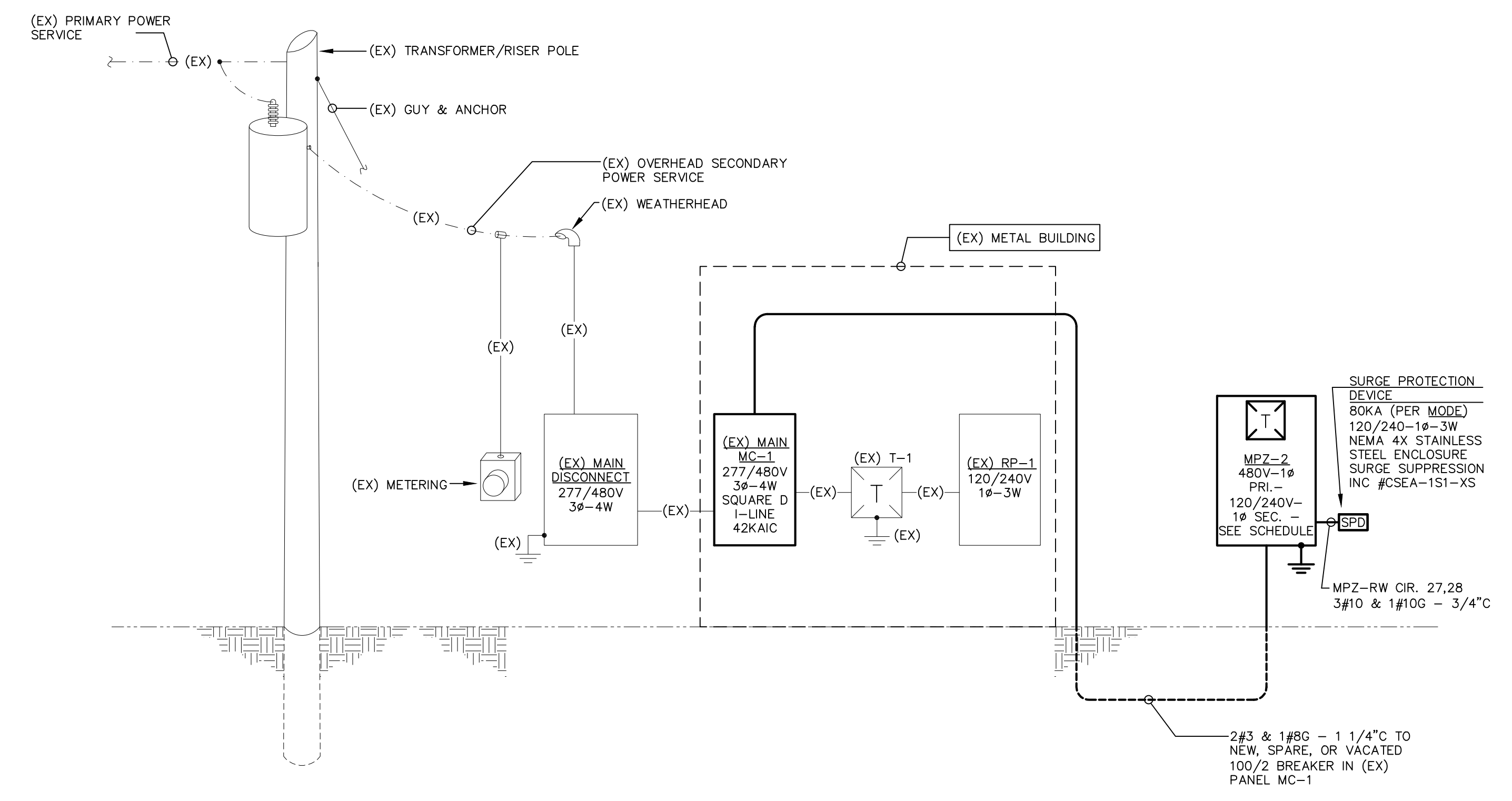
DATE: MAY 2022

DESIGNED BY: PDB

DRAWN BY: ZJG

DWG: 00-E-03

SHEET NUMBER **38**



**SINGLE LINE DIAGRAM**  
SCALE : NONE

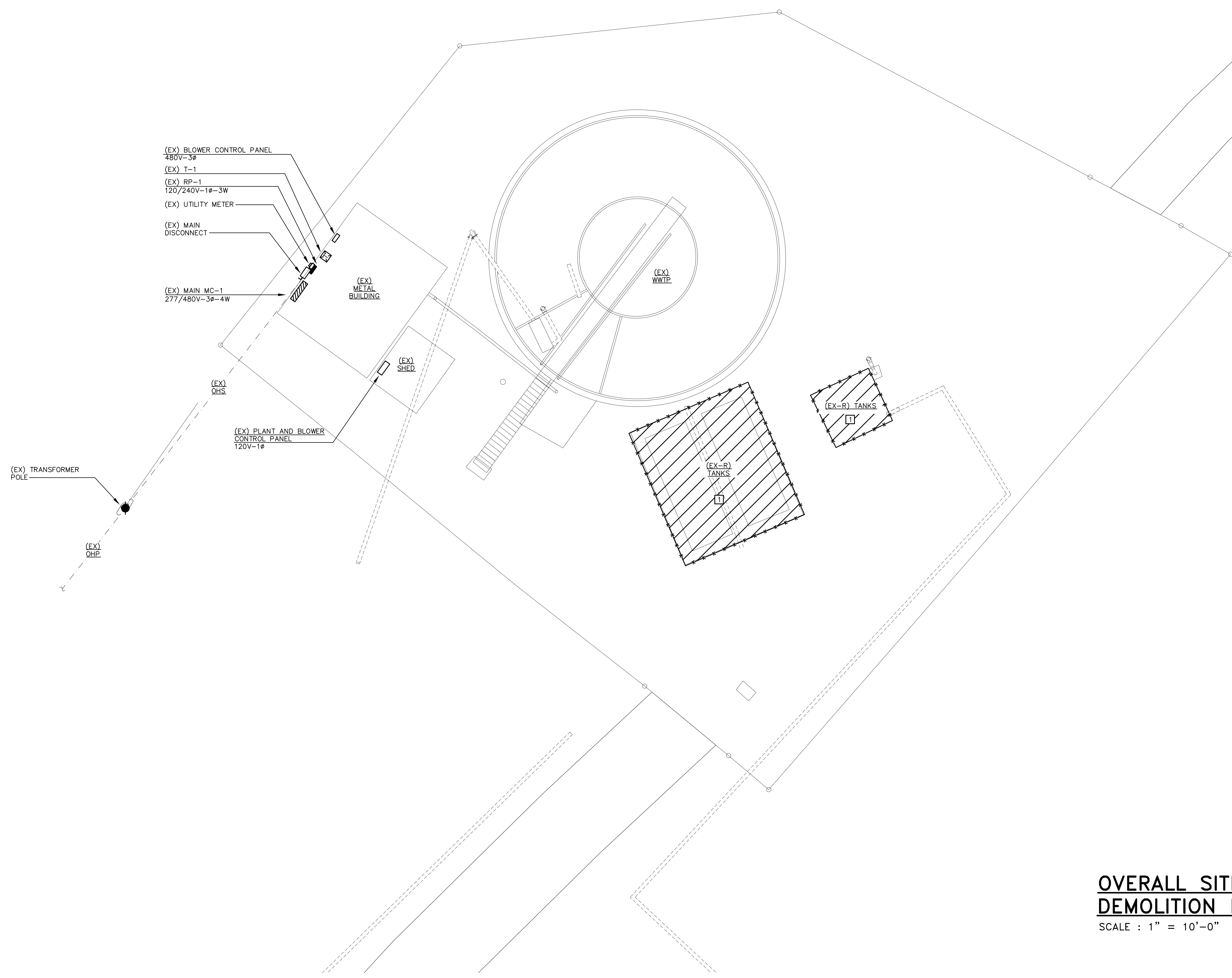
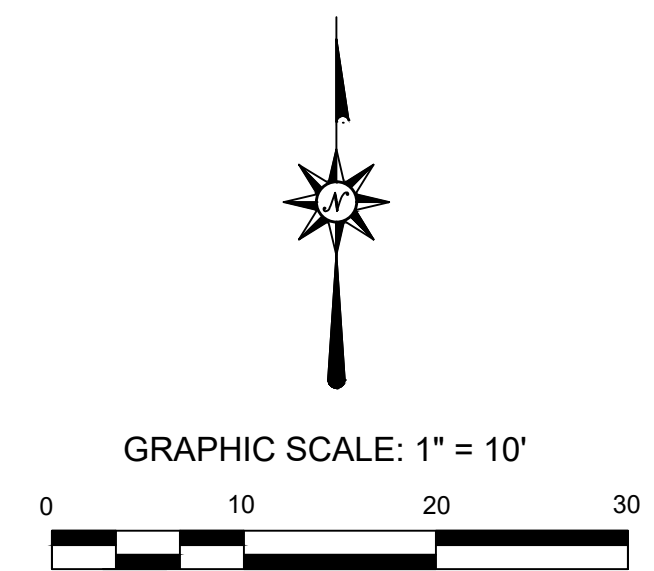
- DIAGRAM NOTES**
- REFER TO EQUIPMENT AND PANELBOARD SCHEDULES FOR ALL APPLICABLE FEEDER SIZES, BREAKER RATINGS, BUS RATINGS, TRANSFORMER RATINGS, ETC. NOT SHOWN ON THIS DIAGRAM.
  - NEW NEUTRAL-GROUND BONDS SHALL ONLY BE MADE AT THE FOLLOWING LOCATIONS:
    - SECONDARY SIDES OF ALL TRANSFORMERS.

EXISTING SERVICE SIZE VERIFICATION CALCULATIONS			
	KW	KVA (WITH 0.8PF)	Amps (at 480V 3Ph-4W)
HISTORICAL PEAK DEMAND FROM POWER CO: x1.25 SAFETY BUFFER (PER NEC 220.87):	59.0	73.8 92.2	115.2
- DEMOLISHED COMPUTED LOAD		0.0	0.0
+ ADDED COMPUTED LOAD		20.9	52.2
= NEW COMPUTED LOAD		113.1	<b>282.6</b>
EXISTING SERVICE AMPACITY			<b>400.0</b>
<b>NEW COMPUTED LOAD (282.6A) &lt; SERVICE AMPACITY (400A)</b> <b>THEREFORE EXISTING SERVICE IS OF SUFFICIENT AMPACITY</b>			

PANELBOARD SCHEDULE - MPZ-2											
PANEL TYPE				AIC RATING				MOUNTING			
SQUARE 'D' MINI POWER ZONE				10KAIC (MINIMUM)				SURFACE			
120/240V-1P-3W											
AMPS & TYPE: SEE NOTE 2 BELOW				LOCATION: FILTRATION AND DISINFECTION EQUIPMENT STAND							
FED FROM: MC-1				FEEDER: SEE SINGLE LINE DIAGRAM							
CKT. NO	NOTES	BKR	DESCRIPTION	WATTS	PHASE	WATTS	DESCRIPTION	BKR	NOTES	CKT NO	
1	-	20/1	UV AND DISINFECTION AREA LTC	200	A	800	WATER REUSE PUMP	15/2	-	16	
2	-	20/1	UV AND FILTER EQ. STAND RECEPT.	200	B	800				17	
3	-	20/1	SPARE	0	A	200	EFFLUENT TANK FLOW XMTR.	20/1	-	18	
4	-	20/1	SPARE		B		SPARE	20/1	-	19	
5	-	20/1	SPARE		A		SPARE	20/1	-	20	
6	-	20/1	SPARE		B		SPARE	20/1	-	21	
7	-	20/2	UV CONTROL PANEL	1,620	A		SPARE	20/1	-	22	
8	-			1,620	B			20/1	-	23	
9	-	20/1	FLUIDYNE FILTER CP	1,000	A			20/1	-	24	
10	-	70/2	FLUIDYNE FILTER AIR COMPRESSOR	3,250	B			20/1	-	25	
11	-			3,250	A			20/1	-	26	
12	-	20/1	FLUIDYNE FILTER AIR DRYER	300	B		SURGE PROTECTION DEVICE	30/2	-	27	
13	-	20/2	REGENERATIVE AIR BLOWER	1,150	A				-	28	
14	-			1,150	B		MAIN SECONDARY BREAKER	125/2	-	29	
15	-	20/1	SPARE		A				-	30	
<b>NOTES:</b>				PH. A	PH. B	<b>TOTAL CONNECTED LOAD:</b>				15.9 KVA	
1. ENCLOSURE SHALL BE NEMA 3R STAINLESS STEEL.				8,220	7,320					67.6 AMPS	
2. MPZ SHALL HAVE INTEGRAL 25 KVA TRANSFORMER, 100A/2P PRIMARY MAIN BKR, 125A/2P SECONDARY MAIN BKR, AND SHALL BE CONFIGURED FOR 480V-1P-2W INPUT.						<b>TOTAL DEMAND LOAD:</b>				15.5 KVA	
						<b>TOTAL COMPUTED LOAD:</b>				67.6 AMPS	
										15.6 KVA	
										68.0 AMPS	

EXISTING PLANT AND BLOWER CONTROL PANEL SCADA POINT LIST AND CONTROL & INSTRUMENTATION WIRING SCHEDULE										
HOMERUN MARK	TO	EQUIP. ID NO.	EQUIPMENT DESCRIPTION	PARAMETER	POINT TYPE	TAG	WIRING	SHEET	REMARKS	
10-CR-100	PLANT AND BLOWER CP	10-CR-100	INTAKE SCREEN CONTROL PANEL	ALARM	DI	10-CR-100-YA	(1) 8C#14 - 1°C	20-E-01		
		10-M-101	SCREEN DRIVE	ON/OFF STATUS	DI	10-M-101-Y1				
10-CR-120	PLANT AND BLOWER CP	10-CR-120	GRINDER PUMP CONTROL PANEL	ALARM	DI	10-CR-120-YA	(1) 8C#14 - 1°C	20-E-01		
		10-M-121	GRINDER PUMP	ON/OFF STATUS	DI	10-M-121-Y1				
20-CR-100	PLANT AND BLOWER CP	20-CR-100	REGENERATIVE AIR BLOWER CONTROL PANEL	ALARM	DI	20-CR-100-YA	(1) 8C#14 - 1°C	30-E-01		
		20-M-101	REGENERATIVE AIR BLOWER	ON/OFF STATUS	DI	20-M-101-Y1				
20-FIT-110	PLANT AND BLOWER CP	20-FIT-110	EFFLUENT TANK FLOW TRANSMITTER	FLOW INDICATION	AI	20-FIT-110-F1	(1) #18TSP - 3/4°C	30-E-01		
30-CR-100	PLANT AND BLOWER CP	30-CR-100	FLUIDYNE FILTER CONTROL PANEL	ALARM	DI	30-CR-100-YA	(1) 8C#14 - 1°C	30-E-01		
				ON/OFF STATUS	DI	30-CR-100-Y1				
40-CR-100	PLANT AND BLOWER CP	40-CR-100	UV SYSTEM CONTROL PANEL	ALARM	DI	40-CR-100-YA	(1) 8C#14 - 1°C	30-E-01		
				ON/OFF STATUS	DI	30-CR-100-Y1				
<b>NOTES:</b>										
1. THIS SCHEDULE ONLY SHOWS NEW SCADA I/O POINTS. OWNER'S INTEGRATOR WILL MODIFY EXISTING RTU AS REQUIRED TO INCORPORATE NEW I/O (N.I.C.).										





- ### ELECTRICAL DEMOLITION NOTES
1. THE ELECTRICAL DEMOLITION PLANS INDICATE GENERAL SCOPE OF DEMOLITION WORK TO BE ACCOMPLISHED UNDER THIS CONTRACT. IT IS NOT THE INTENT OF THESE PLANS TO DETAIL ALL ELECTRICAL ITEMS THAT MUST BE REMOVED. THE ELECTRICAL CONTRACTOR SHALL REFER TO ALL OTHER PLANS IN THIS SET OF DRAWINGS FOR ADDITIONAL INFORMATION RELATED TO EXTENT AND SCOPE OF DEMOLITION WORK. REFER TO ELECTRICAL SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS. VERIFY ALL REQUIREMENTS AT JOB SITE PRIOR TO BID.
  2. EXISTING SALVAGEABLE MATERIALS REMOVED SHALL REMAIN THE PROPERTY OF THE OWNER AND SHALL BE DELIVERED TO OWNER'S DESIGNATED STORAGE FACILITY. ANY MATERIALS REMOVED THAT THE OWNER DOES NOT WISH TO RETAIN SHALL BE DISPOSED OF BY THE CONTRACTOR.
  3. NO EXISTING ELECTRICAL ITEMS SHALL BE REMOVED WITHOUT PRIOR WRITTEN CONSENT OF THE OWNER. THE EXISTING PLANT SHALL BE KEPT OPERATIONAL THROUGHOUT THE CONSTRUCTION PROCESS UNTIL THE ASSOCIATED REPLACEMENT/NEW PLANT SYSTEMS ARE IN SERVICE AND PROPERLY TESTED AND DEEMED RELIABLE/ACCEPTABLE FOR PERMANENT SERVICE.
  4. ALL EXISTING FEEDER WIRING MADE OBSOLETE BY THIS PROJECT SHALL BE DEMOLISHED COMPLETELY. SEE ELECTRICAL DEMOLITION NOTE 3.
  5. ALL EXISTING ELECTRICAL PULLBOXES ASSOCIATED WITH DUCTBANKS MADE OBSOLETE BY THIS PROJECT SHALL BE DEMOLISHED COMPLETELY. WHERE DEMOLITION OF PULLBOXES OR DUCTBANKS IS REQUIRED PRIOR TO DISCONNECTION OF ASSOCIATED LOADS (SUCH AS FOR CONSTRUCTION OF STRUCTURES, ETC.), CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARILY EXTENDING & RECONNECTING EXISTING CIRCUITRY AS REQUIRED. EXISTING OBSOLETE ELECTRICAL DUCTBANKS SHALL BE DEMOLISHED WHERE WITHIN FIVE (5) FEET OF FOOTPRINT INDICATED FOR NEW CONSTRUCTION. EXISTING ELECTRICAL DUCTBANKS OUTSIDE THIS AREA SHALL BE DEMOLISHED TO 36" BELOW GRADE AND BACKFILLED. DUCTBANKS DEEPER THAN 36" BELOW GRADE AND OUTSIDE THE FOOTPRINT AREA OF NEW STRUCTURES MAY BE ABANDONED. REMOVE ALL ELECTRICAL EQUIPMENT, DEVICES, CONDUIT AND WIRING TO INCLUDE FEEDERS AND CONTROL/INSTRUMENTATION WIRING CONNECTIONS TO OTHER BUILDINGS AND STRUCTURES.
  6. DEMOLISH ALL ELECTRICAL PROVISIONS ASSOCIATED WITH SITE VAULTS, EQUIPMENT, STRUCTURES SHOWN TO BE DEMOLISHED ON CIVIL PLANS.
  7. ALL EXISTING ELECTRICAL EQUIPMENT, CONDUIT, WIRING, DEVICES, ETC. THAT BECOME OBSOLETE WITHIN THIS PROJECT SHALL BE DEMOLISHED COMPLETELY (OTHER ITEMS SHALL REMAIN IN SERVICE). WHERE NEW EQUIPMENT, LIGHTING, RECEPTACLES, CONTROLS, INSTRUMENTS, SUPPORTS, CIRCUITS, ETC. ARE SHOWN WITHIN THESE PLANS, ASSOCIATED EXISTING ITEMS THAT BECOME OBSOLETE AS A RESULT SHALL BE DEMOLISHED.

### ELECTRICAL DEMOLITION KEYED NOTES

**I** EXISTING BUILDING/STRUCTURES TO DEMOLISHED WITHIN THIS PROJECT. REMOVE ALL ELECTRICAL EQUIPMENT, DEVICES, CONDUIT AND WIRING TO INCLUDE FEEDERS AND CONTROL/INSTRUMENTATION WIRING CONNECTIONS TO OTHER BUILDINGS AND STRUCTURES.

NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT		CONSTRUCTION REVISIONS	
			AS-BID	REVISIONS	AS-BUILT	REVISIONS

Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

OVERALL SITE  
ELECTRICAL  
DEMOLITION PLAN

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: MAY 2022

DESIGNED BY: PDB

DRAWN BY: ZJG

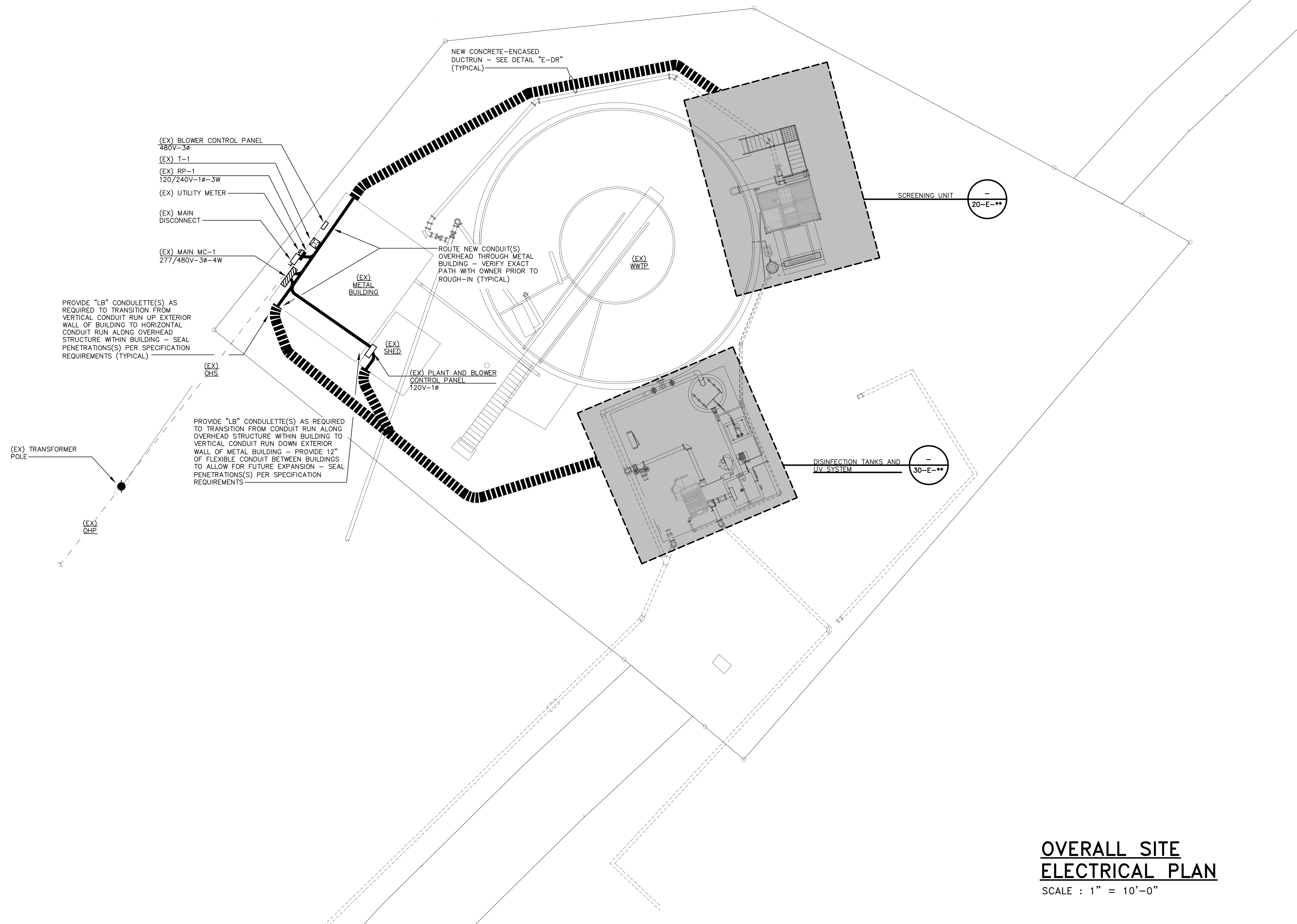
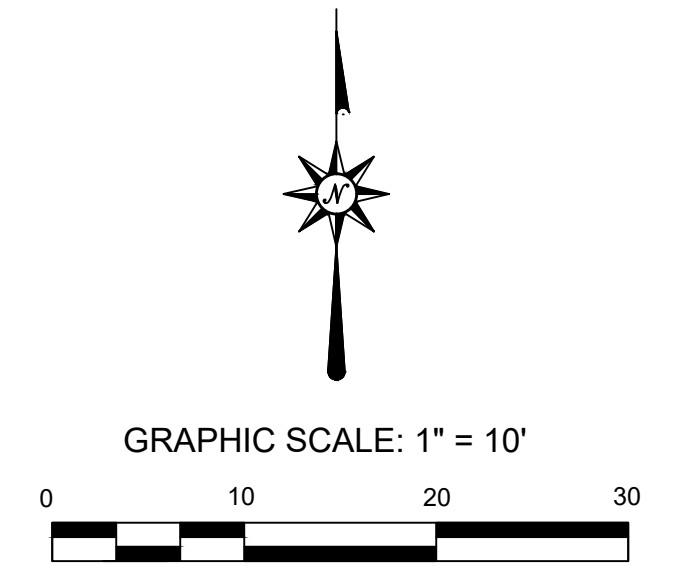
DWG: 10-E-01

SHEET NUMBER **39**

## OVERALL SITE ELECTRICAL DEMOLITION PLAN

SCALE : 1" = 10'-0"





NO.	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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**Alabama Water Utilities**  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

OVERALL SITE ELECTRICAL PLAN

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026

DATE: MAY 2022

DESIGNED BY: PDB

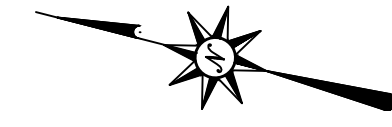
DRAWN BY: ZJG

DWG: 10-E-02

SHEET NUMBER **40**

**OVERALL SITE ELECTRICAL PLAN**  
SCALE : 1" = 10'-0"





NO.	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

SCREENING UNIT ELECTRICAL PLAN

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026

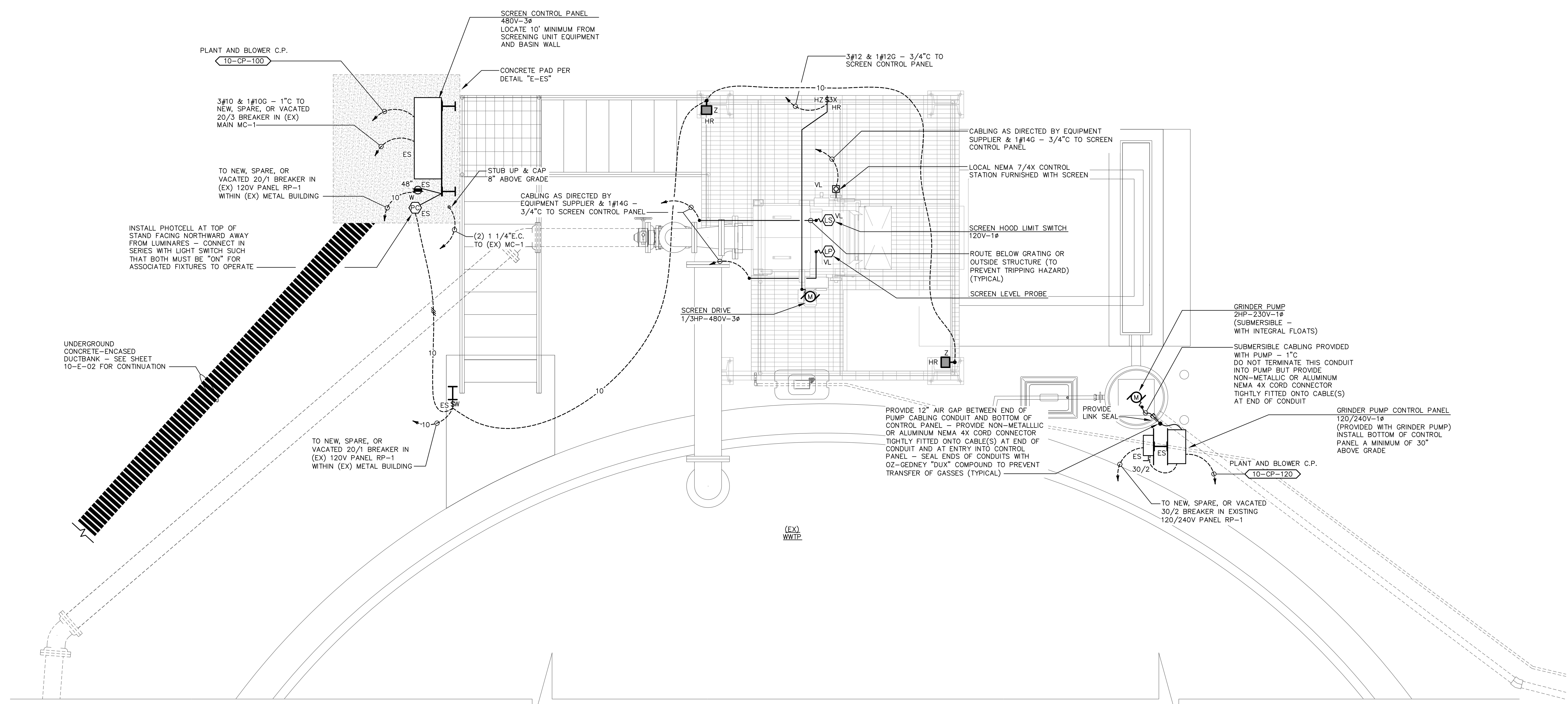
DATE: MAY 2022

DESIGNED BY: PDB

DRAWN BY: ZJG

DWG: 20-E-01

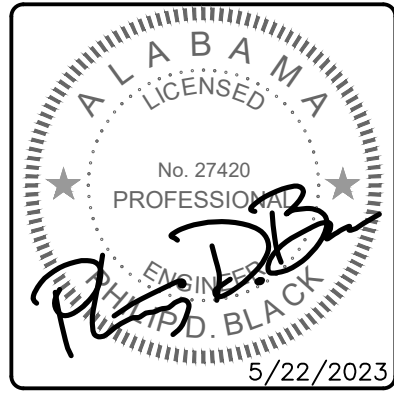
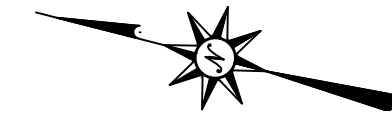
SHEET NUMBER **41**



**SCREENING UNIT ELECTRICAL PLAN**  
SCALE : 1/2" = 1'-0"

- NOTES THIS SHEET ONLY
- ENTIRE ELECTRICAL INSTALLATION WITHIN HAZARDOUS AREAS AS DEFINED BELOW AND BY NFPA 820 SHALL COMPLY WITH ALL APPLICABLE NEC REQUIREMENTS FOR CONDUIT SEALS, RACEWAY TYPES, MATERIAL/DEVICE TYPES, ETC. SEE GENERAL ELECTRICAL NOTE 13.
  - THE FOLLOWING AREAS ON THIS PLAN SHALL BE CONSIDERED CLASS I, DIVISION II, GROUP D AREAS:  
A. AREAS DEFINED BY DETAIL "E-HA0C".





NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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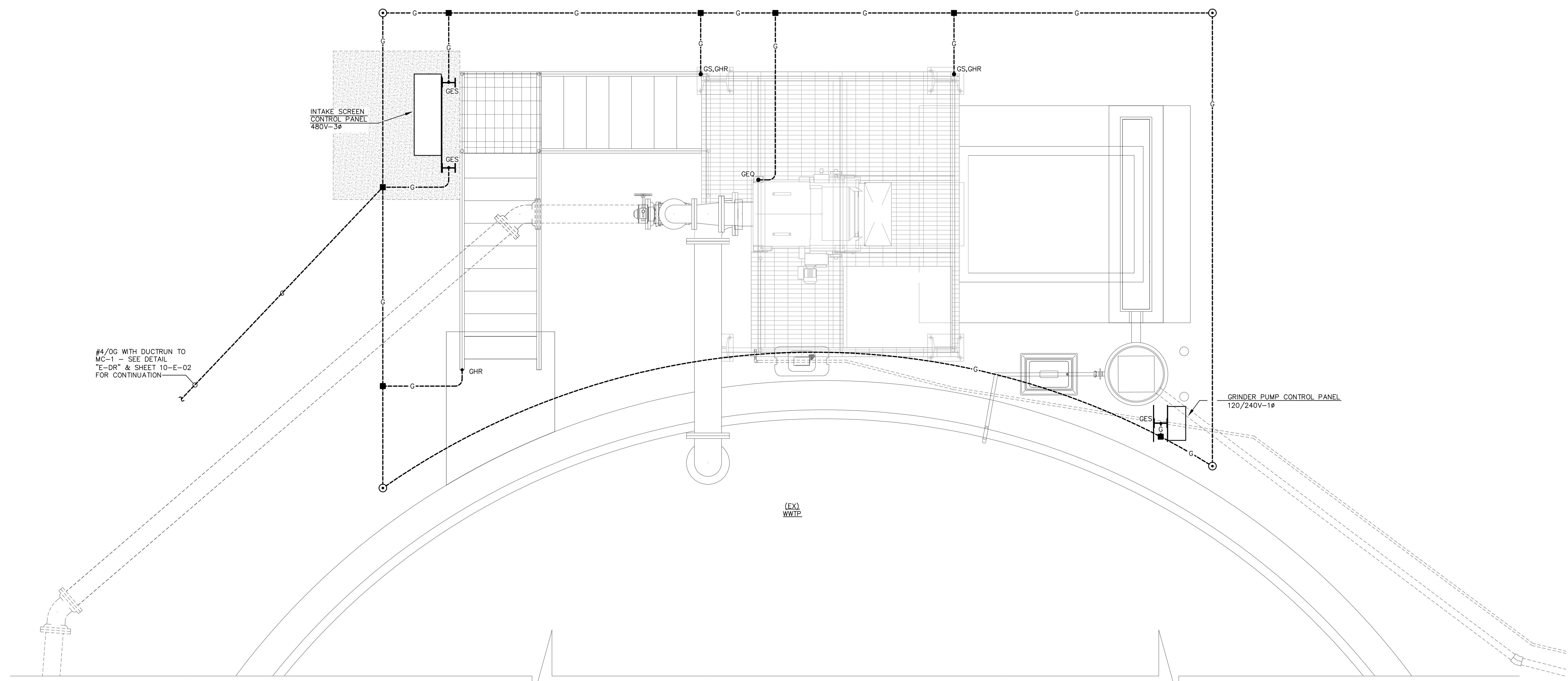
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TUSCALOOSA COUNTY, ALABAMA

SCREENING UNIT  
SUPPLEMENTAL  
GROUNDING PLAN

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026  
DATE: MAY 2022  
DESIGNED BY: PDB  
DRAWN BY: ZJG  
DWG: 20-E-02  
SHEET NUMBER **42**



#4/ØG WITH DUCTRUN TO MC-1 - SEE DETAIL "E-DR" & SHEET 10-E-02 FOR CONTINUATION

INTAKE SCREEN CONTROL PANEL  
480V-3Ø

GRINDER PUMP CONTROL PANEL  
120/240V-1Ø

(EX)  
WWTP

**SCREENING UNIT  
SUPPLEMENTAL  
GROUNDING PLAN**

SCALE : 1/2" = 1'-0"



JACKSON,  
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JRA JOB NO. 221199  
ELECTRICAL ENGINEERING & DESIGN



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
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TUSCALOOSA COUNTY, ALABAMA

FILTRATION AND  
DISINFECTION UNITS  
ELECTRICAL PLAN

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

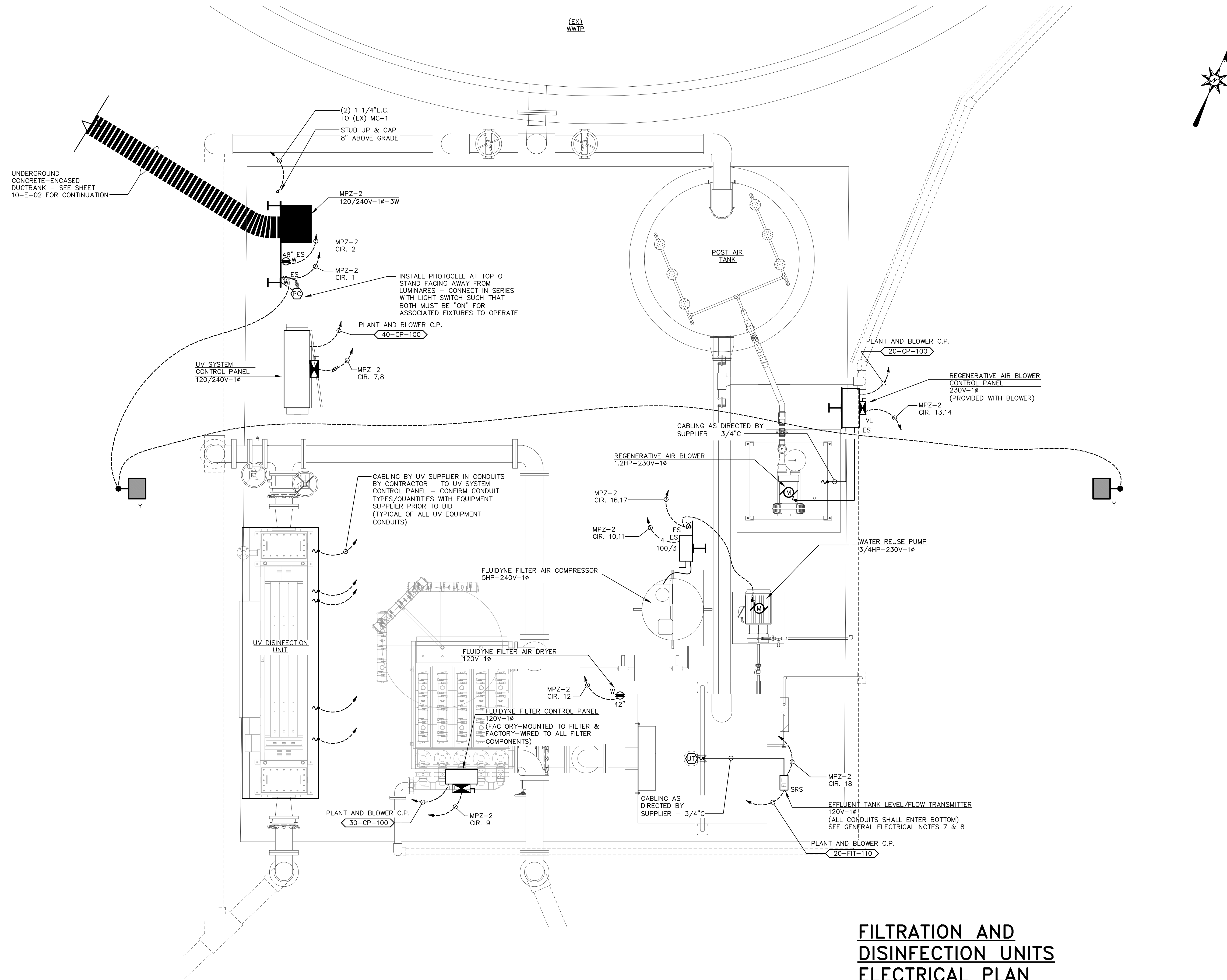
DATE: MAY 2022

DESIGNED BY: PDB

DRAWN BY: ZJG

DWG: 30-E-01

SHEET NUMBER **43**



## FILTRATION AND DISINFECTION UNITS ELECTRICAL PLAN

SCALE : 1/2" = 1'-0"



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NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
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Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

FILTRATION AND  
DISINFECTION UNITS  
SUPPLEMENTAL  
GROUNDING PLAN

BOX IS 2 IN WIDE  
AT FULL SCALE

JOB NO: SW-20026

DATE: MAY 2022

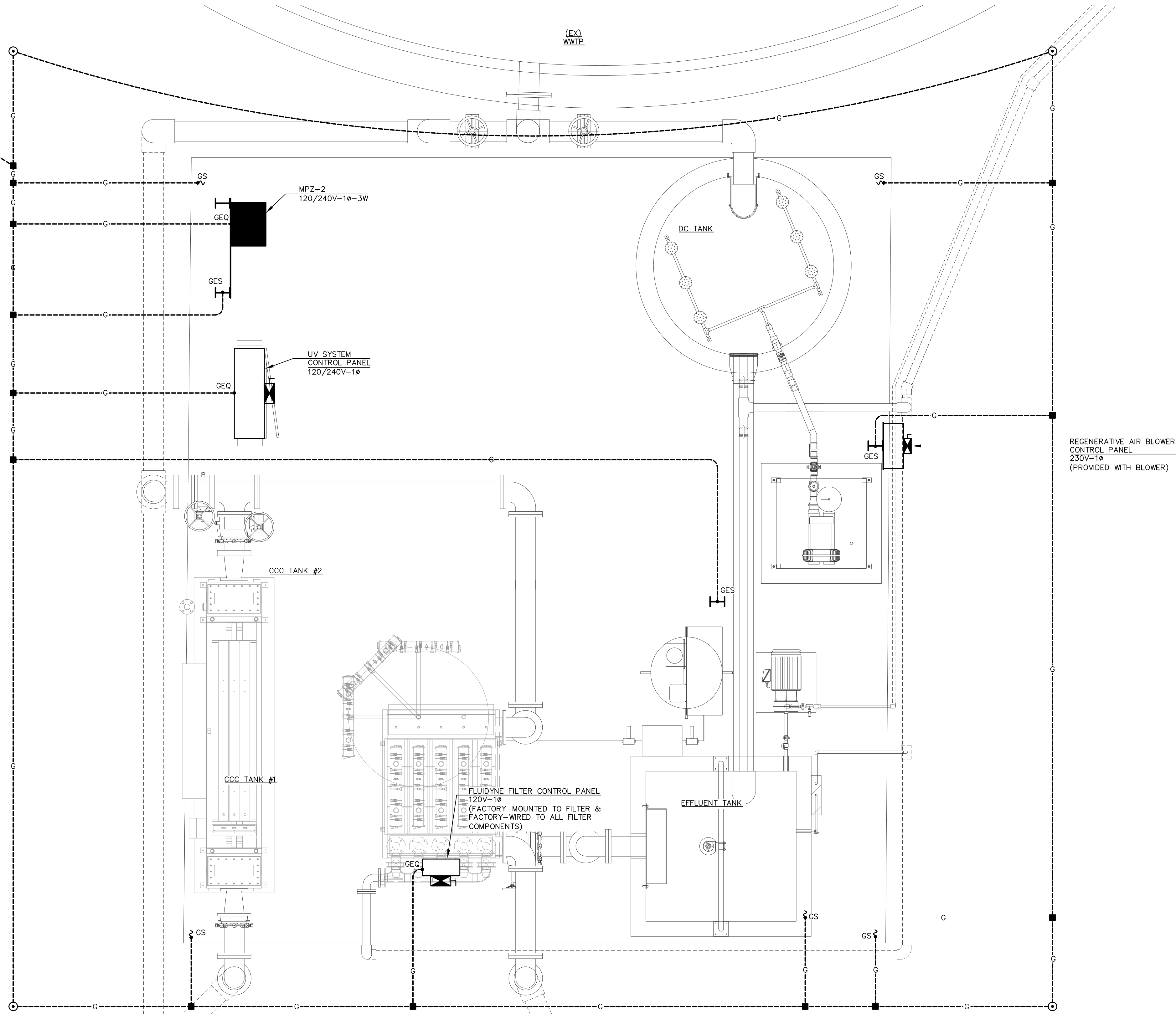
DESIGNED BY: PDB

DRAWN BY: ZJG

DWG: 30-E-02

SHEET NUMBER **44**

#4/OG WITH  
DUCTRUN TO MC-1  
- SEE SHEET DETAIL  
"E-DR" & 10-E-02  
FOR CONTINUATION



**FILTRATION AND  
DISINFECTION UNITS  
SUPPLEMENTAL GROUNDING PLAN**

SCALE : 1/2" = 1'-0"



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JRA JOB NO. 221199



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT

Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

ELECTRICAL DETAILS

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026

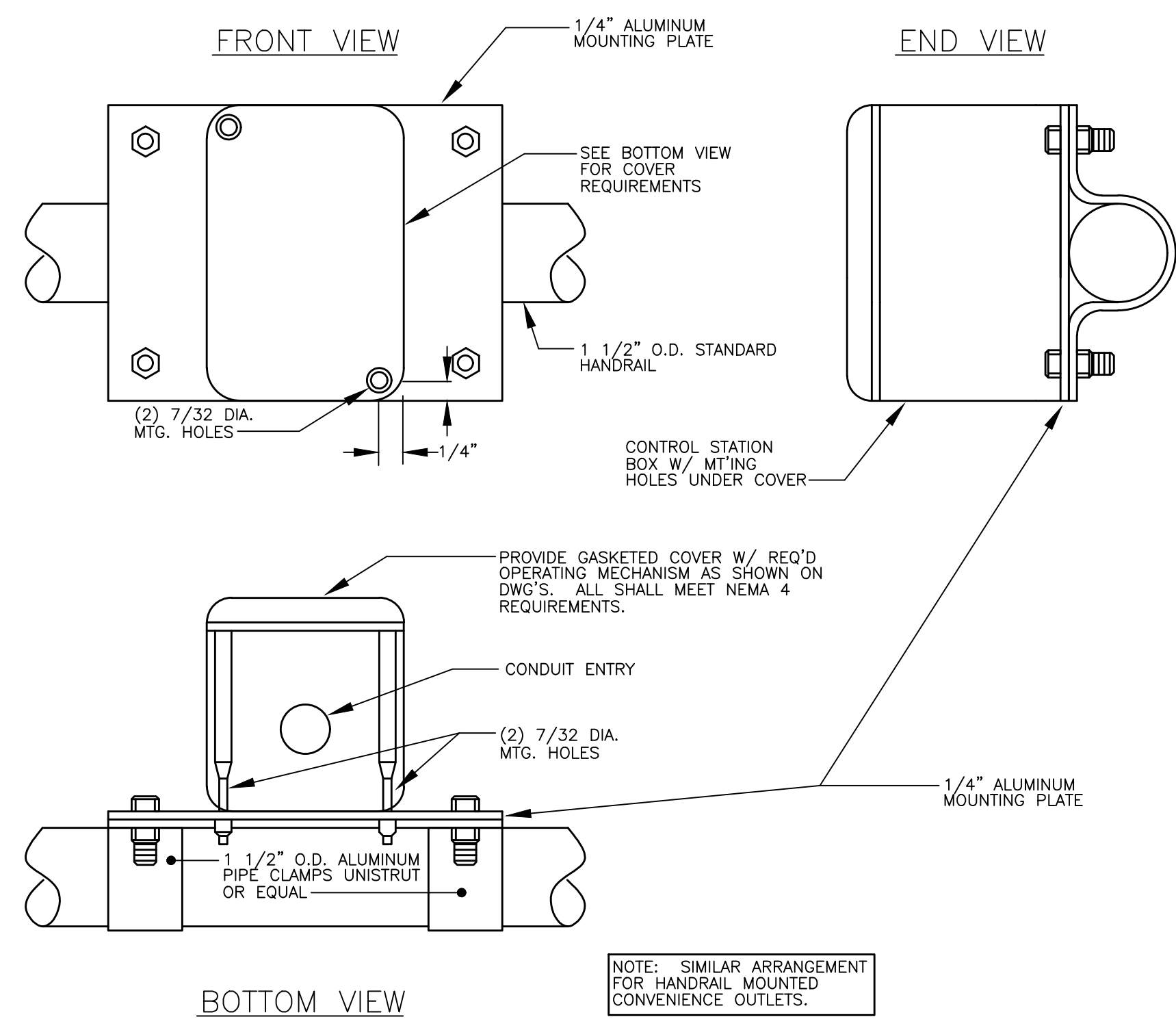
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DESIGNED BY: PDB

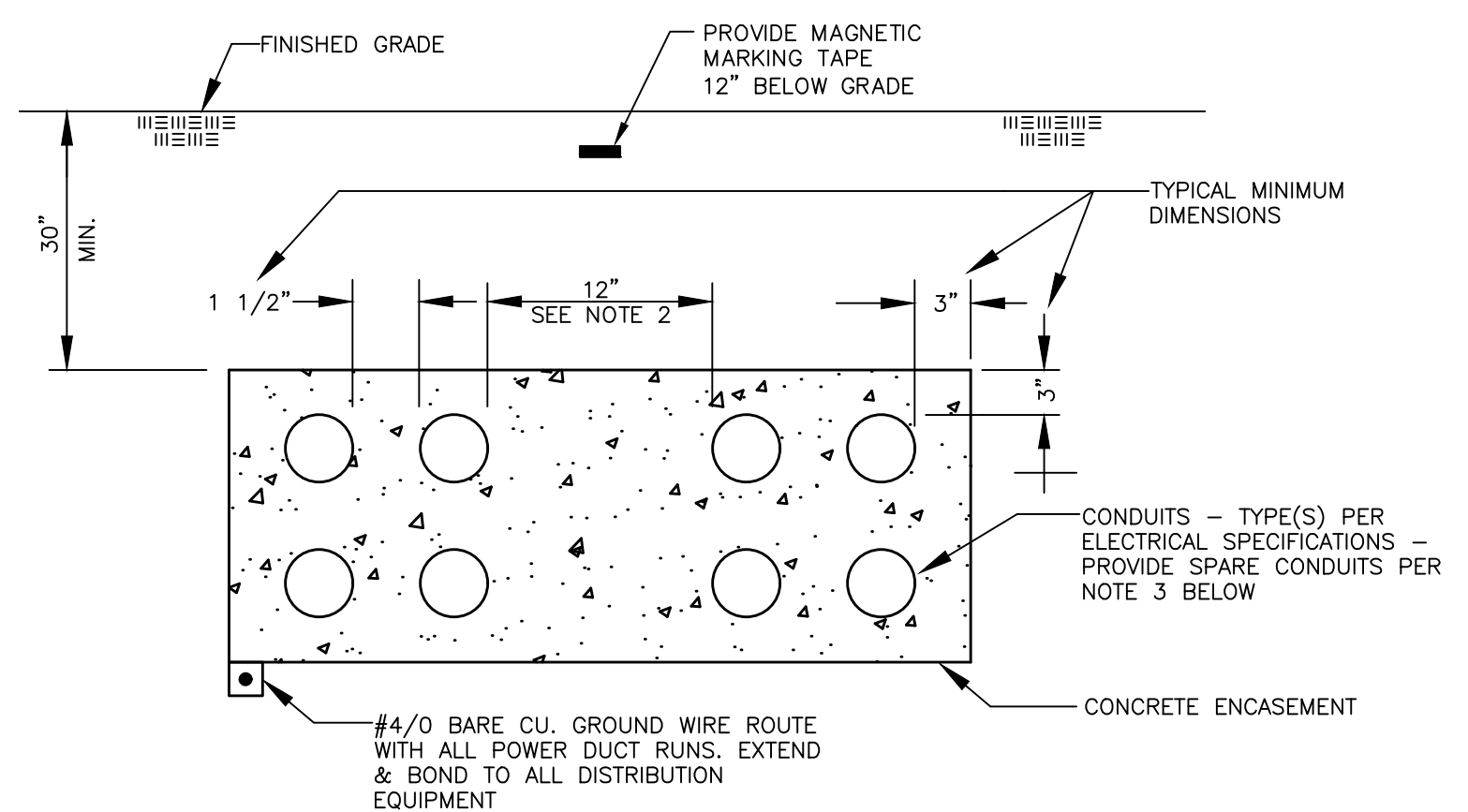
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DWG: 95-E-01

SHEET NUMBER **45**

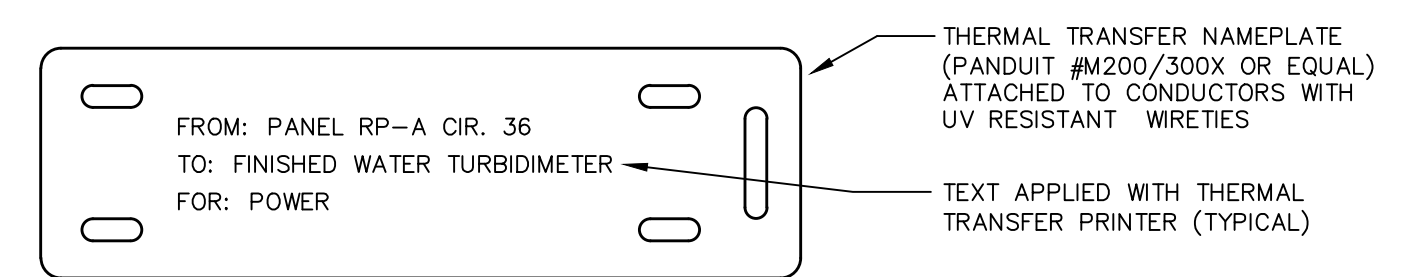


**DETAIL "E-HR"**  
**NEMA 4 HANDRAIL MOUNTING**  
SCALE : NONE



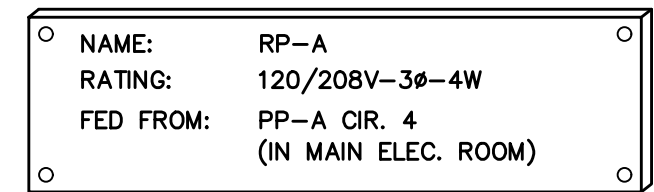
**DETAIL "E-DR"**  
**TYPICAL DUCT RUN SECTION**  
SCALE : NONE

- DETAIL NOTES**
- PVC SPACERS SHALL BE INSTALLED AT RECOMMENDED INTERVALS TO SUPPORT AND MAINTAIN SPACING FOR CONDUITS.
  - INSTRUMENTATION CONDUITS SHALL BE SEPARATED FROM POWER/CONTROL CONDUITS BY A MINIMUM OF 12" THROUGHOUT ANY DUCT RUNS.
  - ROUTE TWO (2) 4"E.C. SPARE PVC POWER CONDUITS AND ONE (1) 2"E.C. SPARE PVC-COATED RIGID STEEL INSTRUMENTATION CUIT ALONG FULL LENGTH(S) OF ALL DUCTBANKS.



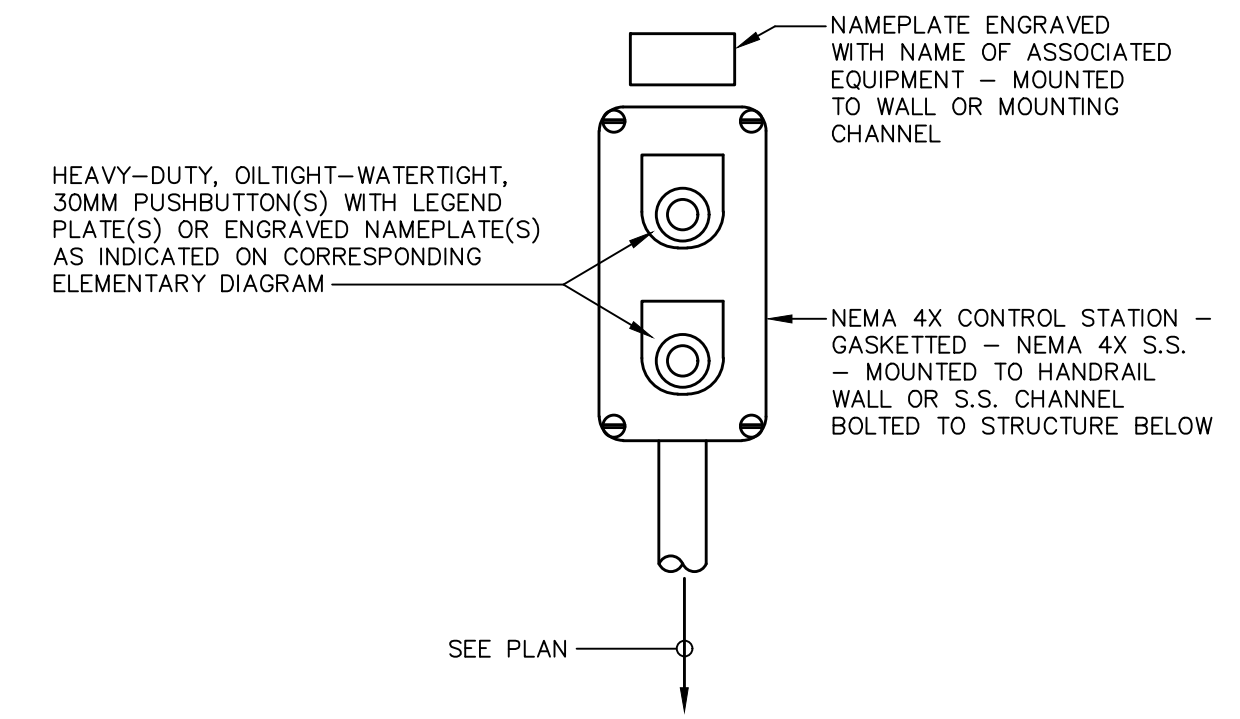
**DETAIL "E-CL"**  
**TYPICAL CIRCUIT LABEL**  
SCALE : NONE

- NOTES THIS DETAIL ONLY**
- CIRCUIT LABEL TYPES SHOWN ABOVE SHALL BE USED TO IDENTIFY ALL CIRCUITS WITHIN PULLBOXES, HANDHOLES, VAULTS JUNCTION BOXES LARGER THAN 4-11/16", APPROXIMATELY EVERY 50 FEET WITHIN CABLE TRAYS (INCLUDING AT MAJOR CABLE TRAY JUNCTIONS AND BREAKOUT LOCATIONS) AND AT OTHER SIMILAR LOCATIONS. SEE SPECIFICATIONS FOR LABELING REQUIREMENTS IN OTHER AREAS.
  - CIRCUIT NUMBERS SHALL BE IDENTIFIED FOR ALL CIRCUITS FED FROM LIGHTING OR POWER PANELBOARDS.
  - "FROM", "TO" & "FOR" TEXT SHOWN ABOVE ARE FOR EXAMPLE PURPOSES ONLY. NAMES/NUMBERS SHALL BE ADJUSTED TO MATCH ASSOCIATED CIRCUITS/CABLES.
  - SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.



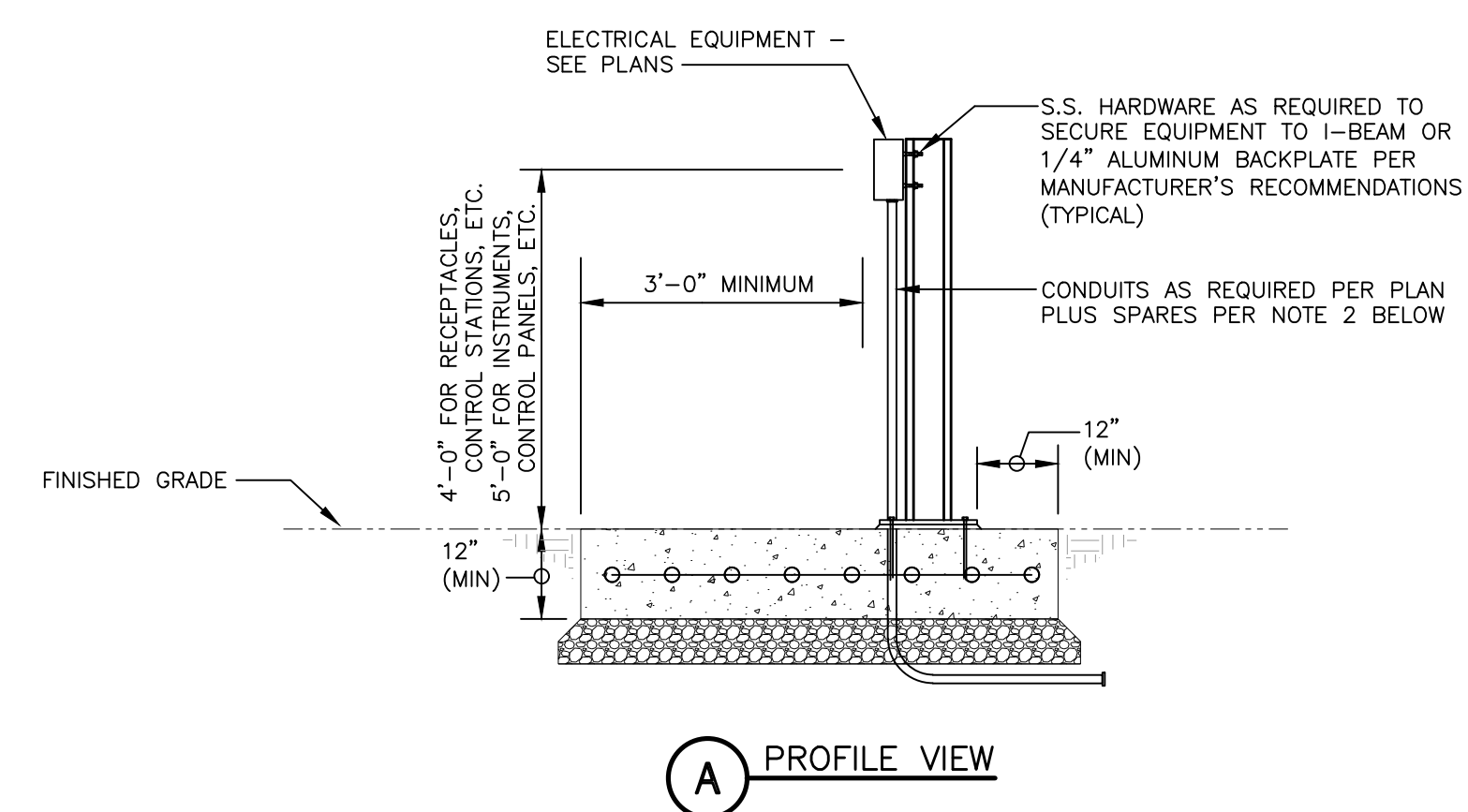
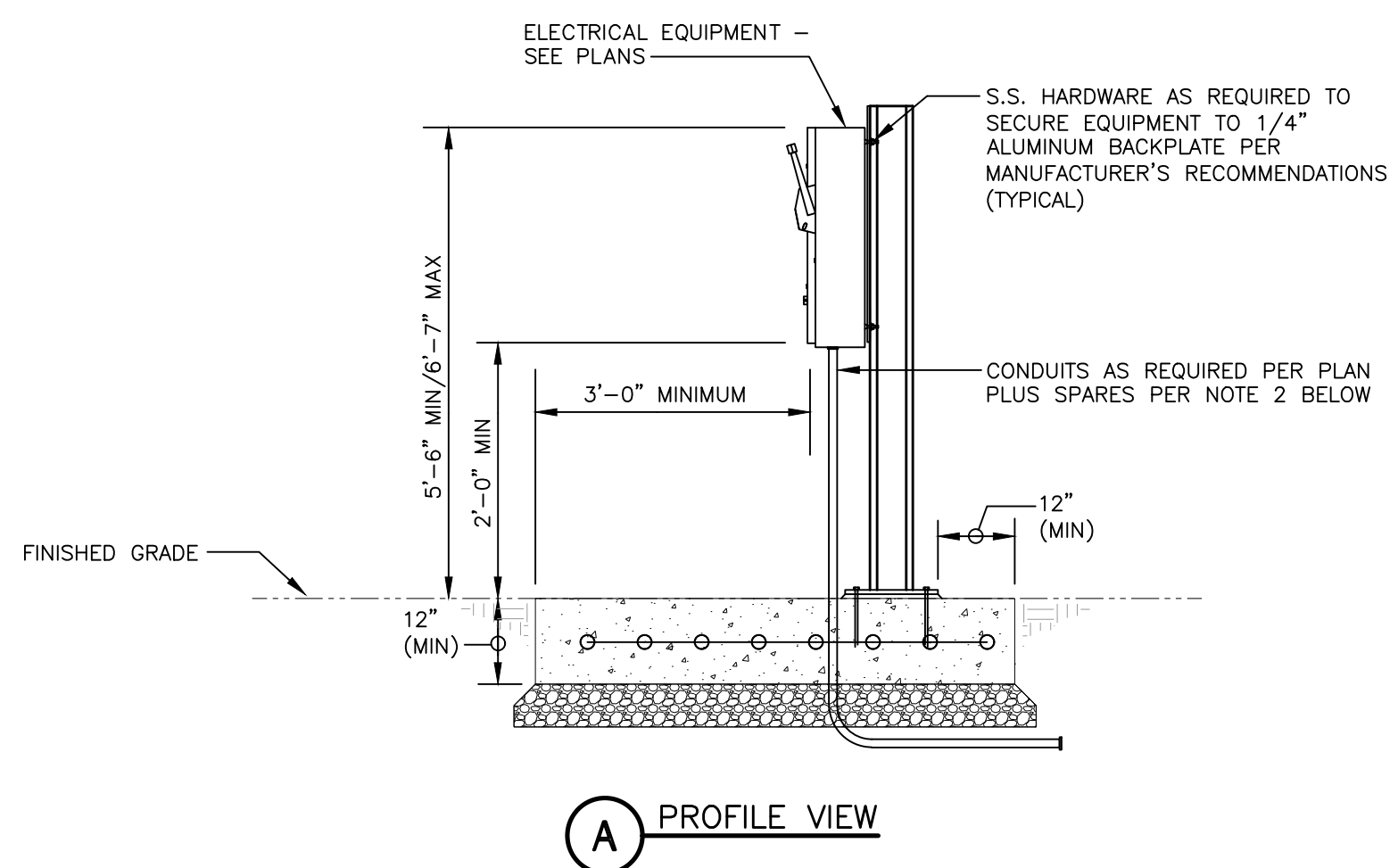
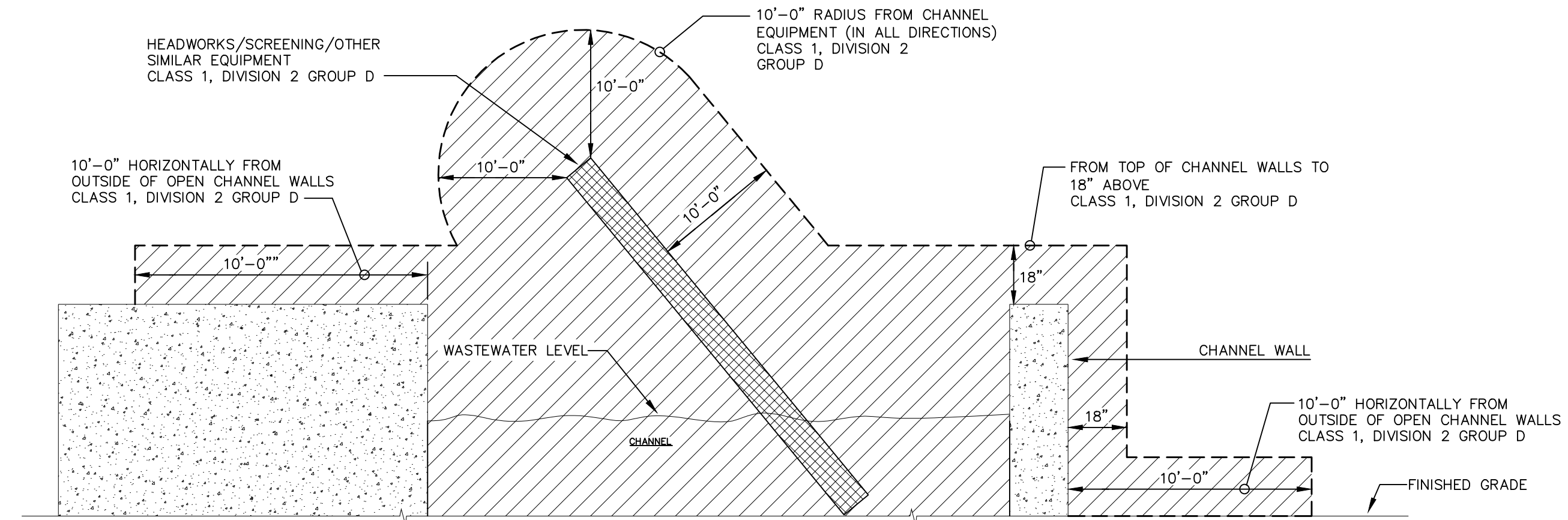
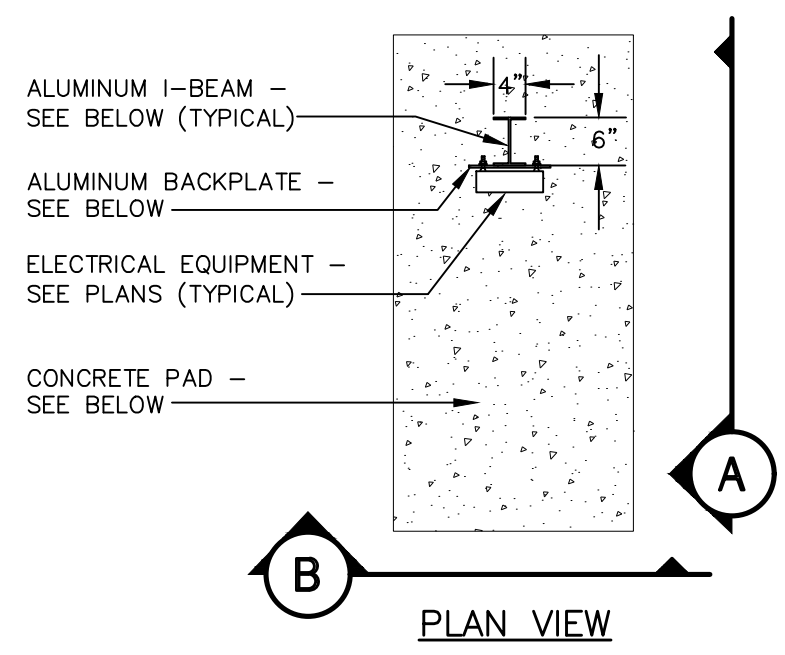
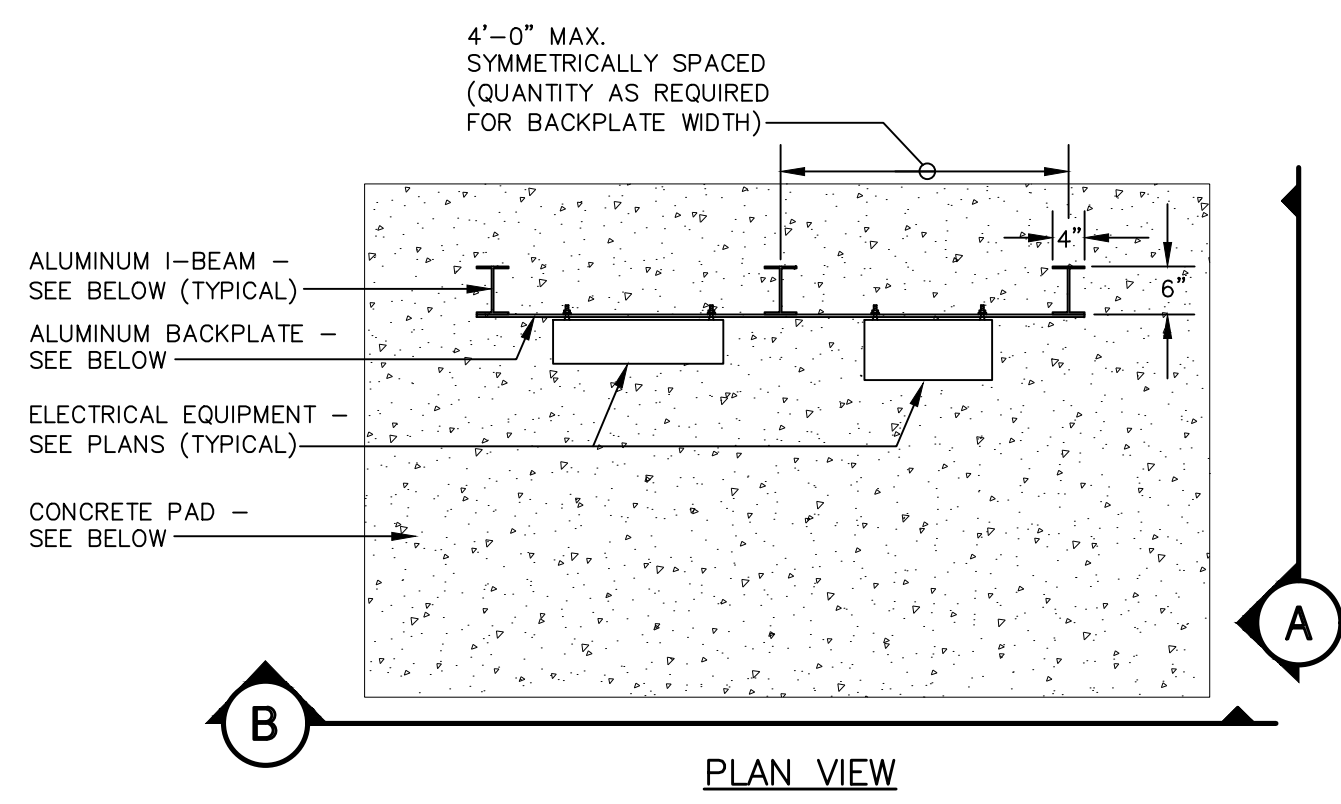
**DETAIL "E-EDL"**  
**ELECTRICAL DISTRIBUTION EQUIPMENT LABEL**  
SCALE : NONE

- DETAIL NOTES**
- PANEL NAMES & RATINGS LISTED ABOVE ARE FOR EXAMPLE PURPOSES ONLY. NAMES & RATINGS SHALL BE ADJUSTED TO MATCH ASSOCIATED EQUIPMENT.
  - THE INTENT OF THIS DETAIL IS TO DEMONSTRATE GENERAL ELECTRICAL IDENTIFICATION REQUIREMENTS FOR ELECTRICAL DISTRIBUTION AND UTILIZATION EQUIPMENT. REFER TO SPECIFICATIONS FOR SPECIFIC REQUIREMENTS REGARDING LOCATIONS, CONTENT, MATERIALS, ETC..



**DETAIL "E-CS"**  
**TYPICAL CONTROL STATION**  
SCALE : NONE





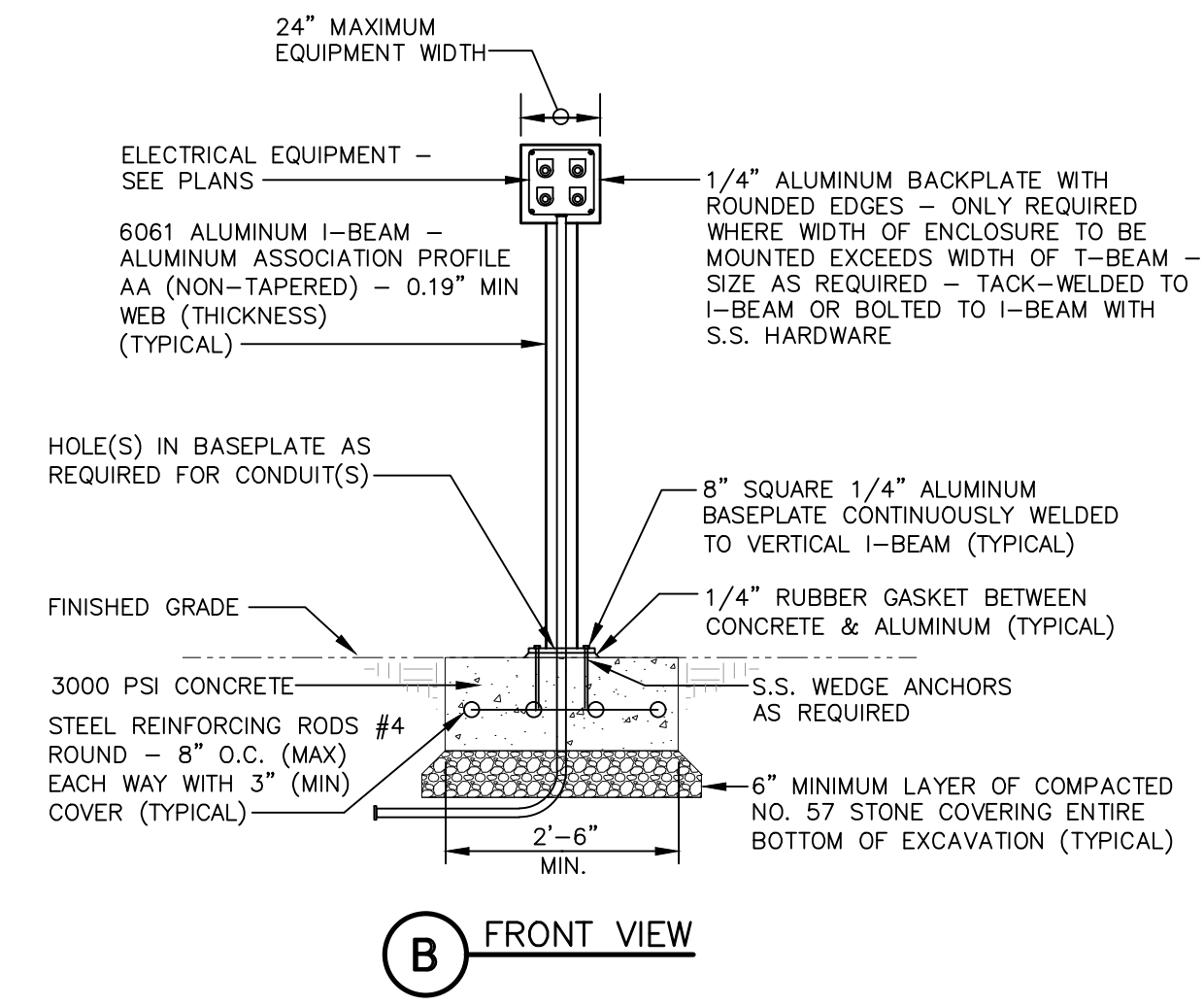
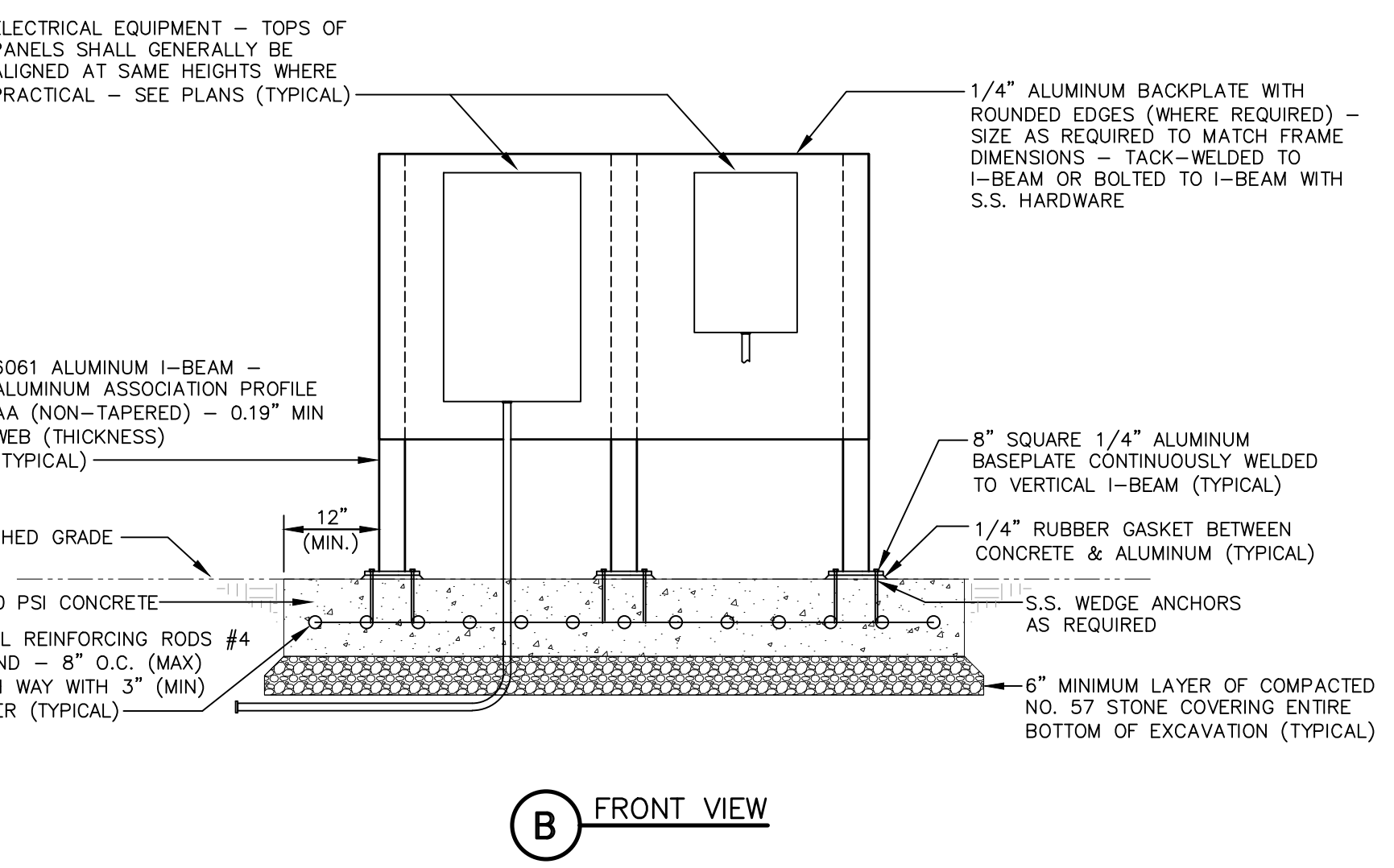
### DETAIL "E-HAOC" HAZARDOUS AREA CLASSIFICATION & HEADWORKS EQUIPMENT

SCALE : NONE

HAZARDOUS AREA LEGEND	
	CLASS 1, DIVISION 1, GROUP D AREA
	CLASS 1, DIVISION 2, GROUP D AREA

**DETAIL NOTES**

- ALL EQUIPMENT, DEVICES, CIRCUITRY, ETC. SHALL BE KEPT OUT OF HAZARDOUS AREAS UNLESS SPECIFICALLY SHOWN OTHERWISE. ENTIRE ELECTRICAL INSTALLATION WITHIN HAZARDOUS AREAS AS (DEFINED ON PLANS OR BY NFPA 820) SHALL COMPLY WITH ALL APPLICABLE NEC REQUIREMENTS FOR INSTALLATION, CONDUIT SEALS, RACEWAY TYPES, MATERIAL/DEVICE TYPES, ETC. GENERAL PROJECT INTENT IS TO MINIMIZE EQUIPMENT/DEVICES/CIRCUITRY LOCATED WITHIN HAZARDOUS AREAS.

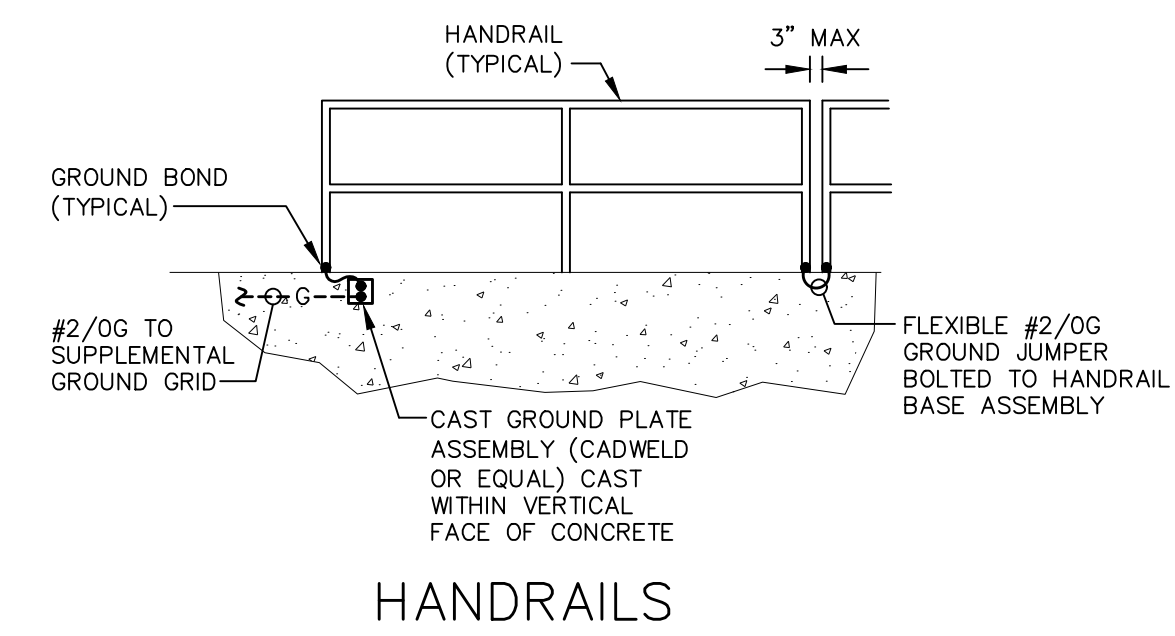


### DETAIL "E-ES" EQUIPMENT SUPPORT

SCALE : NONE

**DETAIL NOTES**

- ALL DIMENSIONS SHOWN ARE TYPICAL.
- PROVIDE TWO (2) 1" E.C. FROM ALL DISTRIBUTION PANELS, LIGHTING PANELS, PLC'S AND CONTROL PANELS ROUTED BELOW CONCRETE PAD TO NEAREST PULLBOX OR ACCESSIBLE STUB OUT LOCATION (NOT UNDERNEATH CONCRETE/ROCK/STRUCTURE/ETC).

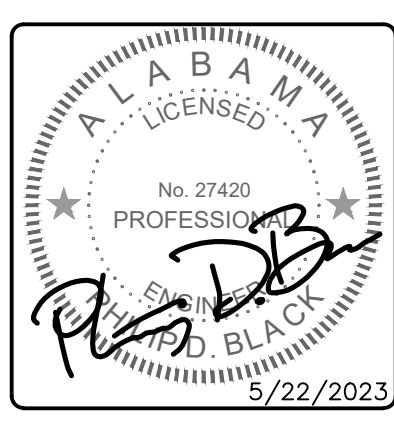
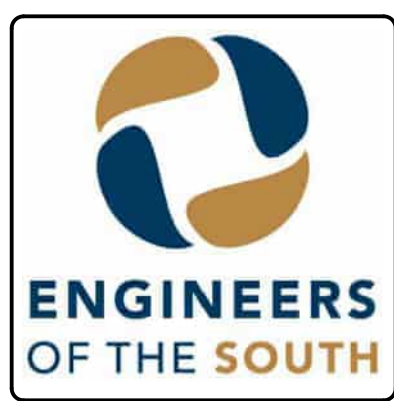


### DETAIL "E-MMG" MISCELLANEOUS METALS GROUNDING

SCALE : NONE

**DETAIL NOTES**

- ALL NEW METAL HANDRAIL, METAL STAIR, AND OTHER SIMILAR MISCELLANEOUS METAL SECTIONS INSTALLED WITHIN THIS PROJECT SHALL BE BONDED TO BE ELECTRICALLY CONTINUOUS TO SUPPLEMENTAL GROUNDING SYSTEM PER THIS DETAIL. FLEXIBLE GROUND JUMPERS MAY BE PROVIDED PER THIS DETAIL TO BOND ADJACENT NON-CONTINUOUS SECTIONS. FOR CONTINUOUS OR BONDED NON-CONTINUOUS SECTIONS, #2/0G CONNECTIONS TO SUPPLEMENTAL GROUND GRID SHALL BE PROVIDED AT INTERVALS NOT TO EXCEED 100 FEET ON CENTER.



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alabama Water Utilities  
BIRMINGHAM, ALABAMA

**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

ELECTRICAL DETAILS

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026

DATE: MAY 2022

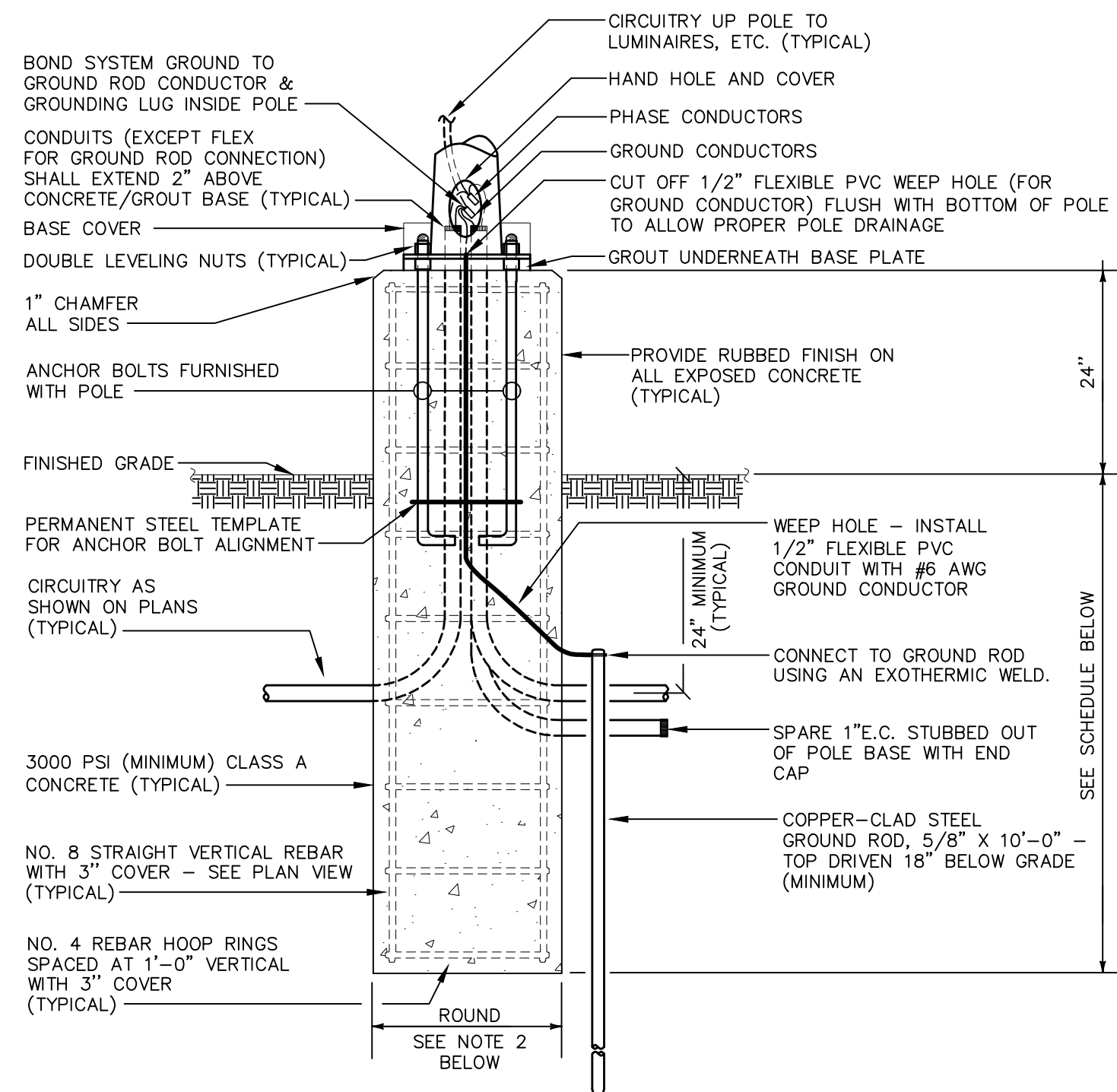
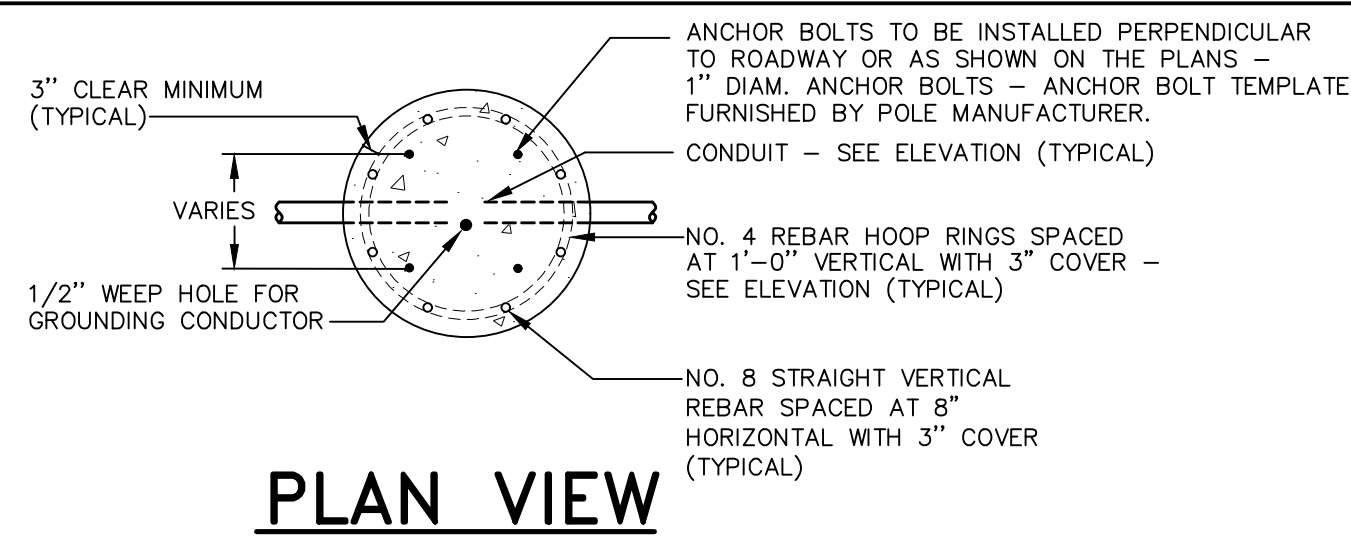
DESIGNED BY: PDB

DRAWN BY: ZJG

DWG: 95-E-02

SHEET NUMBER **46**



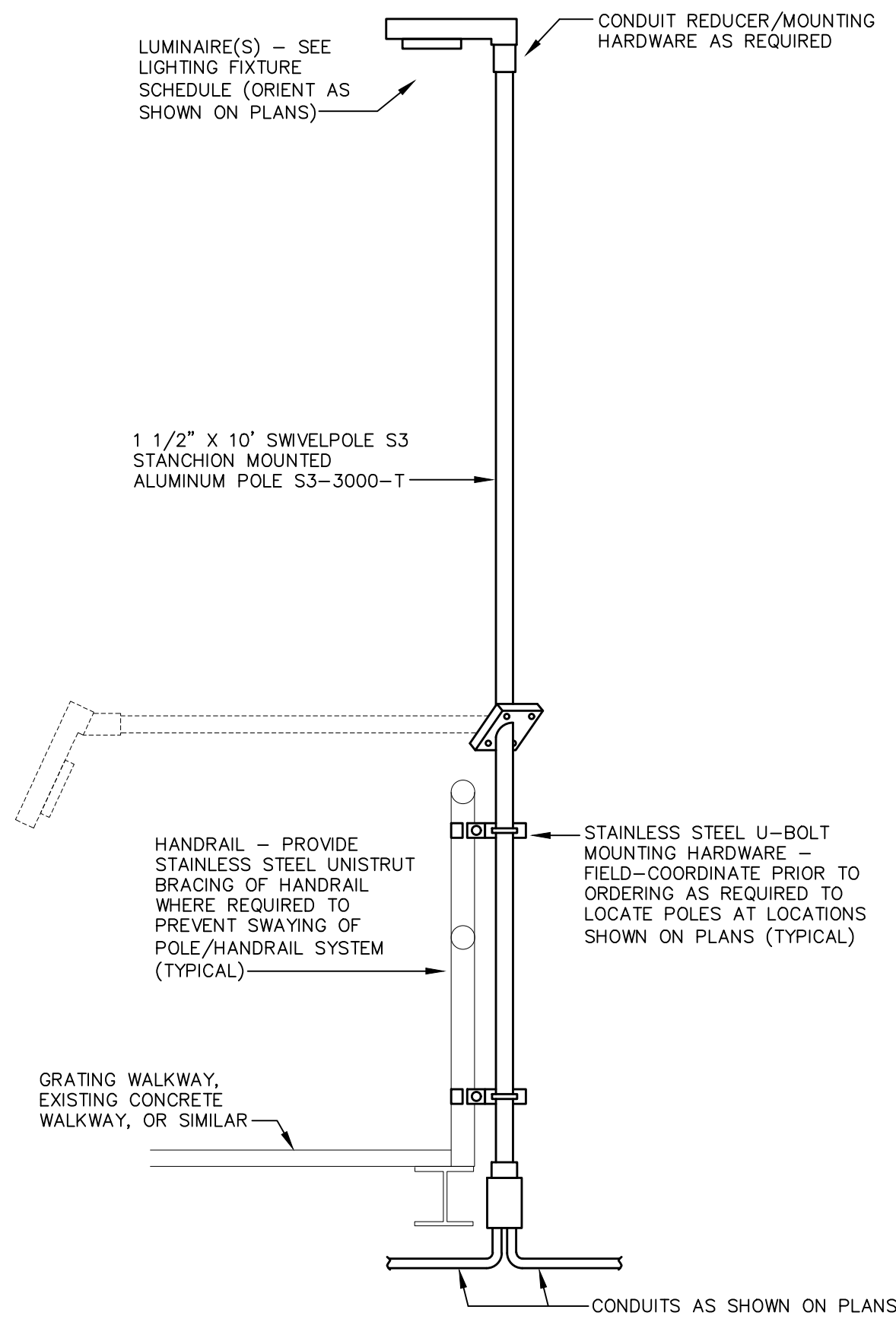


**ELEVATION**

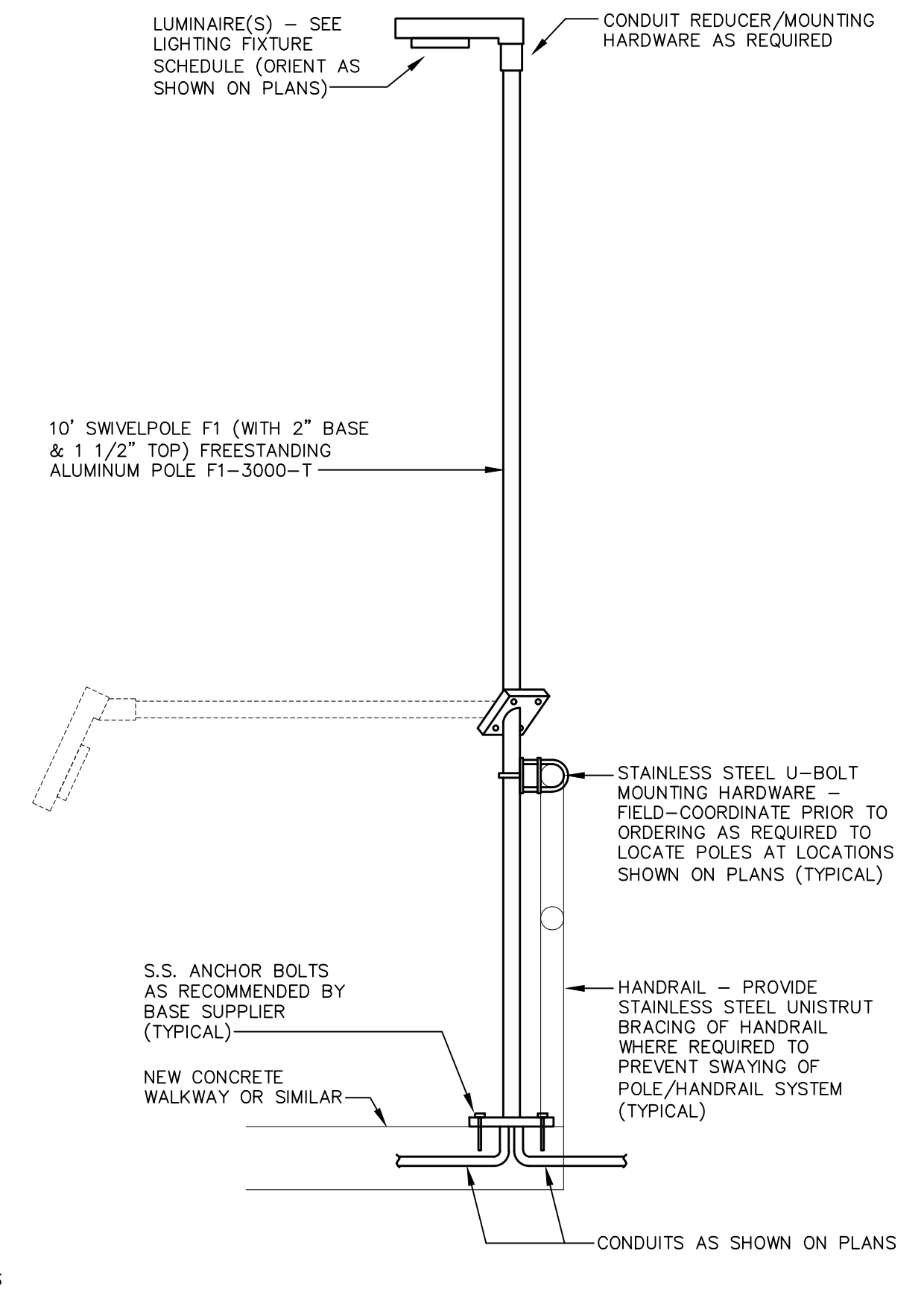
**DETAIL "E-LP1" EXPOSED LIGHT POLE BASE**  
SCALE : NONE

DETAIL NOTES				
1. THIS CONTRACTOR SHALL CONFIRM SOIL CONDITIONS PRIOR TO BID OR INSTALLATION. IF SOIL CONDITIONS/TYPES ARE DIFFERENT THAN THE SPECIFIC TYPES INDICATED BELOW, OR THE POLE HEIGHTS ARE IN EXCESS OF THOSE LISTED BELOW, OR THE BASIC WIND SPEED FOR THE PROPOSED POLE LOCATION (PER ASCE 7 BASIC WIND SPEED MAPS) IS IN EXCESS OF 100MP, OR THE COMBINED E.P.A. OF ALL LUMINAIRES/ARMS/ACCESSORIES INSTALLED ON A POLE IS IN EXCESS OF 5.5 S.F., THE CONTRACTOR SHALL RETAIN A QUALIFIED STRUCTURAL ENGINEER (LICENCED IN THE STATE OF THE PROJECT) TO PROVIDE A PROJECT-SPECIFIC STRUCTURAL DESIGN FOR THE PROPOSED POLE BASE(S), AND SHALL INCLUDE ALL COSTS (FOR THE DESIGN AND THE REQUIRED POLE BASES) IN THE BID.				
2. MINIMUM POLE BASE DIAMETER SHALL BE THE GREATER OF THE FOLLOWING: A. ANCHOR BOLT CIRCLE DIAMETER PLUS 8" (TO PROVIDE MINIMUM 4" COVER OVER ALL ANCHOR BOLTS). B. 20" DIAMETER. C. DIAMETER AS REQUIRED BY SOIL CONDITIONS OR BY POLE SUPPLIER.				
3. CONTRACTOR SHALL VERIFY LOCATIONS OF ALL UNDERGROUND UTILITIES OR OBSTRUCTIONS TO AVOID CONFLICTS PRIOR TO INSTALLATION OF LIGHT POLE BASE(S).				
4. POLE SHALL BE RATED TO WITHSTAND THE WIND SPEED SPECIFIED FOR THE SPECIFIC PROJECT SITE LOCATION PER LATEST VERSION OF ASCE 7 BASIC WIND SPEED MAPS OR APPLICABLE LOCAL BUILDING CODE REQUIREMENTS (WHICHEVER IS MORE STRINGENT), WITH 1.3 GUST FACTOR WITH ALL LUMINAIRES & ACCESSORIES INSTALLED.				

POLE HEIGHT	POLE BASE DIMENSIONS			BASE DIAMETER
	MINIMUM BASE DEPTH (BELOW GRADE) (SEE NOTE 1 ABOVE)			
	CLAYEY SOILS (CL, ML, CH, MH)	SANDY SOILS (SW, SP, SM, SC, GM, GC)	GRAVELY SOILS (GW, GP)	
0 - 15 FT.	6'-0"	5'-0"	4'-6"	SEE NOTE 2 ABOVE
16 - 20 FT.	7'-0"	5'-6"	5'-0"	SEE NOTE 2 ABOVE
21 - 25 FT.	8'-0"	6'-0"	5'-6"	SEE NOTE 2 ABOVE
26 - 30 FT.	8'-6"	7'-0"	6'-6"	SEE NOTE 2 ABOVE
31 - 35 FT.	9'-0"	8'-0"	7'-0"	SEE NOTE 2 ABOVE
36 - 40 FT.	10'-0"	8'-6"	7'-6"	SEE NOTE 2 ABOVE
41 - 45 FT.	10'-6"	8'-6"	8'-0"	SEE NOTE 2 ABOVE
46 - 50 FT.	11'-0"	9'-0"	8'-6"	SEE NOTE 2 ABOVE

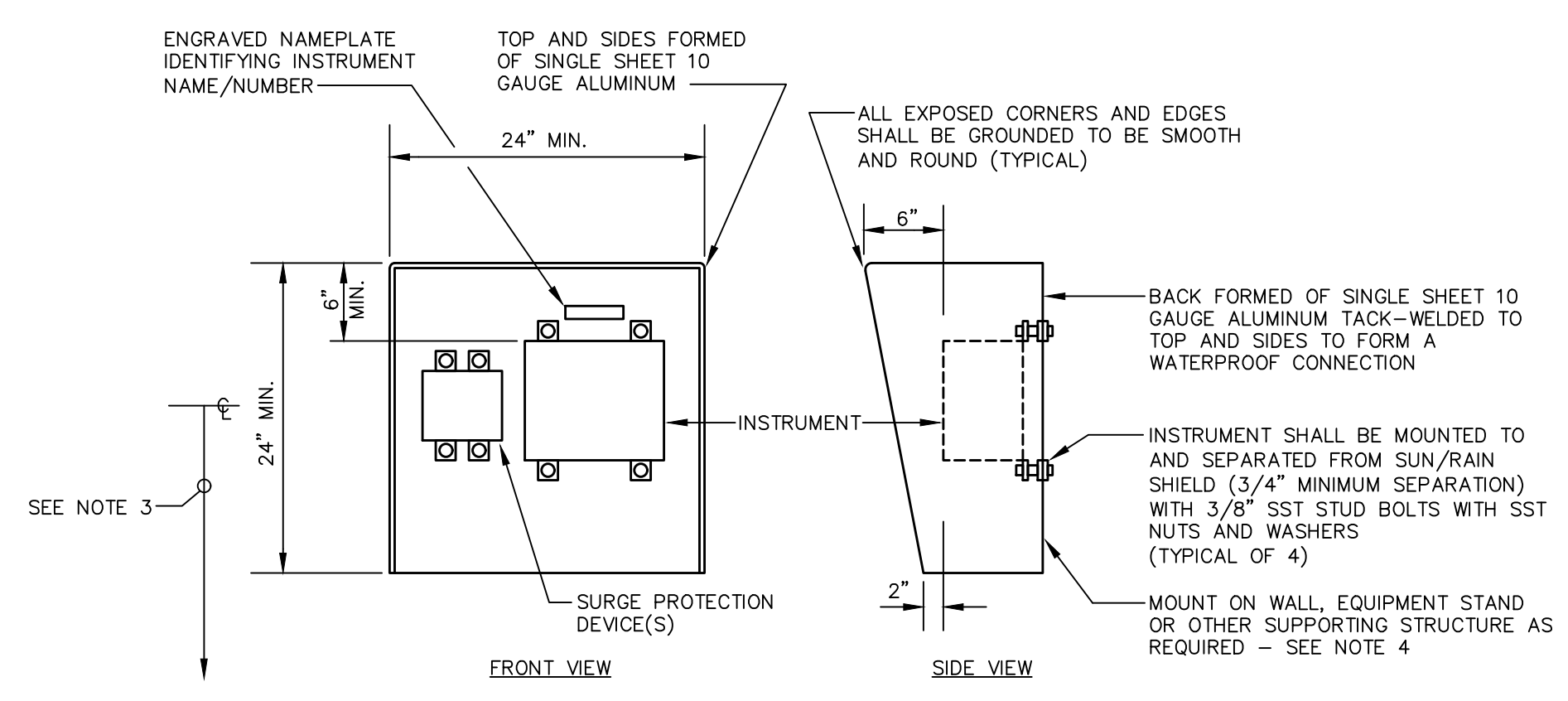


(AT GRATING WALKWAYS OR SIMILAR)



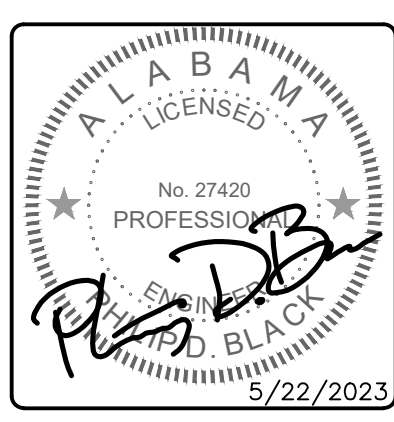
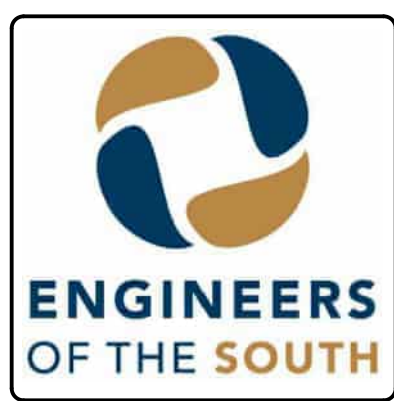
(AT NEW CONCRETE WALKWAYS OR SIMILAR)

**DETAIL "E-LP2" "SWIVELPOLE" POLELIGHT MOUNTING**  
SCALE : NONE



**DETAIL "E-SRS" INSTRUMENT SUN/RAIN SHIELD INSTALLATION DETAIL**  
SCALE : NONE

DETAIL NOTES	
1.	SUN/RAIN SHIELDS SHALL BE FURNISHED FOR ALL ELECTRONIC INSTRUMENTS THAT WILL BE EXPOSED TO SUN OR RAIN (OR WHERE OTHERWISE SPECIFICALLY NOTED).
2.	DIMENSIONS SHOWN ABOVE ARE MINIMUM. SUN/RAIN SHIELDS SHALL BE SUFFICIENTLY SIZED TO ACCOMMODATE INSTRUMENT PLUS ASSOCIATED SURGE PROTECTION DEVICE(S), POWER SUPPLIES, AND OTHER SIMILAR DEVICES.
3.	CENTERLINE OF INSTRUMENT SHALL BE LOCATED AT APPROXIMATELY 60" ABOVE GRADE/FLOOR LEVEL.
4.	WHERE SUN/RAIN SHIELD IS SHOWN TO BE MOUNTED AT HANDRAIL(S), PROVIDE TWO (2) SETS OF VERTICAL 316 STAINLESS STEEL UNISTRUT FRAMES FROM "BACK" SIDE OF BOTH RAILS OF HANDRAIL SYSTEM AS REQUIRED TO OFFSET SUN/RAIN SHIELD BEHIND HANDRAIL SYSTEM, SUCH THAT FRONT OF SUN/RAIN SHIELD DOES NOT PROTRUDE INTO WALKWAY PAST INSIDE OF HANDRAIL, TO "BACK" SIDE OF SUN/RAIN SHIELD.



NO	DATE	DESCRIPTION	FOR REVIEW AND COMMENT	AS-BID	CONSTRUCTION REVISIONS	AS-BUILT

Alabama Water Utilities  
BIRMINGHAM, ALABAMA  
**BROOKWOOD**  
SEU WWTP IMPROVEMENTS  
TUSCALOOSA COUNTY, ALABAMA

ELECTRICAL DETAILS

BOX IS 2 IN WIDE AT FULL SCALE

JOB NO: SW-20026

DATE: MAY 2022

DESIGNED BY: PDB

DRAWN BY: ZJG

DWG: 95-E-03

SHEET NUMBER **47**





# Brookwood SEU WWTP

## Improvements

ALABAMA WATER UTILITIES, INC.  
BIRMINGHAM, ALABAMA



**Alabama  
Water Utilities**

**A SouthWest Water Company**

CONTRACT DOCUMENTS &  
TECHNICAL SPECIFICATIONS



 **ENGINEERS  
OF THE SOUTH**

208 OAK MOUNTAIN CIRCLE  
PELHAM, ALABAMA 35124  
TEL 205-327-9140

MAY  
2023  
SW-20026



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BROOKWOOD SEU WWTP IMPROVEMENTS**

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- 00 43 24 BASIS OF PAYMENT

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- C200 INSTRUCTIONS TO BIDDERS
- C410 BID FORM FOR CONSTRUCTION CONTRACT
- C430 BID BOND PENAL SUM
- C510 NOTICE OF AWARD
- C520 AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR  
CONSTRUCTION
- C550 NOTICE TO PROCEED
- C610 PERFORMANCE BOND
- C615 PAYMENT BOND
- C625 CERTIFICATE OF SUBSTANTIAL COMPLETION
- C626 NOTICE OF ACCEPTABILITY
- C700 GENERAL CONDITIONS

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- 01 11 00 SUMMARY OF WORK
- 01 52 00 WORKING AROUND EXISTING UTILITIES
- 01 56 00 TEMPORARY FACILITIES AND CONTROLS
- 01 60 00 PRODUCT REQUIREMENTS
- 01 78 30 WARRANTIES AND BONDS

*Facility Construction Subgroup*

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- 05 50 00 METAL FABRICATIONS
- 05 51 00 METAL STAIRS
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- 06 74 13 FIBERGLASS REINFORCED GRATING



**DIVISION 09 - FINISHES**

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26 05 53 ELECTRICAL IDENTIFICATION  
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26 24 17 LIGHTING PANELBOARDS  
26 27 26 WIRING DEVICES  
26 28 16 SAFETY SWITCHES AND FUSES  
26 29 00 MANUFACTURED CONTROL PANELS  
26 50 00 LIGHTING MATERIALS AND METHODS

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**APPENDIX**


SCADA Integrator scope of services

Scope of supply for pre-purchased equipment

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1.1 DESIGN PROFESSIONALS OF RECORD

<p>PROJECT ENGINEER</p>	<p>Wynn Echols, Jr. PE No. 22177</p> <p>Engineers of the South Birmingham, AL (205) 327-9140</p> <p>Divisions 00 - 49 except where indicated as prepared by other design professionals of record.</p>	 <p>05/01/2023</p>
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END OF SECTION 00 01 07



## **SECTION 00 43 24 - BASIS OF PAYMENT**

### **BROOKWOOD SEU WWTP IMPROVEMENTS**

The following sections summarize the intent of the bid documents for providing a basis of payment for all work required to complete the project. Descriptions correspond to the numbering in the Unit Prices Form. Any misinterpretations of these descriptions evident in the Contractor's proposal as an "unbalanced" bid shall be basis for considering the bid unresponsive. As described in the Instructions to Bidders Section, the Owner reserves the right to reduce quantities and/or completely remove bid items from the work. The Owner does not guarantee that the approximate quantities or allowances given will hold in the construction of the work. Final Payment will be made for actual quantities of the work performed as approved by the Engineers, at the contract prices bid. Should the quantities of the pay items be more or less than the quantities estimated, the contract unit prices bid in the Proposal will prevail.

The Contract Unit or Lump Sum Bid Amounts shall be payment in full for furnishing all resources (materials, labor, equipment, etc.) necessary to install and complete each portion of the project in complete accordance with the requirements of the Plans, Specification, and Contractual Documents. The Contract Bid Amounts shall include the cost of completing all work described under each bid item description and all necessary incidental work not included or listed as a separate bid item.

#### **ITEM 1 – MOBILIZATION**

The Contract Lump Sum price shall be the cost for mobilization of the Contractor's forces. This item includes portions or all of the Contractor's cost for bonds, insurance, setting up the field offices (if required), establishing temporary utilities, providing an acceptable schedule of payment values, mobilization of equipment, and personnel movement. This will be paid upon completion of mobilization.

#### **ITEM 2 – ROTARY DRUM SCREEN**

The Contract Lump Sum Price shall be the furnishing of all labor, materials, and screen equipment excluding the work and materials listed in other Bid Items. This shall include all additions and/or modifications to the influent / effluent pipe (tapping existing pipe, new influent pipe, valves, fittings and pipe supports, effluent discharge pipe) and screening discharge chute not listed as separate Bid Items. The lump sum price shall also include electrical feed and connections, and all other work and incidentals necessary and required to provide a complete and properly functioning automatic screen in complete accordance with the Plans, Specifications, and Contract documents.

#### **ITEM 3 – ROTARY DRUM SCREEN SUPPORT STRUCTURE**

The Contract Lump Sum Price shall be the furnishing of all labor, materials, and ancillary items excluding the work and materials listed in other Bid Items. This shall include all foundation work including excavation and installation of reinforced concrete base, structural members, grating, stairs, handrails and supports to mount and access the screening unit, and all other work and incidentals necessary and required to provide a complete and equipment support structure in complete accordance with the Plans, Specifications, and Contract documents.

#### **ITEM 4 – OTHER WWTP IMPROVEMENTS**

The Contract Lump Sum Price shall be the furnishing of all labor, materials, and equipment necessary to complete the Brookwood SEU WWTP Improvements excluding the work and materials listed in other Bid Items. This shall include all additions and/or modifications not listed as separate Bid

Items. The lump sum price shall include, but not be limited to, excavating, transporting, placing, and compacting soil fill, the structures, complete equipment assemblies, post aeration blower and controls, installation of tertiary filter and ancillary components, transfer piping, installation of UV disinfection unit controls, dewatering pump station, water reuse pump, all valves (and valve boxes), piping, fittings, all drainage materials and requirements, general water plumbing, connections to existing lines, electrical, and all other work and incidentals necessary and required to construct a complete and properly functioning wastewater treatment facility in complete accordance with the Plans, Specifications, and Contract documents.

#### **ITEM 5 – SCADA AND INSTRUMENTATION**

The Allowance shall be payment in full for the furnishing of all labor, materials, and equipment necessary for the proposed SCADA system and computer improvements. This shall include all additions and/or modifications as shown on the Drawings, Specifications, and Contract Documents. This item shall include, but not be limited to: the I/O Centers for the SCADA system; programming; hardware; software, etc., with all appurtenances, incidentals, and miscellaneous equipment or services necessary for a complete and operable system in full accordance with the Plans, Specifications, and Contract documents. The work shall be performed by Electric Machine Control, Inc., 7015 Haisten Drive, Trussville, Alabama 35173.

#### **ITEM 6 – RESTORATION, START-UP, TESTING, AND RETURN OF COMPLETED FACILITIES TO OPERATION**

The Contract Lump Sum Price shall be paid for furnishing the Owner an operable and completed wastewater treatment plant in which all improvements included in the project have successfully passed all start-up requirements and tests as specified. The new facilities shall have been approved by all authorities for use by the Owner as intended and is put into service. The price in this item represents an allowance that is established by the Owner and used by all Contractors bidding the project. The amount of money written in this item will be paid to the Contractor when the plant is in satisfactory service since the project's components are an integral part of the entire wastewater system project needed by the Owner. Partial payment will not be allowed on this item.

END OF SECTION 00 43 24



INVITATION FOR BIDS  
Alabama Water Utilities, Inc.  
Birmingham, AL  
BROOKWOOD SEU WWTP IMPROVEMENTS

General Notice

Alabama Water Utilities, Inc. (Owner) is requesting Bids for the construction of the following Project:

Brookwood SEU WWTP Improvements  
Project No. SW 20026

Bids for the construction of the Project will be received at the Alabama Water Utilities' Company office located at 728 Volare Drive, Birmingham, AL 35244, until Tuesday, July 25, 2023, at 2:00 pm local time. At that time the Bids received will be privately opened and read.

The Project includes the following Work:

Construction of a new influent screen at the existing Brookwood SEU WWTP:

- Furnish and Install Drum Screen and support platform
- Install Owner furnished tertiary filter unit
- Install Owner furnished UV disinfection unit
- Furnish and Install Post Air system
- Furnish and Install Flow Metering box
- Electrical and Instrumentation improvements

Obtaining the Bidding Documents

Bid documents (plans, specifications, proposal forms, and other contract documents) may be examined at the office of Engineers of the South, 208 Oak Mountain Circle, Pelham, AL 35124 (205) 327-9140. Complete digital project bidding documents are available at [www.questcdn.com](http://www.questcdn.com). They may be downloaded for \$50.00 by inputting Quest project #8277970 on the QuestCDN project search page. Contact QuestCDN at 952-233-1632 or [info@questcdn.com](mailto:info@questcdn.com) for assistance and free membership registration. General Contractors who bid must obtain documents from QuestCDN.

Pre-bid Conference

A mandatory pre-bid conference for the Project will be held on Tuesday, July 18, 2023, at 10:00 am at Brookwood SEU WWTP – located off Brookwood Parkway in Brookwood, Tuscaloosa County, AL (directions to be provided). Bids will not be accepted from Bidders that do not attend the mandatory pre-bid conference.

Instructions to Bidders.

For all further requirements regarding bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents.

This Invitation is issued by:

Owner: Alabama Water Utilities, Inc.  
By: Harry Chandler, PE  
Title: Director of Operations  
Date: 2023-06-16

# INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

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## ARTICLE 1—DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions

## ARTICLE 2—BIDDING DOCUMENTS

2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.

2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.

2.03 Bid documents (plans, specifications, proposal forms, and other contract documents) may be examined at the office of Engineers of the South, 208 Oak Mountain Circle, Pelham, AL 35124 (205) 327-9140. Complete digital project bidding documents are available at [www.questcdn.com](http://www.questcdn.com). They may be downloaded for \$50.00 by inputting Quest project #827970 on the QuestCDN project search page. Contact QuestCDN at 952-233-1632 or [info@questcdn.com](mailto:info@questcdn.com) for assistance and free membership registration. General Contractors who bid must obtain documents from QuestCDN.

### 2.04 *Electronic Documents*

A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.

1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.04.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

### **ARTICLE 3—QUALIFICATIONS OF BIDDERS (OMITTED)**

### **ARTICLE 4—PRE-BID CONFERENCE**

- 4.01 A mandatory pre-bid conference for the Project will be held on Tuesday, July 18, 2023, at 10:00 am at Brookwood SEU WWTP – located off Brookwood Parkway in Brookwood, Tuscaloosa County, AL (directions to be provided). Representatives of Owner and Engineer will be present to discuss the Project. Proposals will not be accepted from Bidders who do not attend the conference. It is each Bidder’s responsibility to sign in at the pre-bid conference to verify its participation. Bidders must sign in using the name of the organization that will be submitting a Bid. A list of qualified Bidders that attended the pre-bid conference and are eligible to submit a Bid for this Project will be issued in an Addendum.
- 4.02 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

### **ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER’S SAFETY PROGRAM; OTHER WORK AT THE SITE**

#### 5.01 *Site and Other Areas*

- A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

### **ARTICLE 6—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS**

#### 6.01 *Express Representations and Certifications in Bid Form, Agreement*

- A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder’s examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.
- B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.



## **ARTICLE 7—INTERPRETATIONS AND ADDENDA**

- 7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.
- 7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:
- 7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders via the QuestCDN website. Questions received less than seven days prior to the date for opening of Bids may not be answered.
- 7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

## **ARTICLE 8—BID SECURITY**

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of five (5) percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates), not to exceed \$10,000.00, and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents.
- 8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract and furnish the required Contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.
- 8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the

Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

- 8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

#### **ARTICLE 9—CONTRACT TIMES**

- 9.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.
- 9.02 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

#### **ARTICLE 10—SUBSTITUTE AND “OR EQUAL” ITEMS**

- 10.01 See Section 00 43 33 Proposed Products Form (if provided) for additional information
- 10.02 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of “or-equal” or substitution requests are made at Bidder’s sole risk.

#### **ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS**

- 11.01 If known at the time of the bid, contractor shall provide the owner contact information and value of work or products included for each diverse subcontractors/suppliers in the bid.
- 11.02 Refer to Exhibit C200-1 regarding the Owner’s Contractor-Subcontractor-Supplier Diversity Program.

#### **ARTICLE 12—PREPARATION OF BID**

- 12.01 The Bid Form is included with the Bidding Documents.
- A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
- 12.02 The Bid must contain evidence of Bidder’s authority to do business in the state where the Project is located.
- 12.03 Bidder’s state contractor license number, if any, must also be shown on the Bid Form.

#### **ARTICLE 13—BASIS OF BID (OMITTED)**

#### **ARTICLE 14—SUBMITTAL OF BID**

- 14.01 The Bidding Documents include one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid



security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.

- 14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the invitation to bid and must be enclosed in a plainly marked package with the Project title, and, the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the designated location.
- 14.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

#### **ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID**

- 15.01 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.

#### **ARTICLE 16—OPENING OF BIDS**

- 16.01 Bids will be opened privately.

#### **ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE (OMITTED)**

#### **ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT**

- 18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.
- 18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.
- 18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.
- 18.04 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.

#### **ARTICLE 19—BONDS AND INSURANCE**

- 19.01 Article 6 of the General Conditions sets forth Owner's requirements as to performance and payment bonds, other required bonds (if any), and insurance. When the Successful Bidder delivers

the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.

- 19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

#### **ARTICLE 20—SIGNING OF AGREEMENT**

- 20.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

#### **ARTICLE 21—SALES AND USE TAXES**

- 21.01 Owner is exempt from Alabama state sales and use taxes on materials and equipment to be incorporated in the Work. Said taxes must not be included in the Bid.

#### **ARTICLE 22—CONTRACTS TO BE ASSIGNED (OMITTED)**



**EXHIBIT C200-1**

**Contractor-Subcontractor-Supplier Diversity Program**

**for**

**Minority Business Enterprise (MBE), Woman Business Enterprise (WBE), Disadvantaged Business Enterprise (DBE) and/or Veteran Owned Business (VBE)**

Bidders are encouraged, but not required, to solicit pricing from Minority Business Enterprise (MBE), Woman Business Enterprise (WBE), Disadvantaged Business Enterprise (DBE) and/or Veteran Owned Business (VBE) Subcontractors and Suppliers. For Subcontractors and Suppliers meeting diversity criteria, the Bidder should include a notation on the Bid Form where applicable. When diverse Subcontractors and Suppliers are utilized by the Contractor, the Contractor shall provide the Owner contact information and value of work or products included for each of the diverse Subcontractors/Suppliers in the Bid (if known at the time of the bid) and on each Application for Payment.

Below is a partial listing of resources that have published lists of various diversity Subcontractors and Suppliers.

Alabama Department of Transportation  
1409 Coliseum Blvd  
Montgomery, AL 36130  
(334) 353 or (800) 269-5081  
<https://www.dot.state.al.us/cboweb/DBEProgram.html>

Alabama Department of Economic and  
Community Affairs  
Office of Minority Business Enterprise  
P.O. Box 5690  
Montgomery, AL 36103-5690  
(334) 353-3966  
<http://adeca.alabama.gov/Divisions/ced/cdp/Pages/ombe.aspx>

Alabama Governor's Office of Minority Affairs  
100 N. Union St. Suite 360  
Montgomery, AL 36104  
(334) 353-2113  
[info@goma.alabama.gov](mailto:info@goma.alabama.gov)  
<https://goma.alabama.gov/>

Birmingham Construction Industrial Authority  
301 37<sup>th</sup> Street South  
Birmingham, AL 35222  
(205) 324-6202  
Fax: (205) 324-6210  
[aorl@bcia1.org](mailto:aorl@bcia1.org)  
<https://bcia1.org/>

Birmingham Office of Economic Development  
City Hall / Third Floor  
710 20<sup>th</sup> Street North  
Birmingham, AL 35203  
(205) 524-2799  
Fax (205) 254-7741  
<https://oed.birminghamal.gov/>

U.S. Department of Commerce  
Minority Business Development Agency  
Atlanta MBDA Business Center  
75 5<sup>th</sup> Street, NW Suite 300  
Atlanta, GA 30308  
(404) 894-8150  
<https://mbdabusinesscenter-atlanta.org/>  
<https://www.mdba.gov/>

National Association of Minority Contractors (NAMC)  
The Barr Building  
910 17<sup>th</sup> Street, NW, Suite 413  
Washington, DC 20006  
(202) 296-1644  
Fax: (202) 296-1644  
[info@namcnational.org](mailto:info@namcnational.org)  
<http://namcnational.org>

NAMC Greater Atlanta Chapter  
1134 Main Street  
Forest Park, GA 30297  
(678) 943-9667  
[www.namcatlanta.org](http://www.namcatlanta.org)

U.S. Small Business Administration  
<https://www.sba.gov/>  
[http://web.sba.gov/pro-net/search/dsp\\_dsbs.cfm](http://web.sba.gov/pro-net/search/dsp_dsbs.cfm)  
<https://www.sba.gov/offices/headquarters/wbo/>



# BID FORM FOR CONSTRUCTION CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders and the General Conditions.

## ARTICLE 1—OWNER AND BIDDER

- 1.01 This Bid is submitted to: **Alabama Water Utilities, Inc.**
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

## ARTICLE 2—ATTACHMENTS TO THIS BID

- 2.01 The following documents are submitted with and made a condition of this Bid:
  - A. Required Bid security;
  - B. Section 00 43 33 – Proposed Products Form (if provided)
  - C. Evidence of authority to do business in the state of the Project;
  - D. Contractor’s license number as evidence of Bidder’s State Contractor’s License;
  - E. E-Verify

## ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

### 3.01 BROOKWOOD SEU WWTP IMPROVEMENTS BID

Item	Description	Qty	Unit	Unit Price	Total
1	Mobilization and Demobilization	1	LS		
2	Rotary Drum Screen	1	LS		
3	Rotary Drum Screen Support Structure	1	LS		
4	Other WWTP Improvements	1	LS		
5	SCADA and Instrumentation	1	Allowance	\$42,151.24	\$42,151.24
6	Restoration, Start-up, Testing, and Return of Completed Facilities to Operation	1	LS	\$15,000.00	\$15,000.00
GRAND TOTAL					

**ARTICLE 4—BASIS OF BID—COST-PLUS FEE (OMITTED-RESERVED)**

**ARTICLE 5—PRICE-PLUS-TIME BID (OMITTED-RESERVED)**

**ARTICLE 6—TIME OF COMPLETION**

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

**ARTICLE 7—BIDDER’S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA**

- 7.01 Bid Acceptance Period
  - A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.
- 7.02 Instructions to Bidders
  - A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.
- 7.03 Receipt of Addenda
  - A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

**ARTICLE 8—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS**

- 8.01 Bidder’s Representations
  - A. In submitting this Bid, Bidder represents the following:
    - 1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
    - 2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
    - 3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
    - 4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.



5. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
6. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
7. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
8. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
9. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
10. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

#### 8.02 Bidder's Certifications

##### A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
  - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
  - b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
  - c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.

- d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

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BIDDER hereby submits this Bid as set forth above:

Bidder:

\_\_\_\_\_  
*(typed or printed name of organization)*

By: \_\_\_\_\_  
*(individual's signature)*

Name: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

Date: \_\_\_\_\_  
*(typed or printed)*

*If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.*

Attest: \_\_\_\_\_  
*(individual's signature)*

Name: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

Date: \_\_\_\_\_  
*(typed or printed)*

Address for giving notices:

\_\_\_\_\_  
\_\_\_\_\_

Bidder's Contact:

Name: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

Phone: \_\_\_\_\_

Email: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Bidder's Contractor License No.: \_\_\_\_\_

## BID BOND (PENAL SUM FORM)

<p><b>Bidder</b></p> <p>Name:</p> <p>Address <i>(principal place of business)</i>:</p>	<p><b>Surety</b></p> <p>Name:</p> <p>Address <i>(principal place of business)</i>:</p>
<p><b>Owner</b></p> <p>Name: <b>Alabama Water Utilities, Inc.</b></p> <p>Address <i>(principal place of business)</i>:</p> <p><b>728 Volare Drive</b> <b>Birmingham, AL 35244</b></p>	<p><b>Bid</b></p> <p>Project: Brookwood SEU WWTP Improvements, Brookwood, AL</p> <p>Bid Due Date:</p>
<p><b>Bond</b></p> <p>Penal Sum:</p> <p>Date of Bond:</p>	
<p>Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.</p>	
<p>Bidder</p> <p style="text-align: center;">_____</p> <p style="text-align: center;"><i>(Full formal name of Bidder)</i></p>	<p>Surety</p> <p style="text-align: center;">_____</p> <p style="text-align: center;"><i>(Full formal name of Surety) (corporate seal)</i></p>
<p>By: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>	<p>By: _____</p> <p style="text-align: center;"><i>(Signature) (Attach Power of Attorney)</i></p>
<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>	<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>	<p>Attest: _____</p> <p style="text-align: center;"><i>(Signature)</i></p>
<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>	<p>Name: _____</p> <p style="text-align: center;"><i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p><i>Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.</i></p>	



1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
  - 3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
  - 3.2. All Bids are rejected by Owner, or
  - 3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

## BID BOND (PENAL SUM FORM)

<b>Bidder</b> Name: Address <i>(principal place of business)</i> :	<b>Surety</b> Name: Address <i>(principal place of business)</i> :
<b>Owner</b> Name: <b>Alabama Water Utilities, Inc.</b> Address <i>(principal place of business)</i> : <b>728 Volare Drive</b> <b>Birmingham, AL 35244</b>	<b>Bid</b> Project: Brookwood SEU WWTP Improvements, Brookwood, AL  Bid Due Date:
<b>Bond</b> Penal Sum: Date of Bond:	
Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.	
Bidder	Surety
_____ <i>(Full formal name of Bidder)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature) (Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<i>Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.</i>	



1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
  - 3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
  - 3.2. All Bids are rejected by Owner, or
  - 3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

**NOTICE OF AWARD**

Date of Issuance:

Owner: Alabama Water Utilities, Inc. Owner’s Project No.: SVO#1001055031

Engineer: Engineers of the South Engineer’s Project No.: SW-20026

Project: Brookwood SEU WWTP Improvements

Contract Name:

Bidder:

Bidder’s Address:

You are notified that Owner has accepted your Bid dated **[date]** for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

**Brookwood SEU WWTP Improvements:** The Contract Price of the awarded Contract is \$**[Contract Price]**. Contract Price is subject to adjustment based on the provisions of the Contract, including but not limited to those governing changes, Unit Price Work, and Work performed on a cost-plus-fee basis, as applicable.

The Agreement (Form C520) will be signed electronically through the Owner’s ContractWorks software once all bonds and insurance are provided and approved. Contract date will be determined at that time – no contract dates shall be entered prior.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Secure and deliver the Contract security (required performance and payment bonds) and insurance certificates, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.
2. Other conditions precedent (if any): **N/A**

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: **Alabama Water Utilities, Inc.**

By (signature): \_\_\_\_\_

Name (printed): \_\_\_\_\_

Title: \_\_\_\_\_

Copy: Engineer



# AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION OF BROOKWOOD SEU WWTP IMPROVEMENTS

This Agreement is by and between **Alabama Water Utilities, Inc.** (“Owner”) and **[name of contracting entity]** (“Contractor”).

Terms used in this Agreement have the meanings stated in the General Conditions.

Owner and Contractor hereby agree as follows:

## ARTICLE 1—WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: **Brookwood SEU WWTP Improvements**

## ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **[Project Name]**

## ARTICLE 3—ENGINEER

3.01 The Owner has retained **Engineers of the South** (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

3.02 INTENTIONALLY OMITTED

## ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 INTENTIONALLY OMITTED

4.03 *Contract Times: Days*

A. The Work will be substantially complete within **240** days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **270** days after the date when the Contract Times commence to run.

4.05 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time.

Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. *Substantial Completion:* Contractor shall pay Owner **\$350** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
  2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner **\$200** for each day that expires after such time until the Work is completed and ready for final payment.
  3. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

#### **ARTICLE 5—CONTRACT PRICE**

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

- A. For all Work a lump sum of \$\_\_\_\_\_.

#### **ARTICLE 6—PAYMENT PROCEDURES**

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the **25th** day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.
  - a. **Ninety (90)** percent of the value of the Work completed (with the balance being retainage).



Once 50 percent or more of the Work has been completed, as determined by Engineer, there will be no additional retainage.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price (including retainage) in accordance with Paragraph 15.06 of the General Conditions.

6.04 *Consent of Surety*

A. Owner will not make final payment, or return or release retainage, unless Contractor submits written consent of the surety to such payment, return, or release.

**ARTICLE 7—CONTRACT DOCUMENTS**

7.01 *Contents*

A. The Contract Documents consist of all of the following:

1. This Agreement.
2. Bonds:
  - a. Performance bond (together with power of attorney).
  - b. Payment bond (together with power of attorney).
3. General Conditions.
4. Specifications as listed in the table of contents of the project manual (copy of list attached).
5. Drawings:

<b>SHT.#</b>	<b>DWG#</b>	<b>DRAWING DESCRIPTION</b>
<b><u>00-GENERAL</u></b>		
<b>1</b>	<b>00-C-01</b>	<b>COVER SHEET</b>
<b>2</b>	<b>00-C-02</b>	<b>SHEET INDEX AND PROJECT NOTES</b>
<b>3</b>	<b>00-C-03</b>	<b>PROJECT NOTES</b>
<b>4</b>	<b>00-C-04</b>	<b>SANITARY SEWER PROJECT NOTES</b>
<b>5</b>	<b>00-C-05</b>	<b>CONCRETE NOTES</b>
<b><u>10-SITE</u></b>		
<b>6</b>	<b>10-C-01</b>	<b>EXISTING SITE PLAN</b>
<b>7</b>	<b>10-C-05</b>	<b>OVERALL SITE PLAN IMPROVEMENTS</b>
<b>8</b>	<b>10-C-06</b>	<b>WWTP SITE PLAN</b>
<b><u>20-SCREENING UNIT</u></b>		
<b>9</b>	<b>20-C-01</b>	<b>PARKSON HYCOR SCREENING UNIT PLAN</b>
<b>10</b>	<b>20-C-02</b>	<b>PARKSON HYCOR SCREENING UNIT SECTIONS</b>
<b>11</b>	<b>20-C-03</b>	<b>PARKSON HYCOR SCREENING UNIT MECHANICAL</b>
<b>12</b>	<b>20-C-04</b>	<b>INFLUENT LIFT STATION SECTIONS B-C AND D</b>
<b>13</b>	<b>20-C-07</b>	<b>SCREENING UNIT FORCE MAIN CONNECTION SECTION C</b>

<u>14</u>	<u>20-C-10</u>	<u>IPEC SCREENING UNIT PLAN</u>
<u>15</u>	<u>20-C-11</u>	<u>IPEC SCREENING UNIT SECTIONS</u>
<u>16</u>	<u>20-C-12</u>	<u>IPEC SCREENING UNIT MECHANICAL</u>
<u>17</u>	<u>20-C-13</u>	<u>IPEC SCREENING UNIT STAIRS DETAIL</u>
<u>18</u>	<u>20-C-14</u>	<u>GRINDER PUMP STATION AND TRENCH DRAIN DETAILS</u>

### 30-FILTRATION AND DISINFECTION UNITS

<u>19</u>	<u>30-C-01</u>	<u>FILTRATION AND DISINFECTION UNITS LOWER PLAN</u>
<u>20</u>	<u>30-C-02</u>	<u>FILTRATION AND DISINFECTION UNITS UPPER PLAN</u>
<u>21</u>	<u>30-C-03</u>	<u>FILTRATION AND DISINFECTION EQUIPMENT PLAN</u>
<u>22</u>	<u>30-C-04</u>	<u>FILTRATION AND DISINFECTION UNITS SECTIONS A AND B</u>
<u>23</u>	<u>30-C-05</u>	<u>FILTRATION AND DISINFECTION UNITS SECTIONS C AND D</u>
<u>24</u>	<u>30-C-06</u>	<u>FILTRATION AND DISINFECTION UNITS SECTION E</u>
<u>25</u>	<u>30-C-07</u>	<u>FILTRATION AND DISINFECTION UNITS REUSE PUMP PLAN</u>
<u>26</u>	<u>30-C-08</u>	<u>FILTRATION AND DISINFECTION UNITS SECTIONS F AND G</u>
<u>27</u>	<u>30-C-09</u>	<u>FILTRATION AND DISINFECTION UNITS SECTION H</u>
<u>28</u>	<u>30-C-10</u>	<u>UV DISINFECTION UNIT PLAN AND SECTIONS</u>

### 40-FLUIDYNE FILTER

<u>29</u>	<u>40-C-01</u>	<u>FLUIDYNE FILTER PLAN AND ANCHOR PLACEMENT</u>
<u>30</u>	<u>40-C-02</u>	<u>FLUIDYNE FILTER SECTIONS</u>
<u>31</u>	<u>40-C-03</u>	<u>FLUIDYNE FILTER HOIST DETAILS</u>

### 95-DETAILS

<u>32</u>	<u>95-C-01</u>	<u>TYPICAL DETAILS THRUST RESTRAINT</u>
<u>33</u>	<u>95-C-02</u>	<u>TYPICAL DETAILS SITE SHT 1</u>
<u>34</u>	<u>95-C-21</u>	<u>TYPICAL DETAILS PIPE SUPPORT</u>
<u>35</u>	<u>95-C-22</u>	<u>TYPICAL DETAILS METALS</u>

### E-ELECTRICAL

<u>36</u>	<u>00-E-01</u>	<u>ELECTRICAL LEGEND</u>
<u>37</u>	<u>00-E-02</u>	<u>ELECTRICAL NOTES &amp; LIGHTING FIXTURE SCHEDULE</u>
<u>38</u>	<u>00-E-03</u>	<u>ELECTRICAL SCHEDULES AND DIAGRAMS</u>
<u>39</u>	<u>10-E-01</u>	<u>OVERALL SITE ELECTRICAL DEMOLITION PLAN</u>
<u>40</u>	<u>10-E-02</u>	<u>OVERALL SITE ELECTRICAL PLAN</u>
<u>41</u>	<u>20-E-01</u>	<u>SCREENING UNIT ELECTRICAL PLAN</u>
<u>42</u>	<u>20-E-02</u>	<u>SCREENING UNIT SUPPLEMENTAL GROUNDING PLAN</u>
<u>43</u>	<u>30-E-01</u>	<u>FILTRATION AND DISINFECTION UNITS ELECTRICAL PLAN</u>
<u>44</u>	<u>30-E-02</u>	<u>FILTRATION AND DISINFECTION UNITS SUPPLEMENTAL GROUNDING PLAN</u>
<u>45</u>	<u>95-E-01</u>	<u>ELECTRICAL DETAILS</u>
<u>46</u>	<u>95-E-02</u>	<u>ELECTRICAL DETAILS</u>
<u>47</u>	<u>95-E-03</u>	<u>ELECTRICAL DETAILS</u>

6. Addenda (numbers [number] to [number], inclusive).
7. Exhibits to the General Conditions, numbered as follows:  
Exhibit 4.05 – Foreseeable Bad Weather Days



Exhibit 6.02 – Required Insurance

8. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
  - a. Notice to Proceed.
  - b. Work Change Directives.
  - c. Change Orders.
  - d. Field Orders.
  - e. Warranty Bond, if any.
- B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 7.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

**ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS**

8.01 *Contractor's Representations*

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
  1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
  2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
  3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
  4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
  5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
  6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and

procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.

7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

#### 8.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:
  1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
  2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
  3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
  4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

#### 8.03 *Standard General Conditions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout).



IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on **[indicate date on which Contract becomes effective]** (which is the Effective Date of the Contract).

Owner:

Contractor:

Alabama Water Utilities, Inc.

*(typed or printed name of organization)*

By:

*(individual's signature)*

Date:

*(date signed)*

Name: Guy Locker

*(typed or printed)*

Title:

General Manager

*(typed or printed)*

Attest:

*(individual's signature)*

Title:

*(typed or printed)*

Address for giving notices:

728 Volare Drive

Birmingham, AL 35244

**With a copy that does not constitute notice  
via e-mail to : legal@swwc.com**

Designated Representative:

Name:

*(typed or printed)*

Title:

*(typed or printed)*

Address:

728 Volare Drive

Birmingham, AL 35244

Phone:

Email: [ ]@swwc.com

*(typed or printed name of organization)*

By:

*(individual's signature)*

Date:

*(date signed)*

Name:

*(typed or printed)*

Title:

*(typed or printed)*

*(If [Type of Entity] is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*

Attest:

*(individual's signature)*

Title:

*(typed or printed)*

Address for giving notices:

Designated Representative:

Name:

*(typed or printed)*

Title:

*(typed or printed)*

Address:

Phone:

Email:

License No.:

State:

## NOTICE TO PROCEED

Owner: Alabama Water Utilities, Inc. Owner's Project No.: SVO#1001055031  
Engineer: \_\_\_\_\_ Engineer's Project No.: SW 20026  
Contractor: \_\_\_\_\_ Contractor's Project No.: \_\_\_\_\_  
Project: Brookwood SEU WWTP Improvements, Brookwood, AL  
Contract Name: Brookwood SEU WWTP Improvements  
Effective Date of Contract: \_\_\_\_\_

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on **[date Contract Times are to start]** pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

In accordance with the Agreement:

The number of days to achieve Substantial Completion is 240 from the date stated above for the commencement of the Contract Times, resulting in a date for Substantial Completion of **[date, calculated from commencement date above]**; and the number of days to achieve readiness for final payment is 270 from the commencement date of the Contract Times, resulting in a date for readiness for final payment of **[date, calculated from commencement date above]**.

Owner: \_\_\_\_\_  
By *(signature)*: \_\_\_\_\_  
Name *(printed)*: \_\_\_\_\_  
Title: \_\_\_\_\_  
Date Issued: \_\_\_\_\_

Copy: Engineer

## PERFORMANCE BOND

<p><b>Contractor</b></p> <p>Name: <b>[Full formal name of Contractor]</b></p> <p>Address <i>(principal place of business)</i>:  <b>[Address of Contractor's principal place of business]</b></p>	<p><b>Surety</b></p> <p>Name: <b>[Full formal name of Surety]</b></p> <p>Address <i>(principal place of business)</i>:  <b>[Address of Surety's principal place of business]</b></p>
<p><b>Owner</b></p> <p>Name: <b>Alabama Water Utilities, Inc.</b></p> <p>Mailing address <i>(principal place of business)</i>:  <b>728 Volare Drive</b>  <b>Birmingham, AL 35244</b></p>	<p><b>Contract</b></p> <p>Description <i>(name and location)</i>:  <b>[Owner's project/contract name, and location of the project]</b></p> <p>Contract Price: <b>[Amount from Contract]</b></p> <p>Effective Date of Contract: <b>[Date from Contract]</b></p>
<p><b>Bond</b></p> <p>Bond Amount: <b>[Amount]</b></p> <p>Date of Bond: <b>[Date]</b></p> <p><i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form:  <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	



1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:
  - 3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;
  - 3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
  - 3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
  - 5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
  - 5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
  - 5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or
  - 5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

- 5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
  - 5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.
7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
  - 7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
  - 7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
  - 7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.
12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.
13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such

statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

- 14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
  - 14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
  - 14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
  - 14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
  - 14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
16. Modifications to this Bond are as follows: **None**



## PAYMENT BOND

<p><b>Contractor</b></p> <p>Name: <b>[Full formal name of Contractor]</b></p> <p>Address <i>(principal place of business)</i>:  <b>[Address of Contractor's principal place of business]</b></p>	<p><b>Surety</b></p> <p>Name: <b>[Full formal name of Surety]</b></p> <p>Address <i>(principal place of business)</i>:  <b>[Address of Surety's principal place of business]</b></p>
<p><b>Owner</b></p> <p>Name: <b>Alabama Water Utilities, Inc.</b></p> <p>Mailing address <i>(principal place of business)</i>:  <b>728 Volare Drive</b>  <b>Birmingham, AL 35244</b></p>	<p><b>Contract</b></p> <p>Description <i>(name and location)</i>:  <b>Brookwood SEU WWTP Improvements,</b>  <b>Brookwood, AL</b></p> <p>Contract Price: <b>[Amount, from Contract]</b></p> <p>Effective Date of Contract: <b>[Date, from Contract]</b></p>
<p><b>Bond</b></p> <p>Bond Amount: <b>[Amount]</b></p> <p>Date of Bond: <b>[Date]</b></p> <p><i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form:  <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 18</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
<i>(Full formal name of Contractor)</i>	<i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond will arise after the following:
  - 5.1. Claimants who do not have a direct contract with the Contractor
    - 5.1.1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
    - 5.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).
  - 5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
  - 7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
  - 7.2. Pay or arrange for payment of any undisputed amounts.
  - 7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. Definitions
  - 16.1. *Claim*—A written statement by the Claimant including at a minimum:
    - 16.1.1. The name of the Claimant;
    - 16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;
    - 16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
    - 16.1.4. A brief description of the labor, materials, or equipment furnished;



- 16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
  - 16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
  - 16.1.7. The total amount of previous payments received by the Claimant; and
  - 16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
- 16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic’s lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of “labor, materials, or equipment” that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor’s subcontractors, and all other items for which a mechanic’s lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
  - 16.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
  - 16.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
  - 16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.
  18. Modifications to this Bond are as follows: **None**

# CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: Alabama Water Utilities, Inc. Owner's Project No.: 1001055031  
Engineer: Engineer's Project No.: SW 20026  
Contractor: Contractor's Project No.:  
Project: Brookwood SEU WWTP Improvements, Brookwood, AL  
Contract Name: Brookwood SEU WWTP Improvements

This  Preliminary  Final Certificate of Substantial Completion applies to:

All Work  The following specified portions of the Work:

### Brookwood SEU WWTP Improvements

Date of Substantial Completion: **[Enter date, as determined by Engineer]**

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

Amendments to Owner's Responsibilities:  None  As follows:

**[List amendments to Owner's Responsibilities]**

Amendments to Contractor's Responsibilities:  None  As follows:

**[List amendments to Contractor's Responsibilities]**

The following documents are attached to and made a part of this Certificate:

**[List attachments such as punch list; other documents]**

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Engineer

By *(signature)*: \_\_\_\_\_

Name *(printed)*: \_\_\_\_\_

Title: \_\_\_\_\_

**NOTICE OF ACCEPTABILITY OF WORK**

Owner: Alabama Water Utilities, Inc. Owner’s Project No.: SVO#1001055031  
Engineer: Engineers of the South Engineer’s Project No.: SW 20026  
Contractor: Contractor’s Project No.:  
Project: Brookwood SEU WWTP Improvements, Brookwood, AL  
Contract Name: Brookwood SEU WWTP Improvements  
Notice Date: Effective Date of the Construction Contract:

The Engineer hereby gives notice to the Owner and Contractor that Engineer recommends final payment to Contractor, and that the Work furnished and performed by Contractor under the Construction Contract is acceptable, expressly subject to the provisions of the Construction Contract’s Contract Documents (“Contract Documents”) and of the Agreement between Owner and Engineer for Professional Services dated **[date of professional services agreement]** (“Owner-Engineer Agreement”). This Notice of Acceptability of Work (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree:

1. This Notice has been prepared with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.
2. This Notice reflects and is an expression of the Engineer’s professional opinion.
3. This Notice has been prepared to the best of Engineer’s knowledge, information, and belief as of the Notice Date.
4. This Notice is based entirely on and expressly limited by the scope of services Engineer has been employed by Owner to perform or furnish during construction of the Project (including observation of the Contractor’s Work) under the Owner-Engineer Agreement, and applies only to facts that are within Engineer’s knowledge or could reasonably have been ascertained by Engineer as a result of carrying out the responsibilities specifically assigned to Engineer under such Owner-Engineer Agreement.
5. This Notice is not a guarantee or warranty of Contractor’s performance under the Construction Contract, an acceptance of Work that is not in accordance with the Contract Documents, including but not limited to defective Work discovered after final inspection, nor an assumption of responsibility for any failure of Contractor to furnish and perform the Work thereunder in accordance with the Contract Documents, or to otherwise comply with the Contract Documents or the terms of any special guarantees specified therein.
6. This Notice does not relieve Contractor of any surviving obligations under the Construction Contract, and is subject to Owner’s reservations of rights with respect to completion and final payment.

Engineer

By *(signature)*: \_\_\_\_\_

Name *(printed)*: \_\_\_\_\_

Title: \_\_\_\_\_



**STANDARD GENERAL CONDITIONS  
OF THE CONSTRUCTION CONTRACT**

**For the Brookwood SEU WWTP Improvements**

**By and Between**

**Alabama Water Utilities, Inc.**

**And**

**(CONTRACTOR)**

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# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

## ARTICLE 1—DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
  2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
  3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
  4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
  5. *Bidder*—An individual or entity that submits a Bid to Owner.
  6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
  7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
  8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
  9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
  10. *Claim*
    - a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract

- Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.
- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
  - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
  - d. A demand for money or services by a third party is not a Claim.
11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions,

including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
  - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
  - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
  - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor’s plan to accomplish the Work within the Contract Times.



32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals.
36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers’ instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part

thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
46. *Technical Data*
  - a. Those items expressly identified as Technical Data in the ~~Supplementary~~ **General** Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
  - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
  - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

## 1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day*: The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective*: The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
1. does not conform to the Contract Documents;
  2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
  3. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
  2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
  3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.



4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

## ARTICLE 2—PRELIMINARY MATTERS

### 2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, ~~except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.~~
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

### 2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor ~~four printed copies of the Contract (including one copy of conformed Contract Documents, including an electronically fully signed counterpart of the Agreement ), and one copy~~ in electronic portable document format (PDF) **incorporating and integrating all Addenda and any amendments negotiated prior to the Effective Date of the Contract.** ~~Additional printed copies will be furnished upon request at the cost of reproduction.~~
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
  2. a preliminary Schedule of Submittals; and
  3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.
1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
  2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
  3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.
  4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

**ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE**

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
  - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
  - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.



### 3.02 *Reference Standards*

#### A. *Standards Specifications, Codes, Laws and Regulations*

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

### 3.03 *Reporting and Resolving Discrepancies*

#### A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

#### B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in

resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

- a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
- b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

### 3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

### 3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
  1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
  2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

## ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

### 4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run ~~on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.~~

### 4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

### 4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

### 4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
  2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

### 4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption,



and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
  2. Abnormal weather conditions;
  3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
  4. Acts of war or terrorism.
  5. **Weather-Related Delays**
    - a. **If "abnormal weather conditions" as set forth in Paragraph 4.05.C.2 of the General Conditions are the basis for a request for an equitable adjustment in the Contract Times, such request must be documented by data substantiating each of the following: 1) that weather conditions were abnormal for the period of time in which the delay occurred, 2) that such weather conditions could not have been reasonably anticipated, and 3) that such weather conditions had an adverse effect on the Work as scheduled.**
    - b. **The existence of abnormal weather conditions will be determined on a month-by-month basis in accordance with the following:**
      - 1) **The Contractor shall submit a nearby weather station (rain gauge) for Owner and Engineer review and approval prior to beginning work.**
      - 2) **Contractor shall provide the monthly number of days receiving measurable rain for the previous 5 years from the approved weather station along with the previous month's days receiving measurable rain. Such data will substantially conform to the format of Exhibit 4.05. The calculated exceedance will be considered for weather days.**
- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
  2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or

interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.

3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
  1. The circumstances that form the basis for the requested adjustment;
  2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
  3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
  4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
  5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

## **ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS**

### **5.01 *Availability of Lands***

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

## 5.02 Use of Site and Other Areas

### A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
  2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.



5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings*: The ~~Supplementary Conditions identify~~ **table is Section 5.03.E identifies**:
1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
  2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
  3. Technical Data contained in such reports and drawings.
- B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.
- C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in **Section 5.03.E** ~~the Supplementary Conditions~~ with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.
- D. *Limitations of Other Data and Documents*: Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
1. the completeness of such reports and drawings for Contractor’s purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
  2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
  3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner’s archival documents concerning the Site; or
  4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.
- E. The following table lists the reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely:**

<u>Report Title</u>	<u>Date of Report</u>	<u>Technical Data</u>
<b><u>NONE</u></b>		

#### 5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
  2. is of such a nature as to require a change in the Drawings or Specifications;
  3. differs materially from that shown or indicated in the Contract Documents; or
  4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
  - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
  - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
- a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
  - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
  - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

#### 5.05 *Underground Facilities*

- A. *Contractor's Responsibilities*: ~~Unless it is otherwise expressly provided in the Supplementary Conditions, the~~ **The** cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
  2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
  4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
  5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
  2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
  3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
  4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.



F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
  - a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
  - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
  - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The ~~Supplementary~~ **General** Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the ~~Supplementary~~ **General** Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or

Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
  2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
  3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30

days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.

- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

## **ARTICLE 6—BONDS AND INSURANCE**

### **6.01 *Performance, Payment, and Other Bonds***

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or

Regulations, the terms of a prescribed bond form, ~~the Supplementary Conditions~~, or other provisions of the Contract.

**1. Required Performance Bond Form: The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2018 edition).**

**2. Required Payment Bond Form: The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2018 edition).**

- B. Contractor shall also furnish such other bonds (if any) as are required by the ~~Supplementary Conditions~~ or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

#### **6.02 Required Insurance—General Provisions**

- A. **Contractor shall obtain and maintain insurance at Contractor's sole cost, as set forth in Exhibit 6.02 to this Agreement.** ~~Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.~~
- ~~B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary~~



~~Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.~~

- C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- ~~D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.~~
- ~~E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.~~
- F. Failure of Owner or Contractor to demand such certificates **of insurance** or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- ~~G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.~~
- H. Contractor shall require:
  - ~~1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and~~
  - ~~2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.~~

- I. ~~If either party **Contractor** does not purchase or maintain the **required** insurance required of such party by the **Contractor** , such party shall notify the other party **Owner** in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.~~
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party **Contractor** has failed to obtain required insurance, ~~the other party **Owner**~~ may elect (but is in no way obligated) to obtain equivalent insurance to protect ~~such other party **Owner**'s~~ interests at ~~the **Contractor's**~~ expense ~~of the party who was required to provide such coverage~~, and the Contract Price will be adjusted accordingly.
- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- ~~N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.~~

~~6.03 — Contractor's Insurance~~

- ~~A. **Required Insurance:** Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.~~
- ~~B. **General Provisions:** The policies of insurance required by this Paragraph 6.03 as supplemented must:
 
  - ~~1. include at least the specific coverages required;~~
  - ~~2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;~~
  - ~~3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;~~~~

4. ~~apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and~~
  5. ~~include all necessary endorsements to support the stated requirements.~~
- C. ~~Additional Insureds: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:~~
1. ~~include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;~~
  2. ~~include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;~~
  3. ~~afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);~~
  4. ~~not seek contribution from insurance maintained by the additional insured; and~~
  5. ~~as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.~~

#### 6.04 ~~Builder's Risk and Other Property Insurance~~

- A. ~~Builder's Risk: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.~~
- B. ~~Property Insurance for Facilities of Owner Where Work Will Occur: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.~~
- C. ~~Property Insurance for Substantially Complete Facilities: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.~~

- ~~D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.~~
- ~~E. *Insurance of Other Property; Additional Insurance:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.~~

~~6.05 — *Property Losses; Subrogation*~~

- ~~A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.~~
- ~~1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.~~
  - ~~2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.~~
- ~~B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.~~
- ~~1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and~~



~~subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.~~

- ~~C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.~~
- ~~D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.~~

#### ~~6.06 — Receipt and Application of Property Insurance Proceeds~~

- ~~A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.~~
- ~~B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.~~
- ~~C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.~~

## **ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES**

### **7.01 Contractor's Means and Methods of Construction**

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to

(1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.
- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. **In the absence of any Laws or Regulations to the contrary, Contractor may perform the Work on holidays, during any or all hours of the day, and on any or all days of the week, at Contractor's sole discretion.** ~~Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.~~

7.04 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 “Or Equals”

- A. *Contractor’s Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or equal” item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an “or equal” item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
    - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
      - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
      - 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
      - 3) has a proven record of performance and availability of responsive service; and
      - 4) is not objectionable to Owner.
    - b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
      - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
      - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor’s Expense:* Contractor shall provide all data in support of any proposed “or equal” item at Contractor’s expense.
- C. *Engineer’s Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each “or-equal” request. Engineer may require Contractor to furnish additional data about the proposed “or-equal” item. Engineer will be the sole judge of acceptability. No “or-equal” item will be ordered, furnished, installed, or utilized until Engineer’s review is complete and Engineer determines that the proposed item is an “or-equal,” which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer’s Determination:* Neither approval nor denial of an “or-equal” request will result in any change in Contract Price. The Engineer’s denial of an “or-equal” request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

- E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an “or-equal” item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

- A. *Contractor’s Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
  2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
  3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
    - a. will certify that the proposed substitute item will:
      - 1) perform adequately the functions and achieve the results called for by the general design;
      - 2) be similar in substance to the item specified; and
      - 3) be suited to the same use as the item specified.
    - b. will state:
      - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
      - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
      - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
    - c. will identify:
      - 1) all variations of the proposed substitute item from the item specified; and
      - 2) available engineering, sales, maintenance, repair, and replacement services.
    - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in



Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

- B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

#### 7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or

otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

#### 7.08 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its

use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.

- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

#### 7.09 Permits

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

#### 7.10 Taxes

- A. **Owner is exempt from payment of sales and compensating use taxes of the State of Alabama on all materials to be incorporated into the Work.** Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.
  - 1. **Owner will furnish the required certificates of tax exemption to Contractor for use in the purchase of supplies and materials to be incorporated into the Work. Contractor shall submit required forms.**
  - 2. **Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.**

### 7.11 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

### 7.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

### 7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
  - 1. all persons on the Site or who may be affected by the Work;



2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
  - E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
  - F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
  - G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. ~~Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.~~ **Owner and Contractor shall review the applicable Safety programs and initiate required coordination during a pre-construction meeting.**
  - H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
  - I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
  - J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

#### 7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required

to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

#### 7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

#### 7.16 *Submittals*

##### A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:
    - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
    - b. determine and verify:
      - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
      - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
      - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
    - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
  2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.
  3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*
    - a. Contractor shall submit the number of copies required in the Specifications.
    - b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.
  2. *Samples*
    - a. Contractor shall submit the number of Samples required in the Specifications.
    - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
  3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Engineer's Review of Shop Drawings and Samples*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
  2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.
  3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
  4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.
  5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
  6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
  8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.
- D. *Resubmittal Procedures for Shop Drawings and Samples*
1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.
  2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
  3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.
- E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*
1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
    - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
    - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
    - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.
    - d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
  2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.



7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
  - 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
  - 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
  - 1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
  - 2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
  - 1. Observations by Engineer;
  - 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
  - 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
  - 4. Use or occupancy of the Work or any part thereof by Owner;
  - 5. Any review and approval of a Shop Drawing or Sample submittal;
  - 6. The issuance of a notice of acceptability by Engineer;
  - 7. The end of the correction period established in Paragraph 15.08;
  - 8. Any inspection, test, or approval by others; or
  - 9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

#### 7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

#### 7.19 *Delegation of Professional Design Services*

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.
- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
  - 1. Checking for conformance with the requirements of this Paragraph 7.19;
  - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
  - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

## **ARTICLE 8—OTHER WORK AT THE SITE**

### **8.01 *Other Work***

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and

proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

#### 8.02 *Coordination*

- A. ~~If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:~~
  - 1. ~~The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;~~
  - 2. ~~An itemization of the specific matters to be covered by such authority and responsibility;~~  
~~and~~
  - 3. ~~The extent of such authority and responsibilities.~~
- B. ~~Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.~~

#### 8.03 *Legal Relationships*

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.



1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
  2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

## **ARTICLE 9—OWNER'S RESPONSIBILITIES**

### **9.01 *Communications to Contractor***

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

### **9.02 *Replacement of Engineer***

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

### **9.03 *Furnish Data***

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

### **9.04 *Pay When Due***

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

### **9.05 *Lands and Easements; Reports, Tests, and Drawings***

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

**ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION**

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

## 10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

## 10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the ~~Supplementary~~ **General** Conditions, and limitations on the responsibilities thereof will be as provided in the ~~Supplementary Conditions and in~~ Paragraph 10.07.
- ~~B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.~~
- C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:**
  - 1. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor's safety meetings), and as appropriate prepare and circulate copies of minutes thereof.**
  - 2. *Safety Compliance:* Comply with Site safety programs, as they apply to RPR, and if required to do so by such safety programs, receive safety training specifically related to RPR's own personal safety while at the Site.**
  - 3. *Liaison***

- a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.
- b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
- c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.

**4. Review of Work; Defective Work**

- a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.
- b. Observe whether any Work in place appears to be defective.
- c. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.

**5. Inspections and Tests**

- a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to those performed by public or other agencies having jurisdiction over the Work.
- b. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.

**6. Payment Requests: Review Applications for Payment with Contractor.**

**7. Completion**

- a. Participate in Engineer's visits regarding Substantial Completion.
- b. Assist in the preparation of a punch list of items to be completed or corrected.
- c. Participate in Engineer's visit to the Site in the company of Owner and Contractor regarding completion of the Work, and prepare a final punch list of items to be completed or corrected by Contractor.
- d. Observe whether items on the final punch list have been completed or corrected.

**D. The RPR will not:**

- 1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).**
- 2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.**
- 3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.**
- 4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction.**



- 5 Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.**
- 6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.**
- 7. Authorize Owner to occupy the Project in whole or in part.**

10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.
- E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

**ARTICLE 11—CHANGES TO THE CONTRACT**

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
  1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
  2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
  3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

#### 11.03 *Work Change Directives*

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.
- B. If Owner has issued a Work Change Directive and:
1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
  2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

#### 11.04 *Field Orders*

- A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

#### 11.05 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease

construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.

- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

#### 11.06 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

#### 11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
  - 1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
  - 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
  - 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will be determined as follows:
  - 1. A mutually acceptable fixed fee; or
  - 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
    - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
    - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
    - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually



performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;

- d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
- e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
- f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

#### 11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

#### 11.09 *Change Proposals*

- A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.
- B. *Change Proposal Procedures*
  - 1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
  - 2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.

- a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
- b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
  4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
  5. *Binding Decision:* Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion:* Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

#### 11.10 Notification to Surety

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

## ARTICLE 12—CLAIMS

### 12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
  2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
  3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
  4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*
1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
  2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
  3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

## **ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK**

### **13.01 *Cost of the Work***

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
  - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
  - 2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
  - 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.



2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
5. Other costs consisting of the following:
  - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
  - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
    - 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.
  - c. *Construction Equipment Rental*
    - 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
    - 2) ~~Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be~~

~~computed by dividing the monthly rates by 176. These computed rates will include all operating costs.~~

- 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price (“changed Work”), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
  - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
  - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder’s risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor’s fee.
  - g. The cost of utilities, fuel, and sanitary facilities at the Site.
  - h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
  - i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *Costs Excluded:* The term Cost of the Work does not include any of the following items:
1. Payroll costs and other compensation of Contractor’s officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor’s principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor’s fee.
  2. The cost of purchasing, renting, or furnishing small tools and hand tools.
  3. Expenses of Contractor’s principal and branch offices other than Contractor’s office at the Site.

4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
  5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
  6. Expenses incurred in preparing and advancing Claims.
  7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*
1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
    - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
    - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
      - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
      - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
  2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.
- E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 *Allowances*

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

- B. *Cash Allowances*: Contractor agrees that:
  - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
  - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

### 13.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.
- E. *Adjustments in Unit Price*
  - 1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
    - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
    - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
  - 2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other

Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

#### **ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK**

##### 14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

##### 14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
  1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
  2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
  3. by manufacturers of equipment furnished under the Contract Documents;
  4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
  5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.



- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

#### 14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

#### 14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against

payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
  - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
  - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored

elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

## **ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD**

### **15.01 *Progress Payments***

- A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
  - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
  - 2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
  - 3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
  - 4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

**5. Each Application for Payment shall specifically identify the diverse Subcontractors/Suppliers whose work or products are included in the Application for Payment, and the value of work or products included in that Application for Payment.**

*C. Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
  - a. the Work has progressed to the point indicated;
  - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
  - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
  - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
  - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
  - a. to supervise, direct, or control the Work;
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
  - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;

- d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
  - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, requiring correction or replacement;
  - b. the Contract Price has been reduced by Change Orders;
  - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
  - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

**D. *Payment Becomes Due***

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

**E. *Reductions in Payment by Owner***

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
- a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
  - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
  - c. Contractor has failed to provide and maintain required bonds or insurance;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
  - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;



- f. The Work is defective, requiring correction or replacement;
  - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - h. The Contract Price has been reduced by Change Orders;
  - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
  - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
  - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
  - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
  3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or

corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

#### 15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
  - 1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
  - 2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

#### 15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 15.06 *Final Payment*

##### A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents;
  - b. consent of the surety, if any, to final payment;
  - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
  - d. a list of all duly pending Change Proposals and Claims; and
  - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release

or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

- B. *Engineer's Review of Final Application and Recommendation of Payment:* If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

#### 15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim, appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

#### 15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary General Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any

damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;
  2. correct such defective Work;
  3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
  4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

## **ARTICLE 16—SUSPENSION OF WORK AND TERMINATION**

### **16.01 *Owner May Suspend Work***

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an



extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
  - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
  - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
  - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
  - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
  - 1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
  - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under

any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

#### 16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
  - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
  - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
  - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

#### 16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

## ARTICLE 17—FINAL RESOLUTION OF DISPUTES

### 17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
  2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
1. elect in writing to invoke the dispute resolution process provided for in the ~~Supplementary Conditions~~ **Section 17.02**; **or**
  2. agree with the other party to submit the dispute to another dispute resolution process;  
~~or~~
  3. ~~if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.~~

### 17.02 *Arbitration*

- A. **All matters subject to final resolution under this Article will be settled by arbitration administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules. Any controversy or claim in the amount of \$100,000 or less will be settled in accordance with the American Arbitration Association's supplemental rules for Fixed Time and Cost Construction Arbitration. This agreement to arbitrate will be specifically enforceable under the prevailing law of any court having jurisdiction.**
- B. **The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitration administrator, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the specific time required in Article 17, or if no specified time is applicable within a reasonable time after the matter in question has arisen, and in no event will any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be barred by the applicable statute of limitations.**
- C. **The arbitrator(s) must be licensed engineers, contractors, attorneys, or construction managers. Hearings will take place pursuant to the standard procedures of the Construction Arbitration Rules that contemplate in-person hearings. The arbitrators will have no authority to award punitive or other damages not measured by the prevailing party's actual damages, except as may be required by statute or the Contract. Any award in an arbitration initiated under this clause will be limited to monetary damages and include no injunction or direction to any party other than the direction to pay a monetary amount.**

- D. The Arbitrators will have the authority to allocate the costs of the arbitration process among the parties, but will only have the authority to allocate attorneys' fees if a specific Law or Regulation or this Contract permits them to do so.**
- E. The award of the arbitrators must be accompanied by a reasoned written opinion and a concise breakdown of the award. The written opinion will cite the Contract provisions deemed applicable and relied on in making the award.**
- F. The parties agree that failure or refusal of a party to pay its required share of the deposits for arbitrator compensation or administrative charges will constitute a waiver by that party to present evidence or cross-examine witness. In such event, the other party shall be required to present evidence and legal argument as the arbitrator(s) may require for the making of an award. Such waiver will not allow for a default judgment against the non-paying party in the absence of evidence presented as provided for above.**
- G. No arbitration arising out of or relating to the Contract will include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:**
- 1. the inclusion of such other individual or entity will allow complete relief to be afforded among those who are already parties to the arbitration;**
  - 2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration, and which will arise in such proceedings;**
  - 3. such other individual or entity is subject to arbitration under a contract with either Owner or Contractor, or consents to being joined in the arbitration; and**
  - 4. the consolidation or joinder is in compliance with the arbitration administrator's procedural rules.**
- H. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Laws and Regulations relating to vacating or modifying an arbitral award.**
- I. Except as may be required by Laws or Regulations, neither party nor an arbitrator may disclose the existence, content, or results of any arbitration hereunder without the prior written consent of both parties, with the exception of any disclosure required by Laws and Regulations or the Contract. To the extent any disclosure is allowed pursuant to the exception, the disclosure must be strictly and narrowly limited to maintain confidentiality to the extent possible.**

*17.03 Attorneys' Fees*

- A. For any matter subject to final resolution under this Article, the prevailing party shall be entitled to an award of its attorneys' fees incurred in the final resolution proceedings, in an equitable amount to be determined in the discretion of the court, arbitrator, arbitration panel, or other arbiter of the matter subject to final resolution, taking into account the parties' initial demand or defense positions in comparison with the final result.**

## ARTICLE 18—MISCELLANEOUS

### 18.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
  - 1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
  - 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
  - 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

### 18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

### 18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

### 18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

### 18.05 *No Waiver*

- A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

### 18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

### 18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.



18.08 *Assignment of Contract*

- A. ~~Unless expressly agreed to elsewhere in the Contract, no~~ **No** assignment by **Contractor** ~~a party to this Contract~~ of any rights under or interests in the Contract will be binding on **Owner** ~~the other party~~ without the **Owner's** written consent ~~of the party sought to be bound~~; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

**EXHIBIT 4.05 - FORESEEABLE BAD WEATHER DAYS**

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Contractor shall provide 5-year average rain data from approved nearby rain gauge in format similar to:

Tuscaloosa AL

Month	Number of Foreseeable Bad Weather Days in Month Based on Precipitation (5 year average)		
		2023	2024
January	7		
February	9		
March	9		
April	8		
May	9		
June	11		
July	10		
August	11		
September	6		
October	6		
November	7		
December	11		
Notes:			

## EXHIBIT 6.02 – REQUIRED INSURANCE

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### A. Minimum required insurance coverages and limits--

- 1) **Workers' compensation and employer's liability ("WC/EL"):** insurance as required by the state where the work is performed with statutory WC limits and Employer's Liability limits in an amount not less than \$1,000,000 per accident for bodily injury by accident, \$1,000,000 policy limit by disease and \$1,000,000 per employee for bodily injury by disease.
- 2) **Business automobile liability:** insurance covering claims for injuries to members of the public and/or damages to property of others arising from use of motor vehicles, including onsite and offsite operations, and owned, non-owned, or hired vehicles, with \$1,000,000 limits for bodily injury and property damage, combined.
- 3) **Commercial general liability ("CGL"):** insurance covering claims for injuries to members of the public or damage to property of others arising out of any covered negligent act or omission of Contractor or of any of its employees, agents, or Subcontractors, with \$1,000,000 per occurrence and \$2,000,000 in the aggregate, per project. In addition, coverages to include minimum limits of \$2,000,000 aggregate, covering Products and Completed Operations, \$1,000,000 for each occurrence of Personal and Advertising Injury, and Contractual Liability coverage in an amount sufficient to cover CONTRACTOR's indemnity obligations but not less than \$1,000,000 for each occurrence and in the aggregate.
- 4) **Professional Liability/Errors and Omissions:** construction management coverage with policy limits of no less than \$1,000,000 for each claim and \$2,000,000 annual aggregate.
- 5) **Completed operations:** Coverages for Products and Completed Operations and Professional Liability/Errors and Omissions shall be maintained for a period of at least three (3) years after acceptance of completed work. Coverage must include all operations involved in the project/scope of work in this contract.
- 6) **Contractors pollution liability:** if pollutants, chemicals or wastewater/sludge are involved, coverage of not less than \$3,000,000 per occurrence and in the aggregate.
- 7) **Umbrella/Excess Liability:** with policy limits of not less than \$1,000,000 per occurrence and annual aggregate, as excess over CGL, automobile liability and employer's liability policies.
- 8) **Builder's Risk Insurance:** The Contractor shall obtain, at its sole expense, Builder's Risk Insurance, covering all risks of physical loss, and including workmanship acceptable to the Company, with limits at all times equal to 100% of the insurable value of materials delivered and labor performed. The policy so issued in the name of the Contractor shall also name its Subcontractors and the Company as additional insured, as their respective interests may appear. The policy shall have endorsements as follows:

*"This insurance shall be specific and primary as to coverage and not considered as contributing or excess insurance with any permanent insurance maintained on the present premises."*

**B. Other insurance requirements--**

- 1) Alabama Water Utilities, Inc. and Engineers of the South to be named as Certificate Holder on Certificate(s) of Insurance.
- 2) Contractor policies shall be endorsed to name Alabama Water Utilities, Inc. and Engineers of the South as an ADDITIONAL INSURED on all policies (except Workers' Compensation/EL) on ISO forms CG 20 10 or CG 20 38 (during performance of work) and CG 20 37 (completed operations), or equivalent forms of such endorsement forms that specify "blanket where required by written contract". ISO form 20 33 is not equivalent and is not acceptable whenever Contractor uses a Subcontractor to perform some of the work under this contract.
- 3) CGL, Auto and Umbrella policies shall contain a SEPARATION OF INSUREDS provision
- 4) All policies shall be endorsed with WAIVER OF SUBROGATION in favor of Alabama Water Utilities, Inc. and Engineers of the South.
- 5) Notwithstanding any other provision in these requirements, in the event of the occurrence of a casualty or other loss, and insurance maintained by Alabama Water Utilities, Inc. and Contractor are both applicable to such casualty or loss, then the insurance maintained by Contractor will be PRIMARY and NON-CONTRIBUTORY with respect to any insurance maintained by Alabama Water Utilities, Inc. All insurance policies shall include coverage for defense costs and related expenses.
- 6) Alabama Water Utilities, Inc. and Engineers of the South to be provided with thirty (30) days' advance written notice of any cancellation to the required insurance policies.
- 7) All insurance policies shall be issued by companies licensed to do business in the states where the Services are delivered and will be rated "A-" or better by A.M. Best (or as otherwise acceptable to Alabama Water Utilities, Inc.).
- 8) Any Subcontractors used by Contractor for any part of the work provided to Alabama Water Utilities, Inc. under this contract shall be required to meet these same insurance requirements as set forth herein, including endorsement of their policies in favor of Alabama Water Utilities, Inc. Contractor shall be responsible for verifying and maintaining the certificates of insurance provided by each subcontractor. In the event that any Subcontractor engaged by Contractor fails to meet any of these insurance requirements, Contractor shall be required to include such Subcontractor as an additional insured under Contractor's insurance policies.
- 9) Prior to commencing work, Contractor shall provide Alabama Water Utilities, Inc. with certificates of insurance evidencing that each required insurance policy is in force. Contractor shall provide Alabama Water Utilities, Inc. with certificates of insurance promptly upon any modification or renewal of such required insurance policies.
- 10) Contractor shall provide Alabama Water Utilities, Inc. copies of any insurance policies, amendments and endorsements required hereunder upon request.
- 11) The insurance policies and other requirements stipulated herein are mandatory and shall not be cancelled, reduced in coverage or in limits.

## SECTION 01 11 00 - SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. General Description.
- B. Contractor use of site and premises.
- C. Sequencing Considerations.
- D. Owner occupancy.
- E. Licenses and Permits.
- F. Protection of Owner, Owner's Agents, and Public.
- G. Meetings.

#### 1.02 GENERAL DESCRIPTION

- A. Contract Description: Brookwood SEU WWTP Improvements
- B. In general, the project includes, but is not limited to:
  - 1. Demolition of existing steel tanks
  - 2. Installation of a rotary self-cleaning screen unit on a structural platform
  - 3. Re-routing the influent feed pipe to the new screen
  - 4. Installation of tertiary filter unit (pre-purchased by Owner)
  - 5. Installation of UV disinfection unit (pre-purchased by Owner) including air compressor, and controls
  - 6. Instrumentation and SCADA additions
  - 7. Installation of automated valve, manual water reuse pump and filtrate pump station
- C. Work or Materials by Owner:
  - 1. Coordination with utility locates and operation of WWTP during the project
  - 2. Provide tertiary filter and UV equipment (see scope of supply in Appendix)
  - 3. Assistance in coordination of work to minimize sewer service outages
- D. Work Restrictions:
  - 1. Except in the case of an emergency, all adjustments to, or shutdowns of, existing systems or piping shall be performed by the Owner's personnel.
  - 2. See General Conditions, Supplementary Conditions, Plans and Specifications

#### 1.03 CONTRACTOR USE OF SITE AND PREMISES

- A. Limit use of site and premises to allow:
  - 1. Owner occupancy.
  - 2. Owner operations.
  - 3. Work by others and work by Owner.
- B. Construction areas shall be limited to Owner's existing property, easements, right-of-ways, etc. and/or as shown in the Plans unless arranged independently by the Contractor.
- C. Utility outages and shutdowns shall be at Owner's convenience.



#### 1.04 OWNER OCCUPANCY

- A. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
- B. Schedule the Work to accommodate this requirement.
- C. Existing facilities must remain in operation throughout the duration of the project.

#### 1.05 LICENSES AND PERMITS

- A. The Contractor's attention has been called to the necessity for compliance with all federal, state and local laws or ordinances regarding licenses and permits. Contractor is referred to in the following applicable sections of the Contract Documents: Instructions to Bidders and General Conditions.
- B. When applicable, the Contractor is instructed to secure from any local Office(s) of Inspection Services for information relative to Licenses and Permits required for performance of the work in the project specific Municipality or County.
- C. The Contractor is reminded that it is mandatory that all licensing requirements be met. Prior to the beginning of any work, including the placement of a construction trailer on or near the project site, all necessary permits must be obtained.

#### 1.06 PROTECTION OF OWNER, OWNER'S AGENTS, AND PUBLIC

- A. The Contractor and the superintendent are requested to carefully read the Articles of the General Conditions relating to protection of the Owner, agents of the Owner, workmen, and the public, such as Insurance; Indemnity; Licenses and Permits: Compliance with Laws, Ordinances and Regulations; Safety; Warning Signs and Barricades; Public Convenience; Sanitary Provisions; etc. This request is made to stress the importance of safe prosecution of the work, and does not imply that the Contractor and his Superintendent should not be completely familiar with all Articles of the General Conditions and all other provisions of the Contract Documents.
- B. Under the terms and conditions of this Contract, the Engineer shall not be required to act as Safety Engineer or Safety Supervisor since such responsibility remains solely with the Contractor, who, in the prosecution of his work, is bound by the requirements of "Safety and Health Regulations for Construction Occupational Safety and Health Administration, U.S. Government Department of Labor", and of other authorities having jurisdiction. It is recommended that the Contractor seek the advice of the Safety Inspector for his Insurance Carrier in regard to job safety, and that he observe all precautions and safety provisions as outlined in the "Manual of Accident Prevention in Construction", as published by the Associated General Contractors of America, to the extent that such provisions are not inconsistent with applicable laws or regulations.

#### 1.07 MEETINGS

- A. Project Meetings
  - 1. At a minimum, construction period meetings will be conducted at monthly intervals. These meetings shall be attended by the Construction Manager (if applicable), Owner's representative, Engineer, and the Contractors' Project Managers with appropriate staff,

subcontractors, or suppliers. Meetings shall include a preconstruction meeting, construction progress meetings and other meeting called by the Construction Manager, Owner, or Engineer in response to developments during the work.

2. Monthly Progress Meetings:
  - a. Contractor shall provide updated Work Schedule
  - b. Contractor shall provide updated Submittal Log
  - c. Contractor shall provide updated RFI Log
  - d. Contractor shall provide updated Plus Minus List
  - e. Engineer shall issue minutes upon project completion

B. Preconstruction Meeting

1. Prior to start of construction, a conference will be called for the purpose of reviewing the construction program with the Contractors. At this conference, detailed program, sequence of work methods of access to construction site and temporary facilities shall be agreed upon. All interested agencies and utility companies will be invited to discuss their interests and requirements relating to the project. All Contractors and all subcontractor representatives shall attend.

- C. Project meetings will include reports on construction progress. Work schedule and sequencing requirements, coordination of building trades, coordination with other Contracts and public utilities, the status of submittal reviews, the status of information requests, and any general business.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 11 00

## SECTION 01 52 00 - WORKING AROUND EXISTING UTILITIES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Working Around Existing Utilities
- B. Measurement and Payment

#### 1.2 RELATED SECTIONS

- A. Section 31 22 20 - Excavation and Backfill
- B. Section 31 92 40 – Site Restoration

#### 1.3 WORKING AROUND EXISTING UTILITIES

- A. Gas lines for the transmission or distribution of natural, manufactured, or liquefied petroleum gas are dangerous to work around. Accidents can be caused by direct damage to these gas mains or service lines during construction or by settlement in the trenches, or settlement of structures after construction is completed. The Contractor shall take every possible precaution to minimize the hazards of working in proximity to gas lines and shall be solely responsible for any damage to them or for any injury to persons or damage to property arising from or caused by his operations.
- B. No excavation or other work shall be done by the Contractor within a gas pipeline right-of-way or within 10 feet of a gas transmission line until the owner of the gas line has been notified not less than 48 hours in advance of such work and until the gas line has been exposed by the Contractor sufficiently to determine its exact horizontal and vertical location. In addition, the owner of the gas line shall be allowed to keep a qualified representative present while any construction work that could damage such line is being done. Methods of excavation specified by the owner of the utility must be adhered to by the Contractor.
- C. Where work is to be done in areas served by medium and low pressure gas distribution systems, the owner of such system is to be notified by the Contractor not less than 24 hours before such work is started and such owner given the opportunity to keep a representative present during this construction work or to locate and stake out all gas lines. In such case, the Contractor shall cooperate with the representative of the owner of the gas lines to avoid damage to them.
- D. Should any gas main or service line or other gas facility be damaged during the construction work, the following minimum precautions shall be taken by the Contractor:
  - 1. Stop all construction work that could cause any further damage to the gas facilities or hazards to other personal property.
  - 2. Give adequate warning to any persons who could be injured or owners of any property that could be damaged and take other necessary safety precautions.
  - 3. Immediately notify the owner of the gas facility of the nature and location of

such damage.

4. Permanent repairs shall be made by the owners of the gas facility or by the Contractor to their satisfaction and approval. Any repairs made by the Contractor shall be in accordance with U.S.A. "Standard Code for Gas Piping" USAS B31.8, latest edition. The inspector, or representative, of the Engineer does not have the responsibility or authority to supervise or inspect repairs to damaged gas facilities.
- E. No structure shall be constructed over or immediately adjacent to a gas pipe line or gas facility, or within the gas line easement. Gas pipe lines shall not pass through manholes or other sewer structures. When sanitary sewer lines cross over gas lines, the minimum cover shall be as specified by the owner of the gas line. (Cover is the vertical distance between the outside top and outside bottom of the two pipe lines.) In both cases, this cover space shall be carefully backfilled with thoroughly compacted selected material as required by the property owner. Where gas lines cross pipe trenches, the excavated space below such gas lines shall also be carefully backfilled with thoroughly compacted crushed stone.
- F. Other utilities such as water lines, steam lines, electrical lines, telephone lines, television cable, and telegraph lines, whether overhead or underground, shall be carefully preserved by the Contractor.
- G. In the event that interference with any existing utilities is imminent, the Contractor shall so notify the owner of the utility 48 hours in advance of any construction activities so that service may be relocated or otherwise preserved and protected.
- H. The Contractor is to cooperate fully with the representative of the utility company to the extent necessary to satisfactorily accomplish the Work.

#### 1.4 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be allowed for work required herein, same being incidental to the various contract items for which unit prices were bid, unless special provision is made in the contract documents.

#### PART 2 - PRODUCTS

Not Applicable

#### PART 3 - EXECUTION

Not Applicable

END OF SECTION 01 52 00

## SECTION 01 56 00 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Requirements of Regulatory Agencies
- B. Removal
- C. Water and Electricity
- D. Temporary Lighting
- E. Sanitary Facilities
- F. Dust Control
- G. Temporary Ventilation
- H. Barriers
- I. Fencing
- J. Protection of Installed Work
- K. Security
- L. Noise Control
- M. Pest Control
- N. Pollution Control
- O. Rodent Control

#### 1.2 RELATED SECTIONS

- A. Section 01 11 00 - Summary of Work

#### 1.3 REQUIREMENTS OF REGULATORY AGENCIES

- A. The Contractor shall obtain and pay for all permits as required by governing authorities.
- B. The Contractor shall obtain and pay for temporary easements required across property other than that of the Owner or that shown on the Plans.
- C. The Contractor shall comply with applicable codes.



#### 1.4 REMOVAL

- A. The Contractor shall completely remove temporary materials, equipment, and offices upon completion of construction.
- B. The Contractor shall repair damage caused by construction operations and restore disturbed areas to specified or original condition. This shall include resurfacing driveways and parking areas.

#### 1.5 WATER AND ELECTRICITY

- A. It shall be the responsibility of the Contractor to provide and maintain at his own expense an adequate supply of water and electricity required for the Work.
- B. Electric power used through permanent or temporary electrical connections of the Work for preliminary operation shall be paid for by the Contractor until final acceptance of the Work or beneficial use as determined by the Owner.

#### 1.6 TEMPORARY LIGHTING

- A. The Contractor shall furnish and install temporary lighting required for:
  - 1. Construction needs.
  - 2. Safe and adequate working conditions.
  - 3. Public Safety.
  - 4. Security lighting.
  - 5. Temporary office and storage area lighting.
- B. Service periods for safety lighting within the construction area shall be available at all times that authorized personnel are present.
- C. The Contractor shall pay all installation, maintenance, and removal costs of temporary lighting.
- D. Maintenance of temporary lighting service (replacement of bulbs, etc.) shall be the sole responsibility of the Contractor.
- E. The Contractor shall provide and maintain one (1) Watt/sq ft lighting to exterior staging and storage areas for security purposes.

#### 1.7 SANITARY FACILITIES

- A. The Contractor shall provide temporary sanitary facilities secluded from public observation, for the use of all personnel on the Work, whether or not in the Contractor's employ. They shall be kept in a clean and sanitary condition and shall comply with the requirements and regulations of the public authorities having jurisdiction. The Contractor shall commit no public nuisance. Temporary sanitary facilities shall be removed upon completion of the Work and the premises shall be left clean.

## 1.8 DUST CONTROL

- A. The Contractor shall execute the Work by methods to minimize raising dust from construction operations. The Contractor shall provide positive means to prevent air-borne dust from dispersing into atmosphere. Work areas inside the project site shall be broom cleaned and debris removed at the end of each working day. Damp mopping will be performed if required to collect dust. Floors and equipment shall be protected from foot traffic as required with walkway protection.

## 1.9 TEMPORARY VENTILATION

- A. The Contractor shall ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- B. The Contractor shall utilize existing ventilation equipment and shall extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

## 1.10 BARRIERS

- A. The Contractor shall provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. The Contractor shall provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing buildings.
- C. The Contractor shall provide protection for plant life designated to remain and shall replace damaged plant life.
- D. The Contractor shall protect non-owned vehicular traffic, stored materials, site, and structures from damage
- E. The Contractor shall provide temporary concrete traffic control barriers as directed by the Engineer.

## 1.11 FENCING

- A. When indicated on the Plans or directed by the Engineer, the Contractor shall provide a six (6) foot high fence around construction site equipped with vehicular and pedestrian gates with locks.
- B. The Contractor shall provide and maintain temporary fencing for protection of livestock located in the Work area. This temporary fencing will be considered incidental to the Work and no separate payment will be made.

## 1.12 PROTECTION OF INSTALLED WORK

- A. The Contractor shall protect installed Work and provide special protection where specified in individual specification sections.

- B. The Contractor shall provide temporary and removable protection for installed products and control activity in the immediate Work area to prevent damage.
- C. The Contractor shall prohibit traffic from landscaped areas.

#### 1.13 SECURITY

- A. The Contractor shall provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. The Contractor shall coordinate with the Owner regarding security program.

#### 1.14 NOISE CONTROL

- A. The Contractor shall provide methods, means, and facilities to minimize noise produced by construction operations.

#### 1.15 PEST CONTROL

- A. The Contractor shall provide methods, means, and facilities to prevent pests and insects from damaging the Work.

#### 1.16 POLLUTION CONTROL

- A. The Contractor shall provide methods, means, and facilities to prevent contamination of soil, water, and air from discharge of noxious, toxic substances, and pollutants produced by construction operations.

#### 1.17 RODENT CONTROL

- A. The Contractor shall provide methods, means, and facilities to prevent rodents from accessing or invading premises.

#### 1.18 MEASUREMENT AND PAYMENT

- A. Temporary concrete traffic control barrier is considered incidental to the Work and shall be included in the pipe installation line item.

END OF SECTION 01 56 00

## SECTION 01 60 00 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Products.
- B. Transportation and handling.
- C. Storage and protection.
- D. Product options.
- E. Substitutions.

#### 1.02 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the work. Products may also include existing materials or components required for reuse.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer, for similar components.

#### 1.03 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

#### 1.04 STORAGE AND PROTECTION

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather tight, climate controlled enclosures.
- B. For exterior storage of fabricated products, place on sloped supports, above ground.
- C. Provide off-site storage and protection when site does not permit on site storage or protection.
- D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

## 1.05 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request ten (10) days before bids are received for substitution for any manufacturer not named or seek approval during submittals at Contractor's risk. If substitution is not approved, provide one by named manufacturers.
- D. Products specified and declared in Bid Documents: No substitution without Engineer's approval before submittals.

## 1.06 SUBSTITUTIONS

- A. Instructions to Bidders specify time restrictions for submitting requests for Substitutions for major equipment during the bidding period to requirements specified in this Section.
- B. Substitutions shall not be allowed for items listed as no substitutions allowed in the individual specification section.
- C. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
- D. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- E. A request constitutes a representation that the Bidder:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the Substitution as for the specified product.
  - 3. Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to Owner.
  - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
  - 5. Will reimburse Owner for review and redesign services associated with re approval by authorities.
- F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- G. Substitution Submittal Procedure:
  - 1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
  - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
  - 3. The Engineer will notify Contractor, in writing, of decision to accept or reject request.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 60 00



## SECTION 01 78 30 - WARRANTIES AND BONDS

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Preparation and submittal.
- B. Time and schedule of submittals.

#### 1.02 FORM OF SUBMITTALS

- A. Bind in commercial quality, 8 1/2 x 11 inch three ring side binders with hardback, cleanable, plastic covers.
- B. Label cover of each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible principal.
- C. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification Section in which specified, and the name of the product or work item.
- D. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

#### 1.03 PREPARATION OF SUBMITTALS.

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item or work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

#### 1.04 TIME OF SUBMITTALS

- A. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
- B. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.

- C. For items of work when acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.
- D. Coordinate Owner's contact information for transfer of all warranty and bonds as required.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 78 30

## SECTION 05 12 00 - STRUCTURAL STEEL

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Structural steel.
  - 2. Grout.
- B. Related Sections include the following:
  - 1. Division 1 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
  - 2. Section 09 90 00, PAINTING AND PROTECTIVE COATINGS for surface preparation and priming requirements.

#### 1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

#### 1.4 SUBMITTALS

- A. Submittals shall conform to Section C700 Part 7.16 of the GENERAL CONDITIONS.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: Show fabrication of structural-steel components.
  - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 2. Include embedment drawings.
  - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
  - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pre-tensioned and slip-critical high-strength bolted connections.
- D. Welding certificates.
- E. Qualification Data: For Installer and fabricator.
- F. Mill Test Reports: Signed by Manufacturers certifying that the following products comply with requirements:
  - 1. Structural steel including chemical and physical properties.
  - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
  - 3. Shop primers.
  - 4. Non shrink grout.
- G. Source quality-control test reports.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who regularly erects structural steel with scope and complexity similar to that of this project.
- B. Fabricator Qualifications: A qualified fabricator who regularly fabricates structural steel with scope and complexity similar to that of this project.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, “Structural Welding Code-Steel.”
- D. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC “Code of Standard Practice for Steel Buildings and Bridges.”
  - 2. AISC “Seismic Provisions for Structural Steel Buildings” and “Supplement No.2.”
  - 3. AISC “Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design.”
  - 4. AISC “Specification for the Design of Steel Hollow Structural Sections.”
  - 5. AISC “Specification for Allowable Stress Design of Single-Angle Members.”
  - 6. RCSC “Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts.”

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
  - 1. Store fasteners in a protected place. Re-lubricate bolts and nuts that become dry.
  - 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
  - 3. Do not clean and use rusty bolts.

## 1.7 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

## PART 2 - PRODUCTS

### 2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992.
- B. Channels, Angles, and Shapes: ASTM A 50 unless otherwise noted.
- C. Plate and Bar: ASTM A 50 unless otherwise noted.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B structural tubing.
- E. Steel Pipe: ASTM A53, Type E or S, Grade B.
  - 1. Weight Class: Standard unless otherwise indicated.

2. Finish: Black, except where indicated to be galvanized.

F. Welding Electrodes: Comply with AWS requirements. Tensile strength should be the same or greater than base metal.

## 2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Plain unless otherwise noted.

B. Un-headed Anchor Rods: ASTM F 1554, Grade 36, unless otherwise indicated.

1. Configuration: as indicated.
2. Nuts: ASTM A 563, heavy hex carbon steel.
3. Plate Washers: ASTM A 36 carbon steel.
4. Washers: ASTM F 436, hardened carbon steel.
5. Finish: Plain.

C. Threaded Rods: ASTM A 36.

1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Washers: ASTM F 436 hardened carbon steel.
3. Finish: Plain.

D. Clevises or turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.

E. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.

F. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

## 2.3 PRIMER

A. Primer: Fabricator's standard lead and chromate free non-asphaltic rust inhibiting primer.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

## 2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, non-corrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

## 2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC "Code of Standard Practice for Steel Buildings and Bridges" and AISC "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design".

1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.



4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."
- F. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.
- G. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10" o.c., unless otherwise indicated.
- H. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
  1. Cut, drill, or punch holes perpendicular to steel surfaces.
  2. Base-Plate Holes: Cut, drill, or punch holes perpendicular to steel surfaces.
  3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
  1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

## 2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
  1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2".
  2. Surfaces to be field welded.
  3. Surfaces to be high-strength bolted with slip-critical connections.
  4. Surfaces to receive sprayed fire-resistive materials.
  5. Galvanized surfaces.

- B. Surface Preparation: Clean the surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to Manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Stripe paint comers, crevices, bolts, welds, and sharp edges.
  - 2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

## 2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
  - 1. Fill vent holes and grind smooth after galvanizing.
  - 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedment, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
  - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
  - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of base plate.
  - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
  - 4. Promptly pack grout solidly between bearing surfaces and base or bearing; plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow it to cure. Comply with Manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- C. Splice members only where indicated.
- D. Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1.
- E. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

### 3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
  - 1. Comply with AISC "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design", for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
  - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC “Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.”
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

### 3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and Manufacturer’s written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
  - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
  - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 09 90 00, PAINTING AND PROTECTIVE COATINGS.

END OF SECTION 05 12 00

## SECTION 05 50 00 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 SECTION REQUIREMENTS

- A. Submittals: Shop Drawings showing details of fabrication and installation.

### PART 2 - PRODUCTS

#### 2.1 METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 240 or ASTM A 666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Rolled Steel Floor Plate: ASTM A 786.
- E. Steel Tubing: ASTM A 500.
- F. Steel Pipe: ASTM A 53, standard weight (Schedule 40), black finish.
- G. Slotted Channel Framing: Cold-formed steel channels, 1-5/8 by 1-5/8 inches by 0.0528 inch thick, complying with MFMA-4.
- H. Cast Iron: ASTM A 48 or ASTM A 47.
- I. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- J. Aluminum-Alloy Rolled Tread Plate: ASTM B 632, Alloy 6061-T6.
- K. Aluminum Castings: ASTM B 26, Alloy 443.0-F.

#### 2.2 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107; recommended by manufacturer for exterior applications.

#### 2.3 FABRICATION

- A. General: Shear and punch metals cleanly and accurately. Remove burrs and ease exposed edges. Form bent-metal corners to smallest radius possible without impairing work.
- B. Welding: Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. At exposed connections, finish welds and surfaces smooth with contour of welded surface matching those adjacent.
- C. On units indicated to be cast into concrete or built into masonry, provide welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c.
- D. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.



- E. Fabricate steel pipe columns with 1/2-inch steel base plates and 1/4-inch steel top plates welded to pipe with continuous fillet weld same size as pipe wall thickness. Drill top plates for connection bolts and base plates for 5/8-inch anchor bolts.
- F. Fabricate loose lintels from steel angles and shapes. Size to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches.
- G. Fabricate structural-steel door frames from structural shapes and bars fully welded together, with 5/8-by-1-1/2-inch steel channel stops. Plug-weld built-up members and continuously weld exposed joints.
- H. Fabricate window security bars to designs indicated from steel bars and shapes of sizes and profiles indicated. Form steel bars by bending, forging, coping, mitering, and welding with full-length, full-penetration welds. Provide wall brackets, fittings, and anchors to secure units.
- I. Fabricate ladders for locations shown, complying with ANSI A14.3, aluminum construction.
- J. Alternating Tread Devices: Fabricate alternating tread devices to comply with the IBC. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Fabricate from aluminum and assemble by welding or with stainless-steel fasteners. Provide brackets and fittings for installation.
- K. Fabricate pipe guards from 3/8-inch- thick by 12-inch- wide steel plate, bent to fit flat against the wall or column at ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.

## 2.4 SIZING

- A. Where size of support system is not detailed on the Plans, the manufacturer shall provide an engineer designed system. Design calculations shall be provided by an engineer licensed to practice in the State of Alabama and shall be submitted with the product submittals.

## 2.5 ABRASIVE METAL NOSINGS AND TREADS

- A. Cast-Metal Units: Cast aluminum, with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.
  - 1. Manufacturers:
    - a. American Safety Tread Co., Inc.
    - b. Balco Inc.
    - c. Barry Pattern & Foundry Co., Inc.
    - d. Safe-T-Metal Co.
    - e. Wooster Products Inc.
  - 2. Nosing: Cross-hatched units, 4" wide with 1/4" lip, for casting into concrete steps.
  - 3. Nosing: Cross-hatched units, 1-1/2" x 1-1/2", for casting into concrete curbs.
  - 4. Treads: Cross-hatched units, full depth of tread with 3/4" x 3/4" nosing, for application over bent plate treads or existing stairs.
- B. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.
  - 1. Available Manufacturers:
    - a. ACL Industries, Inc.

- b. American Safety Tread Co., Inc.
  - c. Amstep Products.
  - d. Armstrong Products, Inc.
  - e. Balco Inc.
  - f. Wooster Products Inc.
2. Provide ribbed units, with abrasive filler strips projecting 1/16" above aluminum extrusion.
  3. Provide solid-abrasive-type units without ribs.
  4. Nosing: Square-back units, 3" wide, for casting into concrete steps.
  5. Nosing: Beveled-back units, 3" wide with 1-3/8" lip, for surface mounting on existing stairs.
  6. Nosing: Two-piece units, 3" wide, with sub channel for casting into concrete steps.
  7. Treads: Beveled-back units, full depth of tread with 1-3/8" lip, for application over existing stairs.
- C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with Manufacturer.
- D. Drill for mechanical anchors and countersink. Locate not more than 4" from ends and not more than 12" o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by Manufacturer.
1. Provide 2 rows of holes for units more than 5" wide, with 2 holes aligned at ends and intermediate holes staggered.
- E. Apply bituminous paint, Mylar isolators or other protective system as approved by the Engineer to concealed bottoms, sides, and edges of cast-metal units set into concrete
- 2.6 STEEL AND IRON FINISHES
- A. Hot-dip galvanize steel fabrications at exterior locations.
  - B. Prepare uncoated ferrous metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning," and paint with a fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack.
- B. Fit exposed connections accurately together to form hairline joints.
- C. Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- D. Install pipe guards at exposed vertical pipes where not protected by curbs or other barriers. Install by bolting to wall or column with drilled-in expansion anchors.
- E. Anchor bollards in concrete and fill solidly with concrete, mounding top surface.

END OF SECTION 05 50 00

## SECTION 05 51 00 - METAL STAIRS

### PART 1 - GENERAL

#### 1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, and structural analysis data signed and sealed by a qualified professional engineer registered in the state where Project is located.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Provide stairs capable of withstanding a uniform load of 100 lbf/sq. ft. and a concentrated load of 300 lbf applied on an area of 4 sq. in. Uniform and concentrated loads need not be assumed to act concurrently.
- B. Provide railings capable of withstanding a uniform load of 50 lbf/ft. and a concentrated load of 200 lbf applied to handrails and top rails of guards in any direction. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Provide railing infill capable of withstanding a concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft. Infill load and other railing loads need not be assumed to act concurrently.

#### 2.2 METALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- B. Aluminum Castings: ASTM B 26, Alloy 443.0-F.

#### 2.3 MISCELLANEOUS MATERIALS

- A. Nosings: Comply with Division 05 Section "Metal Fabrications."
- B. Concrete: Comply with Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

#### 2.4 FABRICATION

- A. General: Shear and punch metals cleanly and accurately. Remove burrs and ease exposed edges. Form bent-metal corners to smallest radius possible without impairing work.
- B. Welding: Use materials and methods that minimize distortion and develop strength of base metals. At exposed connections, finish welds and surfaces smooth.
- C. Stair Framing: Fabricate stringers of steel channels. Construct platforms of steel channel headers and miscellaneous framing members.

## 2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal stairs after assembly.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints. Do not weld, cut, or abrade surfaces of exterior units that are for bolted or screwed field connections.
- C. Place and finish concrete fill for treads and platforms to comply with Division 03 Section "Cast-in-Place Concrete." Install abrasive nosings with anchors fully embedded in concrete.
- D. Attach handrails to wall with wall brackets.

END OF SECTION 05 51 00

## SECTION 05 52 00 - METAL RAILINGS

### PART 1 - GENERAL

#### 1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and Shop Drawings.

### PART 2 - PRODUCTS

#### 2.1 RAILING SYSTEMS

- A. Manufacturers:
  - 1. Moultrie Manufacturing, Moultrie, GA; Wesrail II.
  - 2. Thompson Fabricating Company; Birmingham, AL; TUFRAIL.
- B. Provide railings capable of withstanding a uniform load of 50 lbf/ ft. and a concentrated load of 200 lbf applied to handrails and top rails of guards in any direction. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Provide railing infill capable of withstanding a concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft. Infill load and other railing loads need not be assumed to act concurrently.

#### 2.2 METALS

- A. Aluminum, Extruded Bars and Tubing: ASTM B 221, Alloy 6063-T5/T52.
- B. Aluminum Castings: ASTM B 26/B 26M, Alloy A356.0-T6.
- C. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

#### 2.3 FABRICATION

- A. Assemble railing systems in shop to the greatest extent possible not to exceed 24 feet for field erection. Use connections that maintain structural value of joined pieces.
- B. Form changes in direction of railing members by use of prefabricated fittings.
- C. Fabricate railing systems and handrails for connecting members with concealed mechanical fasteners and fittings.
- D. Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.
- E. Provide wall returns at ends of wall-mounted handrails.
- F. Toeboard shall conform to OSHA standards. Toeboard shall be a minimum of 4" high and shall be an extrusion that attaches to the posts with clamps that will allow for expansion and contraction between posts. Toeboard shall be set 1/4" above the walking surface. Toeboards



shall be provided on handrails throughout the entire project area. Toeboards shall be shipped in stock lengths for field installation.

- G. All components must be mechanically fastened with stainless steel hardware.

## 2.4 FINISHES

- A. Aluminum Railings: Class I, clear anodic finish; AA-M10C22A41; complying with AAMA 611. The pipe shall be plastic-wrapped. The plastic wrap is to be removed after erection.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Fit exposed connections accurately together to form tight, hairline joints.
- B. Set railings accurately in location, alignment, and elevation and free of rack.
- C. Coat concealed surfaces of aluminum that will be in contact with cementitious materials or dissimilar metals, with a heavy coat of bituminous paint.
- D. Concrete anchors shall be stainless steel type 303 or 304 wedge anchors and shall be furnished by the handrail manufacturer. The anchor design shall include the appropriate reduction factors for spacing and edge distances in accordance with the manufacturers published data.
- E. Attach handrails to wall with wall brackets.

END OF SECTION 05 52 00

## SECTION 06 74 13 – FIBERGLASS REINFORCED GRATINGS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS:

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

#### 1.02 SUMMARY:

- A. This section includes the following FRP Products & Fabrications:
  - 1. FRP Pultruded Gratings and Treads

#### 1.03 SCOPE OF WORK:

- A. Furnish all labor, materials, equipment and incidentals governed by this section necessary to install the fiberglass reinforced polymer (FRP) products as specified herein.

#### 1.04 QUALITY ASSURANCE:

- A. The material covered by these specifications shall be furnished by a manufacturer of proven ability who is regularly engaged in the manufacture and fabrication of FRP systems.
- B. Substitution of any component or modification of system shall be made only when approved by the Engineer.
- C. Fabricator Qualifications: Firm experienced in successfully producing FRP fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.
- D. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

#### 1.05 DESIGN CRITERIA:

- A. The design of FRP products including connections shall be in accordance with governing building codes and standards as applicable.
- B. Design live loads of FRP gratings and floor panels shall not be less than 100 PSF uniformly distributed unless specifically stated otherwise in drawings and/or supplementary conditions or in governing building code as applicable. Grating and floor panel deflection at the center of a simple span not to exceed 0.25".
- C. Structural members shall be designed to support all applied loads. Deflection in any direction shall not be more than L/180 of span for structural members unless specifically stated otherwise in drawings and/or supplementary conditions. Connections shall be designed to transfer the loads.
- D. Temperature exposure is limited to 100°F unless specifically stated otherwise in drawings and/or supplementary conditions.

#### 1.06 SUBMITTALS:

- A. Shop drawings of all fabricated pultruded gratings and treads, structural shapes and plate, standard railings, ladders and cages, foam core building panels, building panel systems, planks, molded gratings and treads and appurtenances shall be submitted to the Design Engineer for approval. Manufacturer's catalog data showing:
  - 1. Materials of construction
  - 2. Dimensions, spacings, and construction of grating, handrails and building panels.
- B. Detail shop drawings showing:
  - 1. Dimensions
  - 2. Sectional assembly
  - 3. Location and identification mark
  - 4. Size and type of supporting frames required

#### 1.07 SHIPPING AND STORAGE INSTRUCTIONS:

- A. All systems, sub-systems and structures shall be shop fabricated and assembled into the largest practical size suitable for transporting.
- B. All materials and equipment necessary for the fabrication and installation of pultruded gratings and treads, structural shapes and plate, standard railings, ladders and cages, planks, molded gratings and treads and appurtenances shall be stored before, during, and after shipment in a manner to prevent cracking, twisting, bending, breaking, chipping or damage of any kind to the materials or equipment, including damage due to over exposure to the sun. Any material which, in the opinion of the Engineer, has become damaged as to be unfit for use, shall be promptly removed from the site of work, and the Contractor shall receive no compensation for the damaged material or its removal.
- C. Identify and mark all materials, items and fabrications for installation and field assembly.

### PART 2 - PRODUCTS

#### 2.01 GENERAL:

- A. Materials used in the manufacture of the FRP products shall be in conformance with the specification. The visual quality of the pultruded shapes shall conform to ASTM D4385.
- B. All FRP products noted in 1.02 shall be manufactured using a pultruded process utilizing polyester resin with flame retardant and ultraviolet (UV) inhibitor additives.
- C. If required, after fabrication, all cut ends, holes and abrasions of FRP shapes shall be sealed with a compatible resin coating.
- D. FRP products exposed to weather shall contain an ultraviolet inhibitor. Should additional ultraviolet protection be required, a one mil minimum UV coating can be applied.
- E. All exposed surfaces shall be smooth and true to form, consistent with ASTM D4385.
- F. Manufacturers:
  - 1. Strongwell

## 2.02 PULTRUDED GRATINGS AND TREADS:

### A. General

1. Grating shall be shipped from the manufacturer, palletized and banded with exposed edges protected to prevent damage in shipment.
2. Each piece shall be clearly marked showing manufacturer's applicable drawing number.
3. Grating shall be DURADEK as manufactured by Strongwell.

### B. Design

1. The panels shall be 2 inches deep and sustain a deflection of no more than 0.25" under a uniform distributed load of 100 PSF for the span lengths shown on the plans.
2. Stair treads shall be capable of withstanding a uniform load of 100 PSF or a concentrated load of 300 lbs. on an area of 4 sq. inches located in the center of the tread, whichever produces greater stress and deflect less than 0.25".
3. The top surface of all panels shall have a non-skid grit affixed to the surface by an epoxy resin followed by a top coat of epoxy resin.
4. Panels shall be fabricated to the sizes shown on the drawings.
5. Hold down clamps shall be type 316L stainless steel clips. Use 2 at each support with a minimum of 4 per panel.
6. Color of stair treads shall be high visibility yellow. Color of walkways shall be gray.
7. All bearing bars that are to be exposed to UV shall be coated with polyurethane coating of a minimum thickness of 1 mil.

### C. Products

1. The Pultruded FRP grating and stair treads shall be fabricated from bearing bars and cross rods manufactured by the pultrusion process. The glass fiber reinforcement for the bearing bars shall be a core of continuous glass strand rovings wrapped with continuous strand glass mat. A synthetic surface veil fabric shall encase the glass reinforcement.
2. Fiberglass Grating and Stair Treads
  - a. Fiberglass grating and stair treads shall be made from a chemical resistant, fire retardant polyester resin system with antimony trioxide added to meet the flame spread rating of 25 or less.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from infiltration of water and debris.

### 3.02 INSPECTION AND TESTING

- A. All labor, power, materials, equipment and appurtenances required for testing shall be furnished by the Contractor at no cost to the Owner.

### 3.03 INSTALLATION, GENERAL

- A. Provide anchorage devices and fasteners where necessary for securing miscellaneous FRP fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors.
- B. Cutting, fitting and placement: Perform cutting, drilling and fitting required for installation of miscellaneous FRP fabrications. Set FRP fabrication accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; measured from established lines and levels.
- C. Provide temporary bracing or anchors in form work for items that are to be built into concrete masonry or similar construction.

### 3.04 ALL FRP INSTALLATION

- A. If required, all field cut and drilled edges, holes and abrasions shall be sealed with a catalyzed resin compatible with the original resin as recommended by the manufacturer.
- B. Install items specified as indicated and in accordance with manufacturer's instructions.

END OF SECTION 06 74 13

## SECTION 09 90 00 - PAINTING AND COATING

### PART 1 - GENERAL

#### 1.01 REQUIREMENTS INCLUDED

- A. This specification covers preparation of surfaces, performance, and completion of painting of all surfaces as required by the drawings and as specified herein.
- B. Valves, equipment and products which are provided with a factory coating system suitable for the applicable use will not be required to be re-coated. However, the Contractor shall furnish and install compatible touch-up paint on blemishes or coating damage caused during construction. All exposed primed ductile iron pipe shall be coated as indicated in this section.
- C. All Materials delivered to job site shall be in original sealed and labeled containers of the paint manufacture.

#### 1.02 SUBMITTALS

- A. Product Data, Samples, and Painting Schedule.

#### 1.03 REFERENCES

- A. ANSI/NSF 61 Drinking Water System Components – Health Effects
- B. ASTM D 16 Terminology Relating to Paint, Varnish, Lacquer, and related Products
- C. AWWA D102 Coating Steel Water-Storage Tanks
- D. NACE SPO 188 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
- E. SSPC Society of Protective Coatings

#### 1.04 DEFINITIONS

- A. Terms used in this Section:
  - 1. Definition of Painting Terms: ASTM D16, unless otherwise specified
  - 2. DFT – Dry Film Thickness
  - 3. Mils – Thousandth of an inch
  - 4. VOC – Volatile Organic Compounds
  - 5. SP – Surface Preparation

#### 1.05 ENVIRONMENTAL CONDITIONS

- A. Coatings shall be applied during good painting weather. Air and surface temperatures shall be within limits prescribed by the manufacture for the coating being applied and work areas shall be reasonably free of airborne dust at the time of application and while coating is drying.

#### 1.06 ENVIRONMENTAL REGULATIONS

- A. All materials specified herein meet the current VOC Regulations and National AIM Regulations in effect. Shop applied materials to meet current HAPS requirements.



- B. All products in contact with potable water must be certified by ANSI/NSF to Standard 61.

#### 1.07 QUALITY ASSURANCE

- A. Certification Requirements:
  - 1. All coatings shall conform to OSHA requirements for allowable exposure to lead and other hazardous substances.
  - 2. All coatings in contact with potable water or within potable water reservoirs shall be certified according to NSF Std. 61.
- B. Product Manufacturer:
  - 1. Manufacturer shall be a company that specializes in producing high quality industrial coating materials. This company shall have 10 years or more experience demonstrated by case histories in the designated field of application.
- C. Applicator Qualifications:
  - 1. Engage an experienced applicator with 5 years or more experience that has successfully completed coating system applications similar in material and extent to those indicated.
- D. Single Source Responsibility:
  - 1. Provide coating material and thinners produced by the same manufacturer for each system on all surfaces of the tank.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Material shall be delivered to the site in original containers with labels intact and seals unbroken. Labels should provide the following information: material name, coating manufacturer, color name and number, batch or lot number, date of manufacture, mixing and thinning instructions.
- B. All coatings shall be stored in an enclosed structure to protect them from weather and excessive heat or cold. Flammable coatings must be stored to conform to City, County, State and Federal safety codes for flammable coatings or paint materials. At all times coatings shall be protected from freezing.
- C. All empty containers shall be disposed of in accordance with local, state and federal regulations.

#### 1.09 PROJECT/SITE CONDITIONS

- A. Climate:
  - 1. No paint shall be applied when the air or surface temperature, as measured in the shade, is below that which is recommended by the manufacturer. Paint shall not be applied to wet or damp surfaces, and shall not be applied in rain, snow, fog, mist, or when the surface temperature will be less than 5 F above the dew point. No paint shall be applied when it is expected that the surface temperature will drop below the manufacturer's recommendation within 2 - 4 hours after the application of the paint. Dew or moisture condensation should be anticipated, and if such conditions are prevalent, painting shall be delayed until it is certain that the surfaces are dry. In addition, the days painting shall be completed well in advance of the probable time of day when moisture condensation will

occur in order to permit the film the required drying time as specified by the manufacturer prior to the formation of moisture.

B. Ventilation:

1. Provide ventilation during coating curing stage in confined or enclosed areas in accordance with AWWA D102, Section A.7.5. Forced air ventilation shall be maintained for a minimum of four (4) days following interior coating application to assist in curing process.

C. Dust and Contaminants:

1. Schedule coating work to avoid excessive dust and airborne contaminants. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

## 1.10 GUARANTEE

- A. The contractor shall guarantee his work for a period of one year to the extent that he shall repair any defects due to faulty workmanship or materials which may appear on the structure during this period.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Products:

1. Induron Coatings
2. TNEMEC Co., Inc

- B. Equivalent materials of other manufacturers may be substituted on approval of the engineer. Requests for substitution shall include Manufacturer's literature for each product giving the name, generic type, descriptive information and evidence of satisfactory past performance. Submittals shall include the following performance data as certified by a qualified testing laboratory:

1. ASTM B117 - Method of Salt Spray (Fog) Testing
2. ASTM D149 - Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials of Commercial Power Frequencies
3. ASTM D3359 - Method for Measuring Adhesion by Test Tape
4. ASTM D3363 - Method for Film Hardness by Pencil Test
5. ASTM D4060 - Method for Abrasion Resistance of Organic coatings by the Taber Abraser
6. ASTM D4541 - Method for Pull Off Strength of Coats Using Portable Adhesion Testers
7. ASTM 4585 - Practice for Testing the Water Resistance of Coatings Using Controlled Condensation
8. ASTM G53 - Practice for Operating Light and Water Exposure of nonmetallic Materials
9. AWWA D102 - Standard for Painting Steel Water Storage Tanks
10. SSPC SP6 - Commercial Blast Cleaning
11. SSPC SP10 - Near White Blast Cleaning

- C. Bidders desiring to use coatings other than those specified shall submit their proposal in writing to the engineer at least ten (10) days prior to the bid opening. Substitutions which decrease the film thickness, the number of coats applied, change the generic type of coating,

or fail to meet the performance criteria of the specified materials will not be approved. Prime and finish coats of all surfaces shall be furnished by the same manufacturer.

- D. Colors shall be as selected by the engineer. All colors shall be certified lead free.
- E. Materials supplied by other manufacturers may be considered for substitution if the following prevailing conditions exist:
  - 1. Performance criteria of the specified materials are exceeded by the submitted alternate materials as listed in paragraph 2.01 and detailed on the technical data sheets of each specified product.
  - 2. The submittal must compare the performance criteria of the specified material with that of the submitted material and be documented in a side by side manner for the Engineer\Owner to review.
  - 3. Substitute materials must be for complete systems and not individual products combined with the specified materials and the performance criteria for all products within a system must meet or exceed the specified materials.
  - 4. Only one alternate submittal will be received for this specification and must be accompanied by a detailed statement of the sum to be added or deducted from the base bid should alternate materials be accepted.
- F. Thinning, Mixing, and Tinting:
  - 1. Where thinning is necessary, only the products of the manufacturer furnishing the coating will be allowed. All thinning shall be done in strict accordance with the coating manufacturer's recommendations.
  - 2. Mix in accordance to the manufacturer's recommendations.
  - 3. Each coat shall be slightly different in shade than the preceding coat, unless otherwise noted.

## PART 3 - EXECUTION

### 3.01 SURFACE PREPARATION

- A. Prepare surfaces in accordance with coating system's specifications. Touch up welds, burned and abraded areas with specified primer before applying field coats.
- B. Ensure surfaces are dry.
- C. Prior to field touch up of shop primed steel, all surfaces shall be cleaned to remove all surface contamination including oil, grease, dust, dirt and foreign matter. All rusted, abraded, and unpainted areas shall be prepared to specified surface preparation before primer is applied.
- D. Allow each coat to dry thoroughly before applying next coat.
- E. Finish coats shall be uniform in color and sheen without streaks, laps, runs, sags, or missed areas. Primer and finish coats shall be furnished from the same Manufacturer to ensure compatibility.

### 3.02 SURFACES NOT SCHEDULED TO BE COATED

- A. Protect surrounding areas and surfaces not scheduled to be coated from damage during surface preparation and application of coatings. Immediately remove coatings that fall on surrounding areas and surfaces not scheduled to be coated.

### 3.03 APPLICATION

- A. Materials shall be mixed, thinned, and applied according to the manufacturer's printed instructions and in accordance with AWWA D 102.
- B. Abrasive blast cleaned surfaces shall be coated the same day as the cleaning is performed. If rust or contamination appears as a result of delay in primer application, the surface shall be cleaned to specified surface preparation before primer is applied.
- C. Apply coatings in accordance with coating manufacturer's instructions.
- D. Keep containers closed when not in use to avoid contamination.
- E. Do not use mixed coatings beyond pot life limits.
- F. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.
- G. After sufficient cure of the field prime coat, apply a stripe coat to the interior wet areas with a brush to critical locations on steel such as welds, corners, and edges using specified intermediate coat.
- H. Uniformly apply coatings at spreading rate required to achieve specified DFT.
- I. Apply coatings to be free of film defects that would adversely affect performance of the coating system. Apply exterior coatings to be free of characteristics or defect that adversely affect appearance.

### 3.04 REPAIR

- A. Damaged Materials: Repair or replace damaged materials and surfaces not scheduled to be coated.
- B. Damaged Coatings: Touch-up or repair damaged coatings. Touch-up of minor damage shall be acceptable where the result is not visibly different from adjacent surfaces.
- C. Coating Defects: Repair in accordance with coating manufacturer's instructions coatings that exhibit film characteristics or defects that would adversely affect performance or appearance of coating systems.

### 3.05 ACCEPTANCE OF WORK

- A. All Surface Preparation and repairs shall be approved by the engineer/owner before primer is applied.
- B. Request acceptance of each coat before applying next coat.
- C. Correct work that is not acceptable and request re-inspection.

### 3.06 SYSTEM INSPECTION AND TESTING

- A. After application of each coating in the specified system and its surface has cured, measure its thickness with a properly calibrated Nordson Microtest Dry Film Thickness Gauge, or

equivalent. Follow standard method for measurement of dry paint thickness with magnetic gauges as outlined in The Society of Protective Coating's SSPC PA2.

- B. Make as many determinations as needed to ensure the specified thickness values in each typical area. To all surfaces having less dry film thickness than specified, apply additional coat(s) at no extra cost to Owner to bring thickness up to specifications.
- C. Structural metals in immersion service that receive a protective coating system shall be checked with a non-destructive holiday detector in accordance with NACE SPO 188. All pinholes or defects shall be repaired in accordance with manufacturer's printed recommendations and then retested.
- D. Masonry, drywall, or other non-metallic surfaces shall be continuously checked with wet film thickness gauges during application to ensure proper dry film thickness will be attained. Also, square feet coverage needs to be monitored to verify proper coverage rates.
- E. Painting contractor shall permit Owner's Representative and/or paint & coating manufacturer (as requested by owner) to inspect his work for conformance to this specification. Owner reserves the right to reject all work that does not comply with this specification.

### 3.07 CLEANUP

- A. Remove and dispose of all rubbish or other unsightly material, in a legal manner, leaving the premises in a clean condition.

### 3.08 INDURON PAINTING SCHEDULE

- A. Steel - Structural, Tanks, Pipes and Equipment
  - 1. Exterior, Non-Immersion
    - a. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
    - b. 1st Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
    - c. 2nd Coat: Indurethane 6600 Plus at 2.0 - 3.0 mils DFT.
  - 2. Immersion, Potable or Non Potable Water
    - a. Surface Preparation: SSPC SP10 Near White Blast Cleaning.
    - b. 1st Coat: Ceramapure TL-70 Ceramic Epoxy at 8.0 - 12.0 mils DFT.
    - c. 2nd Coat: Ceramapure TL-70 Ceramic Epoxy at 8.0 - 12.0 mils DFT.
  - 3. Severe Vapor Phase and Liquid Fluctuation Level, Non Potable water with high levels of Hydrogen Sulfide.
    - a. Surface Preparation: SSPC SP5/NACE 1 White Blast Cleaning.
    - b. 1st Coat: Ceramasafe 90 Ceramic Epoxy at 15.0 - 20.0 mils DFT.
    - c. 2nd Coat: Ceramasafe 90 Ceramic Epoxy at 15.0 - 20.0 mils DFT.
    - d. \* May be applied in one coat at 30.0 to 40.0 mils DFT.
  - 4. Immersion or Hydrogen Sulfide Exposure
    - a. Surface Preparation: SSPC SP5/NACE 1 White Blast Cleaning.
    - b. 1st Coat: Ceramasafe 90 Ceramic Epoxy at 7.0 - 10.0 mils DFT.
    - c. 2nd Coat: Ceramasafe 90 Ceramic Epoxy at 7.0 - 10.0 mils DFT.
  - 5. Interior, Non Immersion
    - a. Surface Preparation: SSPC SP6 Commercial Blast Cleaning.
    - b. 1st Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
    - c. 2nd Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
  - 6. Metal Anchorage for Buried Piping

- a. Surface Preparation: Shop Primed Materials Clean and Dry or SSPC SP3 Power Tool Clean.
    - b. 1st Coat: Ceramasafe 90 Ceramic Epoxy at 8.0 - 12.0 mils DFT.
  - 7. Miscellaneous Castings, Including Manhole Rings and Covers
    - a. Surface Preparation: SSPC SP6 Commercial Blast Cleaning.
    - b. 1st Coat: Ceramasafe 90 Ceramic Epoxy at 12.0 - 16.0 mils DFT.
  - 8. Factory Primed
    - a. Surface Preparation: Surface shall be clean and dry.
    - b. Shop Primer: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
- B. Galvanized Metal
  - 1. Exterior, Non-Immersion
    - a. Surface Preparation: Prepare in accordance with ASTM D6386.
    - b. 1st Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
    - c. 2nd Coat: Indurethane 6600 Plus at 2.0 - 3.0 mils DFT.
  - 2. Interior, Non Immersion
    - a. Surface Preparation: Prepare in accordance with ASTM D6386.
    - b. 1st Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
    - c. 2nd Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
  - 3. Immersion
    - a. Surface Preparation: Prepare in accordance with ASTM D6386.
    - b. 1st Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
    - c. 2nd Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
    - d. \* Use Ceramapure TL-70 Epoxy in Potable Water.
- C. Mill Coated Steel Pipe
  - 1. Exterior of Pipe, Non Immersion
    - a. Surface Preparation: SSPC SP6 Commercial Blast Cleaning.
    - b. Surface shall be clean and dry, remove black coating.
    - c. 1st Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
    - d. 2nd Coat: Indurethane 6600 Plus at 2.0 - 3.0 mils DFT.
  - 2. Immersion, Potable or Non Potable Water
    - a. Surface Preparation: SSPC SP10 Near White Blast Cleaning.
    - b. 1st Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
    - c. 2nd Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
    - d. \* Use Ceramapure TL-70 Epoxy in Potable Water.
- D. Ductile or Cast Iron: Pipe and Miscellaneous Fabrications
  - 1. Exterior, Non Immersion
    - a. Surface Preparation: Surface shall be clean and dry. Remove Black Coating in accordance with NAPF 500-03.
    - b. 1st Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
    - c. 2nd Coat: Indurethane 6600 Plus at 2.0 - 3.0 mils DFT.
  - 2. Interior, Non Immersion
    - a. Surface Preparation: Surface shall be clean and dry. Remove Black Coating in accordance with NAPF 500-03.
    - b. One Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
  - 3. Immersion, Potable or Non Potable Water
    - a. Surface Preparation: Surface shall be clean and dry. Remove Black Coating in accordance with NAPF 500-03.
    - b. 1st Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.



- c. 2nd Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
    - d. \* Use Ceramapure TL-70 Epoxy in Potable Water.
  - 4. Severe Vapor Phase and Liquid Fluctuation Level, Non Potable water with high levels of Hydrogen Sulfide.
    - a. Surface Preparation: NAPF 500-03.
    - b. 1st Coat: PermaClean 100 at 15.0 - 20.0 mils DFT.
    - c. 2nd Coat: PermaClean 100 at 15.0 - 20.0 mils DFT.
    - d. \* May be applied in one coat at 30.0 to 40.0 mils DFT.
  - 5. Immersion or Hydrogen Sulfide Exposure
    - a. Surface Preparation: NAPF 500-03.
    - b. 1st Coat: Ceramasafe 90 at 7.0 - 10.0 mils DFT.
    - c. 2nd Coat: Ceramasafe 90 at 7.0 - 10.0 mils DFT.
  - 6. Below Ground
    - a. Surface Preparation: Contact Induron Representative.
    - b. Primer: (Optional) Induraguard Epoxy, 3.0 - 5.0 mils DFT.
    - c. Finish Coat: Ruff Stuff 2100 Coal Tar Epoxy, 14.0 - 20.0 mils DFT.
  - 7. Interior Exposed and/or Immersion
    - a. Surface Preparation: Contact Tnemec Representative
    - b. Primer: PE-70 Epoxy, 2.5 - 3.5 mils DFT.
    - c. Intermediate: Ceramasafe 90, 7.0 - 10.0 mils DFT.
    - d. Finish: Ceramasafe 90, 7.0 - 10.0 mils DFT.
- E. Concrete, Dense Masonry
  - 1. Exterior, Non Immersion
    - a. Surface Preparation: Surface shall be clean and dry.
    - b. One Coat: AC403 Elastomeric Coating at 6.0 - 10.0 mils DFT.
  - 2. Immersion or Interior Non Immersion
    - a. Surface Preparation: Brush Off Blast.
    - b. Filler Coat: Fill flush all bug holes and voids with Induron EFS-707 Epoxy Surfacer.
    - c. 1st Coat: Ceramasafe 90 Epoxy at 10.0 - 15.0 mils DFT.
    - d. \* Use Ceramapure TL-70 in Potable Water.
  - 3. Interior
    - a. Surface Preparation: Surface shall be clean and dry. Stone rub to remove loose and small particles from surface.
    - b. 1st Coat: Induraguard Epoxy at 6.0 - 8.0 mils DFT .
    - c. 2nd Coat: Induraguard Epoxy at 6.0 - 8.0 mils DFT.
  - 4. Interior, exposed to high levels of Hydrogen Sulfide and Sulfuric Acid Condensate
    - a. Surface Preparation: SSPC-SP13/NACE 6, ICRI CSP 5 or greater .
    - b. Surfacer: EFS-707 Epoxy Filler Surfacer.
    - c. 1st Coat: PermaClean 100 at 30.0 - 40.0 mils DFT.
- F. Porous Masonry - CMU
  - 1. Exterior
    - a. Surface Preparation: Surface shall be clean and dry. Stone rub to remove loose and small particles from surface.
    - b. 1st Coat: AC 403 Acrylic at 6.0 - 8.0 mils DFT.
    - c. 2nd Coat: AC 403 Acrylic at 6.0 - 8.0 mils DFT.
    - d. Note: Split face block requires Induron Polyfill Epoxy.
  - 2. Interior

- a. Surface Preparation: Surface shall be clean and dry. Stone rub to remove loose and small particles from surface.
  - b. 1st Coat: Induraguard Epoxy at 80 - 100 sq. ft. gal.
  - c. 2nd Coat: Induraguard Epoxy at 6.0 - 8.0 mils DFT.
- G. Concrete Floors
- 1. Interior
    - a. Operations Building – Colored
      - 1) Surface Preparation: Acid Etch or Brush Off Blast.
      - 2) 1st Coat: Perma Clean II Epoxy at 3.0 - 5.0 mils DFT.
      - 3) 2nd Coat: Perma Clean II Epoxy at 3.0 - 5.0 mils DFT.
      - 4) 3rd Coat (As Required): 290/291-Color CRU at 1.0 - 2.0 mils DFT. Non-skid with 211 Glass beads.
- H. Concrete Structures
- 1. Below Grade
    - a. Surface Preparation: Brush off Blast.
    - b. One Coat: Ruff Stuff 2100 Coal Tar Epoxy at 12.0 - 16.0 mils DFT.
- I. PVC Pipe
- 1. Exterior
    - a. As noted on plans.
- J. Plaster and Wallboard
- 1. Interior
    - a. Surface Preparation: Surface shall be clean and dry.
    - b. 1st Coat: AC210 Acrylic 1.0 - 2.0 mils DFT.
    - c. 2nd Coat: AC230 Acrylic at 4.0 - 6.0 mils DFT.
- K. Wood
- 1. Interior or Exterior
    - a. Surface Preparation: Surface shall be clean and dry
    - b. 1st Coat: AC210 Acrylic Primer at 2.0 - 3.0 mils DFT.
    - c. 2nd Coat: AC230 Acrylic at 2.0 - 3.0 mils DFT.
    - d. 3rd Coat: AC230 Acrylic at 2.0 - 3.0 mils DFT.
- L. Insulated Pipe
- 1. Interior
    - a. Surface Preparation: Surface shall be clean and dry.
    - b. 1st Coat: AC 210 Acrylic at 2.0 - 3.0 mils DFT.
    - c. 2nd Coat: AC230 Acrylic at 2.0 - 3.0 mils DFT.
- M. Non Ferrous Metals
- 1. Interior
    - a. Surface Preparation: SSPC SP1 Solvent Cleaning and lightly scarify.
    - b. One Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
  - 2. Exterior
    - a. Surface Preparation: SSPC SP1 Solvent Cleaning and lightly scarify.
    - b. 1st Coat: Induraguard Epoxy at 4.0 - 6.0 mils DFT.
    - c. 2nd Coat: Indurethane 6600 Plus at 2.0 - 3.0 mils DFT.

### 3.09 TNEMEC PAINTING SCHEDULE

#### A. Steel - Structural, Tanks, Pipes and Equipment

1. Exterior, Non-Immersion
  - a. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
  - b. 1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
  - c. 2nd Coat: 1074\1075 Color Endura Shield at 2.0 - 3.0 mils DFT.
2. Immersion, Potable or Non Potable Water
  - a. Surface Preparation: SSPC SP10 Near White Blast Cleaning.
  - b. 1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
  - c. 2nd Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
  - d. \* Use Series N140 Pota-Pox Plus in Potable Water.
3. Severe Vapor Phase and Liquid Fluctuation Level, Non Potable water with high levels of Hydrogen Sulfide.
  - a. Surface Preparation: SSPC SP5/NACE 1 White Blast Cleaning.
  - b. 1st Coat: 435 Perma-Glaze at 15.0 - 20.0 mils DFT.
  - c. 2nd Coat: 435 Perma-Glaze at 15.0 - 20.0 mils DFT.
  - d. \* May be applied in one coat at 30.0 - 40.0 mils DFT.
4. Immersion or Hydrogen Sulfide Exposure
  - a. Surface Preparation: SSPC SP5/NACE 1 White Blast Cleaning.
  - b. 1st Coat: 446 Perma-Shield at 7.0 - 10.0 mils DFT.
  - c. 2nd Coat: 446 Perma-Shield at 7.0 - 10.0 mils DFT.
5. Interior, Non Immersion
  - a. Surface Preparation: SSPC SP6 Commercial Blast Cleaning.
  - b. 1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
  - c. 2nd Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
6. Metal Anchorage for Buried Piping
  - a. Surface Preparation: Shop Primed Materials Clean and Dry or SSPC SP3 Power Tool Clean.
  - b. 1st Coat: 46 465 H.B. Tnemecol at 8.0 - 12.0 mils DFT.
7. Miscellaneous Castings, Including Manhole Rings and Covers
  - a. Surface Preparation: SSPC SP6 Commercial Blast Cleaning.
  - b. 1st Coat: 46H 413 Hi Build Theme Tar at 12.0 - 16.0 mils DFT.
8. Factory Primed
  - a. Surface Preparation: Surface shall be clean and dry.
  - b. Shop Primer: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
  - c. Barrier Coat as Required: 1-1216 Omnithane at 2.5 - 3.5 mils DFT.
  - d. Finish Coat: See top coat for exposure. System 3.07 A 1, or 5.

#### B. Galvanized Metal

1. Exterior, Non-Immersion
  - a. Surface Preparation: Prepare in accordance with ASTM D6386.
  - b. 1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
  - c. 2nd Coat: 1074\1075 Color Endura Shield at 2.0 - 3.0 mils DFT.
2. Interior, Non Immersion
  - a. Surface Preparation: Prepare in accordance with ASTM D6386.
  - b. 1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
  - c. 2nd Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
3. Immersion
  - a. Surface Preparation: Prepare in accordance with ASTM D6386.
  - b. 1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.

- c. 2nd Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
  - d. \* Use Series N140 Pota-Pox Plus in Potable Water.
- C. Ductile or Cast Iron: Pipe and Miscellaneous Fabrications
- 1. Exterior, Non Immersion
    - a. Surface Preparation: Surface shall be clean and dry. Remove Black Coating in accordance with NAPF 500-03.
    - b. 1st Coat: N(L)69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
    - c. 2nd Coat: 1074/1075-Color Endura Shield at 2.0 - 3.0 mils DFT.
  - 2. Interior, Non Immersion
    - a. Surface Preparation: Surface shall be clean and dry. Remove Black Coating in accordance with NAPF 500-03.
    - b. One Coat: N(L)69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
  - 3. Immersion, Potable or Non Potable Water
    - a. Surface Preparation: Surface shall be clean and dry. Remove Black Coating in accordance with NAPF 500-03.
    - b. 1st Coat: N(L)69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
    - c. 2nd Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
    - d. \* Use Series N140 Pota-Pox Plus in Potable Water
  - 4. Severe Vapor Phase and Liquid Fluctuation Level, Non Potable water with high levels of Hydrogen Sulfide.
    - a. Surface Preparation: NAPF 500-03.
    - b. 1st Coat: 435 Perma-Glaze at 15.0 - 20.0 mils DFT.
    - c. 2nd Coat: 435 Perma-Glaze at 15.0 - 20.0 mils DFT.
    - d. \* May be applied in one coat at 30.0 - 40.0 mils DFT.
  - 5. Immersion or Hydrogen Sulfide Exposure
    - a. Surface Preparation: NAPF 500-03.
    - b. 1st Coat: 446 Perma-Shield at 7.0 - 10.0 mils DFT.
    - c. 2nd Coat: 446 Perma-Shield at 7.0 - 10.0 mils DFT.
  - 6. Below Ground
    - a. Surface Preparation: Contact Tnemec Representative.
    - b. Primer: (Optional) Series N69 Hi-Build Epoxoline, 3.0 - 5.0 mils DFT.
    - c. Finish Coat: Series 46H-413 Hi-Build Tneme-Tar, 14.0 - 20.0 mils DFT.
  - 7. Interior Exposed and/or Immersion
    - a. Surface Preparation: Contact Tnemec Representative.
    - b. Primer: Series 1 Omnithane, DFT 2.5 - 3.5 mils.
    - c. Intermediate: Series 446 Perma-Shield MCU, 7.0 - 10.0 mils DFT.
    - d. Finish: Series 446 Perma-Shield MCU, 7.0 - 10.0 mils DFT.
- D. Concrete, Dense Masonry
- 1. Exterior, Non Immersion
    - a. Surface Preparation: Surface shall be clean and dry.
    - b. One Coat: 180/181-Color W.B Tneme Crete at 6.0 - 8.0 mils DFT.
  - 2. Immersion or Interior Non Immersion
    - a. Surface Preparation: Brush Off Blast.
    - b. Filler Coat: Fill flush all bug holes and voids with TNEMEC 215 Epoxy Surfacer.
    - c. 1st Coat: 104 Color H.S. Epoxy at 6.0 - 10.0 mils DFT.
    - d. 2nd Coat: 104 Color H.S. Epoxy at 6.0 - 10.0 mils DFT.
    - e. \* Use Series N140 Pota-Pox Plus in Potable Water.
  - 3. Interior

- a. Surface Preparation: Surface shall be clean and dry. Stone rub to remove loose and small particles from surface.
  - b. 1st Coat: 84 Color Ceramlon ENV at 6.0 - 8.0 mils DFT .
  - c. 2nd Coat: 84 Color Ceramlon ENV at 6.0 - 8.0 mils DFT.
  - 4. Interior, exposed to high levels of Hydrogen Sulfide and Sulfuric Acid Condensate.
    - a. Surface Preparation: SSPC-SP13/NACE 6, ICRI CSP 5 or greater .
    - b. Surfacer: 218 MortarClad (215 Epoxy Surfacer as required).
    - c. 1st Coat (as required): 434 Perma-Shield H2S at 125 mils DFT.
    - d. 2nd Coat: 435 Perma-Glaze at 30.0 – 40.0 mils DFT. Or: 436 Perma- Shield FR at 50.0 - 125.0 mild DFT.
  - 5. Immersion or Non Immersion, Dense Masonry – Clearwell, wetwells and secondary containment
    - a. Surface Preparation: Pressure Blast to achieve an open Capillary substrate.
    - b. 1st Coat: Apply XYPEX Concentrate at 1.5 pounds per square yard.
    - c. 2nd Coat: Apply XYPEX Modified at 1.5 pounds per square yard.
    - d. Admix C-1000 may be used at the batch plant as an admix.
  - 6. Interior, pipe gallery walls - Clear
    - a. Surface Preparation: Rub seams and irregular areas.
    - b. 1st Coat: Chemprobe Series 660 Prima-A-Pell 200.
    - c. 2nd Coat: Chemprobe Series 660 Prima-A-Pell 200.
  - 7. Interior: pipe gallery walls - Colored
    - a. Surface Preparation: Surface shall be clean and dry.
    - b. 1st Coat: 84 Color Ceramlon ENV at 6.0 - 8.0 mils DFT.
    - c. 2nd Coat: 84 Color Ceramlon ENV at 6.0 - 8.0 mils DFT.
  - 8. Immersion: Potable or Non Potable Water
    - a. Surface Preparation: Brush Off Blast.
    - b. Filler Coat (As Required): Fill flush all bug holes and voids with TNEMEC 215 Epoxy Surfacer.
    - c. 1st Coat: 104 Color H.S. Epoxy at 6.0 - 10.0 mils DFT.
    - d. 2nd Coat: 104 Color H.S. Epoxy at 6.0 - 10.0 mils DFT.
    - e. \* Use Series N140 Pota-Pox Plus in Potable Water.
- E. Porous Masonry - CMU
- 1. Exterior
    - a. Surface Preparation: Surface shall be clean and dry. Stone rub to remove loose and small particles from surface.
    - b. 1st Coat: 156 Color Enviro-Crete at 6.0 - 8.0 mils DFT.
    - c. 2nd Coat: 156 Color Enviro-Crete at 6.0 - 8.0 mils DFT.
    - d. Note: Split face block requires TNEMEC 130 Envirofill.
  - 2. Interior
    - a. Surface Preparation: Surface shall be clean and dry. Stone rub to remove loose and small particles from surface.
    - b. 1st Coat: 84 Color Ceramlon ENV at 80 - 100 sq. ft. gal.
    - c. 2nd Coat: 84 Color Ceramlon ENV at 6.0 - 8.0 mils DFT.
  - 3. Exterior: Clear Sealer and/or Stain
    - a. Surface Preparation: Surface to be sound, dry and free of cracks, oils efflorescence, paint or other contaminates.
    - b. Sealer Coat: Apply TNEMEC Prima-Pell H20 at 125 - 150 Sq. ft./gal.
  - 4. Exterior Exposed – Graffiti Protection
    - a. Surface Preparation: SSPC-SP 13/NACE 6 Clean and Dry.
    - b. Primer: Series 626 Dur A Pell GS, DFT 65 - 300 sq ft/gal.

- c. Finish: Series 626 Dur A Pell GS, DFT 100 - 300 sq ft/gal.
- F. Concrete Floors
- 1. Interior
    - a. Operations Building – Colored
      - 1) Surface Preparation: Acid Etch or Brush Off Blast.
      - 2) 1st Coat: 205-ColorTerra-Tread FC at 3.0 - 5.0 mils DFT.
      - 3) 2nd Coat: 205-ColorTerra-Tread FC at 3.0 - 5.0 mils DFT.
      - 4) 3rd Coat (As Required): 290/291-Color CRU at 1.0 – 2.0 mils DFT. Non-skid with 211 Glass beads.
- G. Concrete Structures.
- 1. Below Grade
    - a. Surface Preparation: Brush off Blast.
    - b. One Coat: 46H 413 Hi Build Tneme Tar at 12.0 - 16.0 mils DFT.
- H. PVC Pipe
- 1. Exterior
    - a. As noted on plans.
- I. Plaster and Wallboard
- 1. Interior
    - a. Surface Preparation: Surface shall be clean and dry.
    - b. 1st Coat: Series 51 PVA Sealer DFT 1.0 - 2.0 mils.
    - c. 2nd Coat: 113 Color H.B. Tneme Tufcoat at 4.0 - 6.0 mils DFT.
  - 2. Interior – Heavy Abuse
    - a. Primer: Series 201 Epoxoprime, DFT 6.0 - 8.0 mils.
    - b. Intermediate: Series 270 Stranlok, DFT 25.0 - 40.0 or 273 Stranlok ML, DFT 20.0 to 25.0 mils with reinforcing mat.
    - c. Finish: Series 280 Tneme-Glaze, DFT 6.0 - 8.0 mils.
- J. Wood
- 1. Interior or Exterior
    - a. Surface Preparation: Surface shall be clean and dry.
    - b. 1st Coat: 10-99W Tnemec Primer at 2.0 - 3.0 mils DFT.
    - c. 2nd Coat: 1028/1029-Color Tneme Cryl at 2.0 - 3.0 mils DFT.
    - d. 3rd Coat: 1028/1029-Color Tneme Cryl at 2.0 - 3.0 mils DFT.
- K. Insulated Pipe
- 1. Interior
    - a. Surface Preparation: Surface shall be clean and dry.
    - b. 1st Coat: 6 Color Tneme Cryl at 2.0 - 3.0 mils DFT.
    - c. 2nd Coat: 1028/1029-Color Tneme Cryl at 2.0 - 3.0 mils DFT.
- L. Non Ferrous Metals
- 1. Interior
    - a. Surface Preparation: SSPC SP1 Solvent Cleaning and lightly scarify.
    - b. One Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
  - 2. Exterior
    - a. Surface Preparation: SSPC SP1 Solvent Cleaning and lightly scarify.
    - b. 1st Coat: N(L)69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.



- c. 2nd Coat: 1074/1075-Color Endura Shield at 2.0 - 3.0 mils DFT.

M. Brick

- 1. Exterior Sealer
  - a. Surface Preparation: Surface to be sound, dry and free of cracks, oils, efflorescence, paint or other contaminates.
  - b. Sealer Coat.: Apply TNEMEC Prima-Pell H20 at 125 - 150 Sq. ft./gal.

3.10 COLOR CODE FOR PROCESSING EQUIPMENT

A. Pipe Identification Painting:

- 1. Color code non submerged metal piping except electrical conduit. Paint fittings and valves the same color as pipe, except equipment isolation valves.
- 2. Piping Color Coding: In accordance with the attached Preliminary Schedule unless approved otherwise.
- 3. On exposed stainless steel piping, apply color 24" in length along pipe axis at connections to equipment, valves, or branch fittings, at wall boundaries, and at intervals along piping not greater than 9' on center.
- 4. Pipe Supports: Mild steel, painted No. 70 light gray as specified in ANSI 359
- 5. Fiberglass reinforced plastic (FRP) pipe and polyvinyl chloride (PVC) pipe located outside of buildings and enclosed structures will not require painting, except as noted or scheduled.

B. Lettering on piping shall be painted, stenciled, or snap-on markers. Snap-on markers shall be plastic sleeves, Brady "Bradysnap-On B-915" or Seton "Setmark". Letter size shall be as follows:

Outside Diameter of Pipe or Covering	Minimum Height of Letters
5/8 inch and smaller	Metal Tags - 1/4 inch
3/4 inch through 4 inch	3/4 inch
5 inch and larger	2 inches

C. Colors: All colors for architectural finishes, doors, windows, etc shall be as selected by the Owner. Preliminary schedule for piping colors to be verified during the submittal process are as follows:

- 1. Gas – OSHA Safety Yellow
- 2. Compressed Air - OSHA Safety Blue
- 3. Potable Water - OSHA Safety Green
- 4. Raw Water – Olive Green 305
- 5. Hot Water, Potable - OSHA Safety Green, Red Band
- 6. Wastewater – Light Grey 306
- 7. Drain Piping – Olive Green 305
- 8. Washwater – Dark Blue 303
- 9. Sludge – Dark Brown 318
- 10. Coagulant Aid - OSHA Safety Purple, Red Band
- 11. Fire Hydrant - OSHA Safety Red

D. Proprietary identification of colors is for identification only. Selected Manufacturer may supply matches.

END OF SECTION 09 90 00

JRA PROJECT NO. 221199  
Brookwood SEU WWTP Improvements  
CLIENT JOB NO. SW-20026  
BASED ON CLIENT TEMPLATE: "Engineers of the South.docx"  
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# DIVISION 26/27/28 ELECTRICAL



5/22/2023

## SECTION 26 05 00 - BASIC ELECTRICAL MATERIALS AND METHODS

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

##### A. General Conditions:

1. The accompanying General Conditions (front-end specifications) shall apply to and form a part of this section.

##### B. General Requirements:

1. Carefully examine General Conditions, other specification sections, and other drawings (in addition to Electrical) in order to be fully acquainted with their effect on electrical work.
2. Do all work in compliance with all applicable codes, laws, and ordinances, the National Electrical Safety Code, the National Electrical Code (hereinafter referred to as "Code"), applicable energy codes, and the regulations of the local utility companies. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like.
3. Cooperate with other trades and contractors at job. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by electrical workmen.
4. The Owner shall be provided access to all software to include copies of software for all systems provided under this division of the specifications. Software shall be password protected where applicable.
5. Only qualified electrical sub-contractors will be allowed to submit proposals for this project. In order to be considered qualified, contractor shall have completed a minimum of five (5) projects of similar type/scope and equal or greater magnitude and complexity within the last ten (10) years. Sub-contractors without qualifications will be rejected. If desired, potential electrical sub-contractors may submit qualification evidence for review and pre-bid approval a minimum of ten (10) days prior to bid. Previous projects used to meet this experience requirement must have included similar (or greater) scopes of work for each of the following areas:
  - a. Power Systems.
  - b. Control Systems.
  - c. Instrumentation Systems.
6. Electrical contracting firm shall be licensed as an electrical contractor in the state where work will be performed

#### 1.02 GENERAL SCOPE OF ELECTRICAL WORK (REFER TO DRAWINGS FOR OTHER SPECIFIC SCOPE ITEMS)

- A. Furnish all labor and materials to complete electrical work as shown on drawings and/or herein specified.

- B. Remove all existing electrical equipment and wiring made obsolete by this project and remove or relocate all electrical services located on or crossing through the project property, either above or below grade, which would obstruct the construction of the project or conflict in any manner with the completed project or any code pertaining thereto. Dispose of salvageable materials as directed by the Engineer. Contractor shall schedule meeting to review scope of electrical demolition and to confirm scope and phasing of proposed demolition with the owner in the presence of the prime consultant prior to start of any electrical demolition.
- C. Furnish and install complete power distribution system as shown on drawings and/or specified herein.
- D. Furnish and install disconnect switches for motors as shown on drawings and/or specified herein.
- E. Furnish and install complete electrical grounding systems as shown on drawings and/or specified herein.
- F. Install and connect electrical equipment mentioned in Division 26/27/28 Specifications or noted in drawings, whether furnished by electrical contractor or by others.
  - 1. Where shown or specified, equipment furnished by others shall be installed and connected under this Contract.
  - 2. Where shown or specified, Contractor shall receive, unpack, check and assume custody of equipment furnished by Others. Contractor shall assume responsibility for care and safekeeping of this equipment, when delivered into his custody. He shall protect it from moisture, dust and damage during construction and until Owner acceptance of project.
- G. Furnish and install complete electrical lighting systems as shown on drawings and/or specified herein.
- H. Furnish and install all electrical items shown on drawings and/or herein specified, unless shown or specified otherwise.
- I. Furnish and install complete controls, instrumentation & auxiliary systems as shown on drawings and/or specified herein.
- J. Procure and pay for permits and certificates as required by local and state ordinances and fire underwriter's certificate of inspection.
- K. Balance loads as equally as practicable on services, distribution feeders, circuits and buses. Provide typewritten directory for each panel.
- L. Unless specifically indicated or required otherwise, terminate all circuitry/cabling provided within this contract at associated equipment/devices/etc. in accordance with all applicable codes, standards and supplier requirements, whether associated equipment/device/etc. is furnished within this contract or by others.
- M. Complete field testing, adjustment & startup of all systems listed above as shown on drawings and/or specified herein.

## PART 2 - PRODUCTS

## 2.01 APPROVED MATERIALS AND DEVICES

- A. Where not otherwise specified, provide only new, standard, first-grade materials/systems throughout, conforming to standards established by Underwriter's Laboratories, Inc., and so marked or labeled, together with manufacturer's brand or trademark. All equipment/systems subject to approval of Engineer before installation. All like items and associated equipment/systems shall be of one manufacturer.
- B. To ensure proper coordination, it is intended that all electrical equipment and materials specified in Division 26/27/28 of these specifications and shown on the electrical drawings be furnished and installed by the electrical sub-contractor. It will not be permissible for any of these items to be furnished directly by the general contractor without the electrical contractor's coordination.
- C. To ensure commonality of spare parts, it is required that the electrical contractor provide the same brand for all circuit breakers, starters, power equipment, etc. provided under the following divisions of these specifications:
  - 1. SECTION 26 05 73: POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES
  - 2. SECTION 26 24 17: LIGHTING PANELBOARDS
  - 3. SECTION 26 28 16: SAFETY SWITCHES AND FUSES

## 2.02 SUBMITTALS

- A. All submittals to the design team shall be accompanied by a letter summarizing all proposed deviations from specified products or pre-approved substitutions. The absence of such a letter shall be understood to indicate that the contractor intends to meet all contract requirements, regardless of cut-sheets/data-sheets provided within the submittal.
- B. Submit to Engineer ten (10) days prior to bid date three (3) copies of any items and/or manufacturers which are proposed as substitutes for those specified.
- C. Submit to Engineer promptly after award of Contract and prior to purchasing, the number of copies required by the contract. All drawings of a specific item or system shall be made in one submittal, and within thirty (30) days after award of Contract. Shop drawings of all power equipment shall contain exact details of device placement, phasing and numbering, in form of elevations, for each major piece of equipment. Shop drawings shall be submitted on the following:
  - 1. SECTION 26 05 73: POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES
  - 2. SECTION 26 24 17: LIGHTING PANELBOARDS
  - 3. SECTION 26 28 16: SAFETY SWITCHES AND FUSES
  - 4. SECTION 26 29 00: MANUFACTURED CONTROL PANELS
  - 5. SECTION 26 50 00: LIGHTING MATERIALS AND METHODS
  - 6. ALL POWER DISTRIBUTION EQUIPMENT (i.e. SWITCHBOARDS, PANELBOARDS, DRY TYPE TRANSFORMER, ETC.)
  - 7. ALL CONTROL ITEMS & SYSTEMS
- D. The contractor shall fully review, comment upon and correct all shop drawings as required to assure compliance with contract documents prior to submittal to Engineer. The failure of the contractor to properly review and correct shop drawings prior to submittal will result in rejection of shop drawings by the engineer. Review by the Engineer will be for general



conformance with contract documents. The contractor shall be fully responsible for correctness of all submitted dimensions, details, quantities and locations.

- E. None of the above items shall be installed until shop drawings or catalog data have been reviewed by Engineer without rejection or required resubmittal. Any listed item not submitted, even if specified, shall be considered not acceptable and shall be removed if directed.
- F. Any required resubmittal will be reviewed by the Engineer for conformance with previously issued comments only. The contractor shall be responsible for verifying that all items not specifically requiring resubmittal have not been altered from the previously reviewed submittal.
- G. Material proposed for substitution shall be of the same quality, perform the same functions, conform to such physical dimensions and appearance as are required by the Engineer. All material proposed for substitution is subject to the approval of the Engineer and his authority for approval is final. No material proposed for substitution will be considered unless all submittal data complies with the drawings and specifications of Section 16 as to time of submission, number of copies of submittal, and detail requirements.
- H. Samples of material shall be furnished where required by drawings or Division 26/27/28 Specification, or as requested by the Engineer on items proposed as substitutes.
- I. Submit to Engineer a certificate of final inspection from local inspection department.

### PART 3 - EXECUTION

#### 3.01 SITE VISIT

- A. The Contractor shall visit the site to determine existing dimensions and conditions affecting electrical work. Failure to do so in no way relieves Contractor of his responsibility under Contract.

#### 3.02 WORKMANSHIP

- A. All work shall be in accordance with the latest editions of NFPA 70 (National Electrical Code), NFPA 101 (Life Safety Code), National Electric Safety Code, International Building Code, applicable NECA standards and the rules and regulations of State and Local Authorities Having Jurisdiction.
- B. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance upon completion.
- C. All equipment, devices, etc. shall be installed in accordance with manufacturer's recommendations.
- D. All items shall be installed straight and plumb in a workmanlike manner and care shall be exercised so that like items are mounted the same position, heights and general location.
- E. Keep site clean of accumulation of cartons, trash and debris.

#### 3.03 SAFETY

- A. The contractor is solely responsible for all job safety. Engineer assumes no responsibility for job safety. Maximum consideration shall be given to job safety and only such methods as will reasonably insure the safety of all persons shall be employed. The codes and regulations of OSHA shall be given strict compliance as well as such other codes, laws, and regulations as may be applicable.

### 3.04 CONTRACT DOCUMENTS

- A. Contract documents indicate diagrammatically, extent, general character and approximate location of work. Where work is indicated but minor details omitted, furnish and install it complete so as to perform its intended functions. For details and mechanical equipment, follow drawings provided by other disciplines (Architectural, Mechanical, Structural, Civil, etc.) and fit electrical work thereto.
- B. Contract documents consist only of the hardcopy documents issued by the Prime Engineer. Electronic documents issued directly by the electrical engineer to the contractor and/or its sub-contractors/vendors are issued for convenience only (electronic documents are not formal contract documents).
- C. If the contractor and/or one of its suppliers require a one-time transfer of electronic files of the current electrical construction documents to prepare shop drawings (or for another similar purpose), it shall:
  - 1. Sign a waiver prepared by the electrical engineer prior to the transmittal of these files.
  - 2. Agree to pay the electrical engineer a fee of \$50.00 per drawing, up to a maximum of \$400 per transfer, payable upon receipt of the files.
  - 3. To the fullest extent permitted by law, indemnify, hold harmless, and defend JRA from all claims, damages, losses and expenses, including attorneys' fees arising out of or resulting from the use of the CAD files.
- D. Take finish dimensions at job in preference to scaled dimensions.
- E. Except as above noted, make no changes in or deviations from work as shown or specified except on written order of Engineer.

### 3.05 UNDERGROUND UTILITY/EQUIPMENT COORDINATION

- A. Prior to commencement of work, verify exact locations of all existing or proposed underground utilities and/or underground equipment and verify that proposed electrical installation does not conflict with these items. Notify Engineer immediately if any conflict is found.

### 3.06 EQUIPMENT STORAGE

- A. Store all electrical equipment in dry, covered locations as directed by equipment manufacturers. Contractor shall be responsible for replacing or repairing improperly-stored equipment as directed by Engineer.

### 3.07 EXCAVATION, CUTTING AND PATCHING

- A. Perform all cutting and excavating as necessary for installation of electrical systems, unless specifically covered under another section. After Engineer's observation, complete all

excavation, filling and backfilling as directed under specifications for preparation of site and earthwork. Foundations for equipment shall be as specified under concrete section. Concrete pads shall be minimum of 6" thick; unless greater thickness required by equipment manufacturer. Obtain specific approval of Engineer before cutting into any structural members.

- B. For all such work employ competent workmen, and finish up in neat and workmanlike manner, equal to quality and appearance to adjacent work.

### 3.08 PENETRATIONS

- A. All penetrations in water tight barriers shall be made so that barrier rating is not compromised. Furnish roof flashing for all equipment installed under Division 26/27/28 that penetrates through the roof. Appropriate flashing is specified under roofing and sheet metal section. Supply these flashings for installation under roofing and sheet metal section.
- B. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly to maintain the fire/smoke rating of the associated membrane.
- C. Where penetrations are required through structural elements, verify penetration locations and sizes with structural engineer. In no case shall the structural integrity be compromised without written approval from structural engineer.

### 3.09 INSTALLATION OF EQUIPMENT - GENERAL

- A. Care shall be exercised in exact routing and location of all items so as not to obstruct access to equipment, personnel walkways, or expose it to potential mechanical damage.
- B. Items shall be securely anchored and/or fastened. Provide proper support for all equipment, devices, conduits, boxes, panels, etc. as required by code and for a workmanlike installation. Provide guy wiring for wood poles where required to prevent leaning. All construction shall meet the seismic design requirements of the building code. Items (especially transformers, light fixtures, equipment racks, freestanding gear, etc.) installed in seismic zones C, D, E or F shall be supported and braced per applicable codes and standards.
- C. All wall, pole or frame-mounted electrical equipment shall be mounted to metal unistrut (or similar) frames of same material as electrical equipment. For example, pole-mounted stainless steel disconnect switches shall be mounted to stainless steel unistrut frames.
- D. All electrical equipment, furnished by Contractor or by others shall be covered and protected during construction.
- E. All control cabinets, panels, motor control centers and other electrical cabinets and enclosures shall have all trash removed and be vacuumed clean. All foreign paint, etc., shall be removed from exterior and all scratches in finish touched up with same color and material as original. Any rusted areas shall be sanded, primed and repainted.
- F. All relays, starters, push-button and other control devices shall be cleaned and if necessary, lubricated with CRC 2-26 to assure free operation.

### 3.10 MOTORS, STARTERS AND CONTROLS

- A. Unless otherwise specified or shown, all motors will be furnished and installed under other sections of this specification.
- B. Electrical Contractor shall install all starters and all electrical power wiring and connections to motors and starters.
- C. Unless otherwise specified or shown, all control items for motors shall be furnished, installed and wired in conduit by the electrician.

### 3.11 CIRCUITS AND BRANCH CIRCUITS

- A. Outlets shall be connected to branch circuits as indicated on drawings by circuit numbers. No more outlets than are indicated shall be connected to a circuit.
- B. Branch circuit homeruns shall be installed as shown on drawings. Multiple homerun conduits shall not be combined by contractor into larger, single homerun conduits unless specific permission is granted by the Engineer.

### 3.12 LUG/TERMINAL RATINGS

- A. All lug/terminal ratings, sizes, locations, types, etc. shall be coordinated with the associated conductor sizes, types, routings, etc. by the contractor.
- B. All lugs/terminals/etc. shall be rated for 75 degree C terminations (minimum, unless specified otherwise).

### 3.13 EQUIPMENT FAULT CURRENT RATINGS

- A. All equipment and breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated distribution equipment. All interrupting ratings shall be full ratings. Where new devices or breakers are added to existing distribution equipment, the new devices/breakers shall have interrupting ratings matching or exceeding that of the existing distribution equipment.

### 3.14 OUTLET LOCATION

- A. Symbols shown on drawings and mounting heights indicated on drawings and in specifications are approximate only. The exact locations and mounting height must be determined on the job and it shall be the Contractor's responsibility to coordinate with other trades to insure correct installation.

### 3.15 IDENTIFICATION

- A. Each panel shall have each circuit identified. Panels without branch circuit nameplates shall have typewritten directories.
- B. Each individually mounted switch, circuit breaker, starter and/or any other control or protective device shall identify equipment fed and fuse size, if any, by engraved plastic nameplate, white with black letters, screw attached.
- C. See Specification Section 26 05 53 for additional requirements.

### 3.16 GROUNDING

- A. All equipment shall be grounded and bonded in accordance with all state/local regulations, The National Electrical Code and as specified herein.

### 3.17 PAINTING

- A. Refer to Painting/Finishing specifications for requirements regarding field painting of exposed conduit. Any scratches, dents or rust spots in conduit electrical enclosures, panels, motor control or any other electrical items shall have the dents removed, and they, along with any rust spots or scratches, sanded and touched up with the same exact color paint as original finish.

### 3.18 ACCEPTANCE TESTING

- A. Upon completion of work, the entire electrical system installed within this project shall be tested and shall be shown to be in perfect working condition, in accordance with the intent of the specifications and drawings. It shall be the responsibility of the Electrical Contractor to have all systems ready for operation and to have an electrician available to operate same in accordance with and under the supervision of the observation representative(s) of the Engineer. The Electrician shall be available to assist in removal of panel fronts, etc., to permit inspection as required.

### 3.19 OPERATION AND MAINTENANCE DATA

- A. One set of marked "AS BUILT" drawings, three (3) sets of all equipment catalog and maintenance data and three (3) sets of all final shop drawings, on all equipment requiring same shall be turned over to owner. These items shall be bound in hard back book. Contractor shall explain and demonstrate all systems to Owner's representative.

### 3.20 GUARANTY-WARRANTY

- A. Furnish a written Guarantee-Warranty, countersigned and guaranteed by General Contractor, stating:
  1. That all work executed under this section will be free from defects of workmanship and materials for a period of one (1) year from date of final acceptance of this work.
  2. Above parties further agree that they will, at their own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the Guaranty-Warranty.

END OF SECTION 26 05 00

## SECTION 26 05 19 - POWER CONDUCTORS AND CABLES 51V-600V

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Power Wires and Cables
- B. Low Voltage Wires and Cables

### PART 2 - PRODUCTS

#### 2.01 POWER WIRES AND CABLES - 600 VOLT

- A. General: Conductors shall have current carrying capacities as per N.E.C. and with 600 volt insulation, #12 minimum except for controls and fixture wire. Conductors shall be copper.
- B. General Application (see below for exceptions):
  - 1. At or Below Grade (including within slab-on-grade):
    - a. #8 or larger conductors:
      - 1) XHHW or RHH/RHW/USE stranded (in conduit).
    - b. #10 or smaller conductors for circuits terminating at motors:
      - 1) THHN/THWN or XHHW stranded (in conduit).
    - c. #10 or smaller conductors (excluding circuits terminating at motors):
      - 1) THHN/THWN or XHHW solid (in conduit).
  - 2. Above Grade:
    - a. #8 or larger conductors:
      - 1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
    - b. #10 or smaller conductors for circuits terminating at motors:
      - 1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
    - c. #10 or smaller conductors (excluding circuits terminating at motors):
      - 1) THHN/THWN, XHHW or RHH/RHW/USE solid (in conduit).
  - 3. Power Wire and cable shall be as manufactured by Southwire, Rome, Encore Wire, American Insulated Wire, Okonite, Phelps-Dodge, Americable, Aetna or approved equal.



C. Class 1 Control Cabling (120VAC Control Circuits, Etc.)

1. Unless specified otherwise, Class 1 control cabling shall:
  - a. Be rated for exposed cable tray installation.
  - b. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).
  - c. Be UL-rated for the proposed application.
  - d. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
  - e. Utilize copper conductors.
  - f. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
  - g. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
  - h. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.
  - i. Be rated for 600V.
  - j. Be industrial grade.
  - k. Have stranded conductors.
  - l. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
2. Control cabling shall be as manufactured by Belden, AlphaWire or General Cable.

D. Fixture Wiring

1. Conductor Types:
  - a. Type TFFN or XFF.
2. Minimum Sizes:
  - a. For fixtures up to 300 watts: #16.
  - b. For fixtures over 300 watts up to 1500 watts: #14.
  - c. For fixtures over 1500 watts: as required.
  - d. Conductors to concrete pour fixtures: #12.
3. Fixture wire shall extend only from fixture to first junction, and not over 6 feet, except for concrete pour units.

2.02 WIRE CONNECTIONS:

A. All connector types:

1. Shall be properly rated for the proposed application by UL and per the manufacturer.

B. At Motor Connections (within motor terminal boxes):

1. On Unshielded Wire:
  - a. Single conductor per phase: shall be made with insulated set screw connectors or 3M 5300 Series 1kV Motor Lead Connections kits with mechanical lugs as required.
  - b. Multiple conductors per phase: shall be made with insulated mechanical lugs, rated for the associated motor cable types, by Polaris or IIsco.
2. On Shielded Power Wire:
  - a. The braided shields and internal grounding conductors of shielded power (not instrumentation) cables shall be grounded at BOTH ends (at VFD/starter and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.

C. Other Dry locations:

1. On Wire larger than #10: shall be made with solderless, non-insulated compression-type connectors meeting requirements of Federal Specification WS-610e for Type II, Class 2 and shall be covered with Scotch #33 electrical tape so that insulation is equal to 150% of conductor insulation.
2. On Wire #10 and smaller: shall be made with one of the following:
  - a. Ideal Wing Nuts or equal by 3M .
  - b. Ideal Push-In Wire Connectors (for #12 and smaller only).

D. Other Wet/Damp locations:

1. On Wire larger than #10: shall be made with underground/direct-burial, waterproof rated EPDM or TPE-insulated connectors by IIsco, Burndy or T&B.
2. On Wire #10 and smaller: shall be made with one of the following:
  - a. Ideal Weatherproof or Underground Wire Connectors pre-filled with 100% silicone sealant as required by the application.

## PART 3 - EXECUTION

### 3.01 GENERAL INSTALLATION

- A. All wires and cables shall be installed in conduit unless specifically noted otherwise.
- B. All joints and splices on wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation.
- C. No splices shall be pulled into conduit.
- D. No conductor shall be pulled until conduit is cleaned of all foreign matter.
- E. Wire and cable shall be neatly formed, bundled and tied in all panelboards, wireways, disconnect switches, pullboxes, junction boxes, cabinets and other similar electrical enclosures.

- F. All wires and cables installed in underground or other wet locations shall be rated by the manufacturer for wet locations.
- G. Network cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.
- H. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See above for general termination hardware requirements.

### 3.02 POWER WIRE AND CABLE INSTALLATION:

- A. No power conductor shall be smaller than #12 except where so designated on the drawings or hereinafter specified.
- B. Multi-wire lighting branches shall be used as indicated.
- C. Where more than three current-carrying conductors are installed in a single raceway or cable, conductors shall be derated as indicated in NEC Table 310.15(B)(3)(a).
- D. Raceways/cables shall generally not be installed exposed to sunlight on roofs unless specifically required. Where raceways or cables are installed exposed to sunlight on roofs, conductors shall be derated with ampacities adjusted per NEC Table 310.15(B)(3)(c).
- E. In installing parallel power conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size, the same type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded at both ends in an approved manner.
- F. In installing overhead main power services, a minimum of 5'-0" of cable per run shall be extended beyond the weatherhead(s) for connection to service drop. Confirm exact requirements with local utility company.

### 3.03 WIRE CONNECTIONS

- A. See Part 2 above for material types.
- B. Aluminum Wire Connections:
  - 1. Where aluminum wiring is allowed, connections shall utilize compression fittings, no exceptions (Anderson Versa Crimp or equal).
- C. Any stranded wire connection to wiring devices shall be made with crimp type terminals.
- D. All electrical connections and terminals shall be tightened according to manufacturer's published torque-tightening values with calibrated torque wrenches as required to clearly indicate final torque value to the contractor. Where manufacturer's torque values are not provided, those specified in UL 486A & 486B shall be used.
- E. All connections and connector types shall be installed in strict compliance with all requirements of the connector manufacturer.
- F. Under no condition shall the specified conductors be connected to terminals rated less than

75°C. Where conductors sized #1 or smaller are shown to be terminated at equipment and the terminals of that equipment are rated for less than 75°C, contractor shall install junction box near equipment to capture the specified conductors, splice with compression connections (rated for a least 75°C) and extend conductors with ampacity rating as required by NEC (based on terminal temperature rating) to equipment terminals. The length of the conductors to be terminated shall be as directed by the AHJ but not less than 48 inches.

3.04 SHIELDED CABLE INSTALLATION

A. Shielded instrumentation (low voltage) cables:

1. The outer foil of shielded instrumentation cables shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.

3.05 LOW VOLTAGE (LESS THAN 50V) CONTROL AND NETWORK CABLE INSTALLATION:

A. All wires and cables shall be installed in conduit unless specifically noted otherwise. Low voltage control and/or network cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:

1. Cabling shall be plenum-rated, multi-conductor.
2. Cabling shall be supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
3. Cabling shall be properly bundled with plenum-rated Velcro straps on intervals not to exceed 30" on center.
4. Properly-sized conduit(s) shall be provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings or through walls). End bushings shall be provided on both ends of all raceway terminations. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.

3.06 CIRCUITS AND BRANCH CIRCUITS

A. Outlets shall be connected to branch circuits as indicated on drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

3.07 LABELING AND COLOR CODING OF WIRE AND CABLE

A. Refer to Specification Section 26 05 53 for all labeling requirements.

B. A color coding system as listed below shall be followed throughout the network of branch power circuits as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
A	BLACK	BLACK	BROWN
B	RED	ORANGE (FOR HI-	ORANGE

C	BLUE	LEG)	
NEUTRAL	WHITE	BLUE	YELLOW
GROUND	GREEN	WHITE	GRAY
		GREEN	GREEN

- C. Where dedicated neutrals are installed for multi-wire branch circuits, the neutral conductors shall be color coded as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
NEUTRAL A	WHITE W/ BLACK TRACER	WHITE W/ BLACK TRACER	GRAY W/ BROWN TRACER
NEUTRAL B	WHITE W/ RED TRACER	WHITE W/ ORANGE TRACER (FOR HI-LEG NEUTRAL)	GRAY W/ ORANGE TRACER
NEUTRAL C	WHITE W/ BLUE TRACER	WHITE W/ BLUE TRACER	GRAY W/ YELLOW TRACER

- D. Control Conductors: Shall be color coded by use of colored “tracers”. No control circuit shall contain two identical conductors. For example, a set of five (5) control conductors for a pushbutton station represents one (1) control circuit which would require five (5) uniquely-colored control conductors.

### 3.08 TESTING

- A. The insulation resistance of all feeder conductors (feeding electrical distribution equipment such as switchboards, panelboards, transfer switches, transformers, etc.) shall be tested at the load side of the feeder breaker with a 1000-volt DC Megger Tester prior to energization or final termination. Any feeder conductor with an insulation resistance less than the recommended minimums in the latest version of NETA Acceptance Testing Specification (“ATS”) standard shall be replaced by the contractor at the contractor’s expense. All final test results shall be clearly documented (with date, time, feeder, results, test equipment, etc.), and the final test results shall be submitted to the design team for review.

END OF SECTION 26 05 19

## SECTION 26 05 26 - GROUNDING

### PART 1 - GENERAL

#### 1.01 GENERAL

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO GROUNDING OF THE FOLLOWING:

1. Service Equipment.
2. Transformers.
3. Non-current carrying conductive surfaces of equipment.
4. Metal Buildings.
5. Structures.
6. Other Equipment.

#### 1.02 GENERAL REQUIREMENTS

- A. All equipment, building steel, and main service shall be effectively and permanently grounded with a conductor cross section as required by the National Electrical Code and of capacity sufficient to insure continued effectiveness of the ground connections for fault current. Ground conductors shall be as short and straight as possible, protected from mechanical injury and, if practicable, without splice or joint.
- B. All grounding connections shall be installed in accordance with the National Electrical Code and all local codes and requirements. Such codes shall be considered minimum requirements and the installation of the grounding system shall insure freedom from dangerous shock voltage exposure and provide a low impedance ground fault path to permit proper operation of overcurrent and ground fault protective devices.

### PART 2 - PRODUCTS

#### 2.01 CONDUCTORS

- A. All grounding conductors shall be insulated with green colored, 600 volt insulation unless noted otherwise.
- B. Motors having power supplied by single conductor wire in conduit shall be grounded through the conduit system. Flexible conduit shall be "jumped" by an appropriate bonding conductor.
- C. Supplemental grounding system conductors shall be bare, softdrawn, stranded, single conductor copper wire, and generally sized as follows (unless shown otherwise on plans):
1. Switchgear, motor control centers, and power transformer #4/0 minimum or as shown on plans.
  2. Power panels, #2/0.
  3. Control panels and consoles, #4.
  4. Process Motors, #1/0.
  5. Building Columns, #4/0.



6. Light Poles, #2.
7. Telephone Backboard & Cabinet ground busses, #2.

## 2.02 GROUNDING ELECTRODES

- A. Grounding electrodes shall be copper-clad steel rods 3/4 inch in diameter and ten feet long. Where longer electrodes are necessary to reduce the ground resistance, Contractor shall provide sectional rods, connectors, drive heads, etc.

## 2.03 CONNECTIONS

- A. All conductor-to-conductor, conductor-to-ground rod, conductor-to-structure, conductor-to-fence connections of #6 and larger sized conductors and underground ground connections shall be permanent exothermic welded connections (Cadweld or equal) unless otherwise noted on applicable drawings.
- B. Connections to equipment shall be by bolted compression type lugs (except for motors). When the conductor is #6 and larger, the lug shall be joined to the conductor by an exothermic weld (Cadweld or equal).
- C. Motors to be grounded by the grounding conductors run with the power conductors shall have a split-post grounding stud installed in the connection box.
- D. Each cast pull box or junction box shall have a ground lug, connected to largest ground conductor to enter box.
- E. Ground connections at conduit terminations shall be made by approved grounding bushings (see Raceways Specification Section for additional requirements).

## 2.04 MANUFACTURERS

- A. Conduit clamps and connectors shall be manufactured by Raco, OZ., or Ercon.
- B. Lugs shall be as manufactured by Square "D", Burndy, or T and B.
- C. Exothermic weld connections shall be as manufactured by Cadweld, or approved equal.
- D. Ground rods shall be as manufactured by Joslyn or McGraw Edison.
- E. Split post grounding shall be as manufactured by Burndy or T and B.

## PART 3 - EXECUTION

### 3.01 MAIN SERVICE GROUND

- A. The main service grounding electrode system shall consist of the following items bonded together by the grounding electrode conductor:
  1. The main underground cold water pipe (metal).
  2. The metal frame of the building.
  3. Driven ground rods. Ground rods shall be embedded at the lowest point in the building and below the permanent moisture level. Ground rods shall be spaced a minimum of ten

(10) feet apart and connected in parallel until resistance to ground does not exceed five (5) ohms.

- B. The grounding electrode system shall be connected to the grounded conductor (neutral) on the supply side of the service disconnecting means by a grounding electrode conductor not smaller than that shown in Table 250.66 of the N.E.C. The main service equipment grounding conductor shall be connected to the grounding conductor on the supply side of the service disconnecting means in accordance with Table 250.122 of the N.E.C. for the ampere rating of the service entrance equipment. Where in a service entrance switchboard, the equipment grounding conductor shall not be less than 25% of the main bus rating. These connections shall be made inside the service entrance equipment enclosure.

### 3.02 TRANSFORMER GROUNDS

- A. Dry type insulation transformers with a grounded conductor in the secondary shall be grounded in accordance with N.E.C. Section 250-30.

### 3.03 EXPOSED NON-CURRENT-CARRYING METAL PARTS

- A. General: Ground connections to equipment or devices shall be made as close to the current carrying parts as possible, that is, to the main frame rather than supporting structures, bases or shields. Grounding connections shall be made only to dry surfaces that are clean and dry. Steel surfaces shall be ground or filed to remove all scales, rust, grease, and dirt. Copper and galvanized steel shall be cleaned to remove oxide before making welds or connections. Code size ground conductors shall be run in all power conduits and properly terminated at each end.
- B. Ground conductors shall be routed as straight as possible. Where possible, ground conductors shall be routed such as to avoid bends exceeding 90 degrees or with a radius of less than 8”.
- C. Motors: Exposed non-current-carrying metal parts, shall be grounded by a grounding conductor either run with power conductors, and/or separate grounding conductors. Drawings will show method(s) to be used. The ground conductors with all motor conductors shall be connected to the ground buss in the motor connection box. Jumper connections shall be installed between frames and rigid conduit for equipment having flexible conduit connections (sealtight). All AC motor grounds shall provide a low impedance path to ground. Connections from the supplemental grounding system (when specified) shall be made directly to the motor frame. Additionally, utilization equipment connected to the motor (pump, fan, mixer, etc.) shall be bonded to the motor with flexible braid-type bonding strap to ensure equalization of ground potentials.
- D. Raceways & boxes: All raceways, conduits, armored or shielded cable and all exposed non-current carrying metal parts shall be grounded. Such items shall be bonded together and permanently grounded to the equipment ground buss. Metallic conduits shall be connected by grounding or clamps to ground buss. Flexible “jumpers” shall be provided around all raceway expansion joints. Bonding straps for steel conduit shall be copper. Jumper connections shall be provided to effectively ground all sections or rigid conduit connected into plastic pipe. No metallic conduit shall be left ungrounded. In conduit systems interrupted by junction or switch boxes where locknuts and bushings are used to secure the conduit in the box, the sections of conduit and box must be bonded together. If conduit, couplings or fittings have a protective coating or non-conductive material, such as enamel,

such coating must be thoroughly removed from threads of both couplings and conduit and the surface of conduit or fitting where the ground clamp is secured.

- E. Enclosures: Metal conduits entering free standing motor control centers, switchboards or other free standing equipment shall be grounded by bare conductors and approved clamp. Any conduits entering low voltage (480 volts or below) equipment through sheet metal enclosure and effectively grounded to enclosure by double locknut or hub need not be otherwise bonded.
- F. Equipment: In addition to equipment grounding provisions mandated by code requirements, additional equipment grounding provisions (including local ground rods, connections, etc.) shall be provided by the contractor as directed by equipment suppliers.
- G. Both ends of ground busses in motor control centers, switchboards, etc., shall be separately connected to the main ground buss to form two separate paths to ground.
- H. Fences and Grills: Fences and metal grills around equipment carrying voltage above 500 volts between phases shall be bonded together and to ground. Fences and grill work shall be grounded at every post, column, or support, and on each side of every gate.

#### 3.04 ACCEPTANCE DOCUMENTATION AND TESTING

- A. Contractor shall take and store photographs of all underground grounding system connections prior to burial of connections, for review by Engineer.
- B. Upon completion of work, the entire ground system shall be shown to be in perfect working condition, in accordance with the intent of the Specifications.
- C. Contractor shall measure the resistance between the main ground bonding jumper to true earth ground using the Fall of Potential method as described by ANSI/IEEE Standard 81 (“Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of an Earth System”). If the measured value is greater than five ohms, additional grounding electrodes shall be installed as described in Part 3.1 above. The final ground resistance value shall be submitted in writing, and documented via picture of the meter reading from the Fall of Potential test, to the Engineer prior to the final observation, and shall be included in final O&M documentation.

END OF SECTION 26 05 26

## SECTION 26 05 33 - RACEWAYS

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

##### A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

1. Conduits
2. Conduit Fittings
3. Couplings & Connectors
4. Bushings
5. Raceway Hardware, Conduit Clamps & Supports
6. Watertight Entrance Seal Devices

### PART 2 - PRODUCTS

#### 2.01 CONDUITS

##### A. PVC-Coated Rigid Steel:

1. The PVC coated rigid metal conduit must be UL Listed. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material. Applicable UL standards may include: UL 6 Standard for Safety, Rigid Metal Conduit, UL514B Standard for Safety, Fittings for Conduit and Outlet Boxes.
2. The PVC-coated rigid metal conduit shall be ETL PVC-001 listed.
3. The conduit shall be hot dip galvanized inside and out with hot galvanized threads.
4. Form 8 Condulets®, 3/4" through 2" diameters, shall have a tongue-in-groove "V-Seal" gasket to effectively seal against the elements. The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be available.
5. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.
6. The PVC coating on the outside of conduit couplings shall have a series of longitudinal ribs 40 mils in thickness to protect the coating from tool damage during installation.
7. Form 8 Condulets® shall be supplied with plastic encapsulated stainless steel cover screws.
8. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.
9. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30deg.F (-1deg.C).
10. All male threads on conduit, elbows and nipples shall be protected by application of a urethane coating.
11. All female threads on fittings or conduit couplings shall be protected by application of a urethane coating.

12. Independent certified test results shall be available to confirm coating adhesion per ETL PVC-001 standards under the following conditions:
  - a. Conduit immersed in boiling water with a minimum mean time to adhesion failure of 200 hours. (ASTM D870)
  - b. Conduit and conduit exposure to 150deg F (65deg C) and 95% relative humidity with a minimum mean time to failure of 30 days. (ASTM D11513).
  - c. The interior coating bond shall be confirmed using the Standard Method of Adhesion by Tape Test (ASTM D3359).
  - d. No trace of the internal coating shall be visible on a white cloth following six wipes over the coating which has been wetted with acetone (ASTM D1308).
  - e. The exterior coating bond shall be confirmed using the methods described in Section 3.8, NEMA RN1.
  - f. After these tests the physical properties of the exterior coating shall exceed the minimum requirements specified in Table 3.1, NEMA RN1.

13. Water tight flex connectors used in areas where PVC coated metal conduit is utilized shall be PVC coated also.

14. Shall be as manufactured by Perma-Cote, Plastibond, Korkap, Ocal or Okote.

B. Rigid Galvanized Steel and I.M.C.:

1. Shall be galvanized outside and inside by hot dipping.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

C. Rigid Aluminum:

1. Shall be manufactured of 6063 Alloy, T-1 temper.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

D. Schedule 40 and 80 PVC:

1. Shall be composed of polyvinyl chloride and shall be U.L. rated type 40 or 80 for use with 90 degree rated conductors. Conduit shall conform to NEMA Standards and applicable sections of N.E.C.
2. The conduit manufacturer shall have had a minimum of 5 years experience in the manufacture of the products. Non-metallic raceways shall be as manufactured by Carlon, Triangle, Can-Tex, Allied or equal.

E. HDPE Innerduct

1. Shall be composed high density polyethylene and shall be orange in color, unless noted otherwise.
2. Shall be corrugated unless noted otherwise.
3. Shall be manufactured by Carlon, Ipex or equal.

F. Flexible Metallic Conduit:

1. Shall be continuous spiral wound and interlocked galvanized material, code approved for grounding.

G. Liquidtight Flexible Metallic Conduit:

1. Shall be galvanized steel-core sealtite, code approved for grounding.
2. Shall have an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core.
3. Shall be as manufactured by Electric-Flex, Anaconda or equal.

2.02 FITTINGS, COUPLINGS & CONNECTORS

- A. Rigid Galvanized Steel and I.M.C. couplings and connectors shall be standard threaded type, galvanized outside and inside by hot dipping. Threadless and clamp type are not acceptable. Couplings/connectors shall be as manufactured by Raco, Efcor, or Appleton or equal.
- B. All fittings, couplings and connectors (**including, but not limited to, conduit couplings, connectors, hubs, nipples, unions, expansion fittings, explosion proof seal-offs, threaded hole closures, and seal-tight connectors, etc.**) used in areas where PVC-Coated Rigid conduit is used shall also be PVC-coated.
- C. All fittings, couplings and connectors (**including, but not limited to, conduit couplings, connectors, hubs, nipples, unions, expansion fittings, explosion proof seal-offs, threaded hole closures, and seal-tight connectors, etc.**) installed in other wet, exterior or process areas where PVC-coated conduit systems are not required, shall be aluminum or stainless steel type. Standard steel fittings will not be acceptable.
- D. All rain tight connectors shall be threaded Myers or approved equal, rated for outdoor application.
- E. Rigid Aluminum couplings and connectors shall be standard threaded type, of the same alloy as the associated conduit. Threadless and clamp type are not acceptable. Fittings shall be as manufactured by Thomas & Betts, Crouse-Hinds, Appleton, Pyle-National or equal.
- F. All PVC couplings, adapters, end bells, reducers, etc., shall be of same material as conduit.
- G. Liquidtight Flexible Metallic Conduit connectors shall be liquidtight with insulating throat or end bushing, designed for application with Liquidtight Flexible Metallic Conduit. Fittings shall be as manufactured by Efcor, Raco, Midwest or equal.
- H. All LB unilets sizes 1 ¼” or larger shall have rollers.
- I. Miscellaneous conduit fittings shall be as manufactured by Appleton, Crouse-Hinds, Pyle-National, Russell & Stoll or equal.

2.03 BUSHINGS

- A. All non-grounding rigid bushings 1-1/4” and larger shall be the insulating type (O-Z/Gedney type “BB” or equal by T&B, Midwest Electric or Penn Union).
- B. All non-grounding rigid bushings 1” and smaller shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. Non-grounding rigid conduit bushings shall be O-Z/Gedney type “B” or equal by T&B, Midwest Electric or Penn Union.
- C. All grounding rigid bushings shall be threaded malleable iron with integral noncombustible



insulator rated for 150°C. All grounding rigid conduit bushings shall be O-Z/Gedney type “BLG” or equal by T&B, Midwest Electric or Penn Union.

#### 2.04 HARDWARE, CONDUIT CLAMPS AND SUPPORTS

- A. All hardware such as expansion shields, machine screws, toggle bolts, “U” or “J” bolts, machine bolts, conduit clamps and supports shall be of corrosion resistant materials (stainless steel, aluminum, galvanized or plated steel, or other approved materials).
- B. Hardware in contact with aluminum handrails, plates or structural members and all hardware in exterior, wet or corrosive areas shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.
- C. Supports in exterior, process, wet or corrosive locations shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.
- D. Supports in extremely corrosive environments (such as chlorine or fluoride storage rooms) shall be PVC-Coated steel unless specifically noted otherwise.
- E. Hardware and conduit clamps shall be as manufactured by Efcor, Steel City, G.A., Tinnerman or equal.

#### 2.05 WATERTIGHT ENTRANCE SEAL DEVICES

- A. For new construction, seal devices shall consist of oversized sleeve and malleable iron body with sealing rings, pressure rings, sealing grommets and pressure clamps as required (O-Z/Gedney type FSK/WSK or equal).
- B. For cored-hole applications, seal devices shall consist of assembled dual pressure disks with neoprene sealing rings and membrane clamps as required (O-Z/Gedney type CSM or equal).

### PART 3 - EXECUTION

#### 3.01 RACEWAY APPLICATION

- A. Minimum Diameter: 3/4-inch.
- B. Raceway Type: Raceway types shall be as specified below, unless indicated otherwise on drawings:
  - 1. Exterior, Exposed: Rigid Aluminum unless otherwise noted.
  - 2. Exterior, Used for Instrumentation Circuits: See Below.
  - 3. Other Exterior (Concrete-Encased or Direct Earth Buried): Schedule 40 PVC. PVC conduit shall convert to metallic conduit prior to exiting concrete-encasement or direct earth burial. See “transition” items below for additional requirements. Conduits shall be left exposed until after Engineer’s observation.
  - 4. Interior, Exposed:
    - a. Hazardous Locations: Rigid Aluminum .

- b. Wet Locations (including, but not limited to, Pump Rooms, Areas with exposed piping, Dewatering Rooms, Wet Wells, Underground Vaults, and other similar locations): Rigid Aluminum .
  - c. Dry Locations: Rigid Aluminum.
  - d. Extremely Corrosive Locations (Chlorine Storage Rooms, Fluoride Storage Rooms and other similar areas): Schedule 80 PVC.
5. Interior, Concealed:
- a. Embedded inside Poured Concrete Walls, Ceilings or Floors, with a minimum of 2” of concrete between finished surface and outer wall of conduit on all sides, where no anchor bolts, screws or other similar items will be installed: Schedule 40 PVC. PVC conduit shall convert to metallic conduit (exact type as specified elsewhere within this section) prior to exiting poured concrete-encasement of wall, ceiling, floor or ductbank. See “transition” items below for additional requirements.
  - b. Other Raceways Embedded inside Poured Concrete Walls, Ceilings or Floors (not meeting requirements above): PVC-Coated Rigid Steel
6. Raceways used for Instrumentation Circuits:
- a. Typical Dry or Wet Locations: Rigid Aluminum .
  - b. Underground or Locations Embedded inside Poured Concrete: PVC-Coated Rigid Steel.
  - c. Extremely Corrosive Locations (Chlorine Storage Rooms, Fluoride Storage Rooms and other similar areas): PVC-Coated Rigid Steel.
7. Terminations at motors, transformers and other equipment which has moving or vibrating parts:
- a. Exterior or Wet Locations (including, but not limited to, Pump Rooms, Wet Wells, Underground Vaults, and other similar locations): Liquidtight Flexible Metallic Conduit (shall generally not exceed 24 inches in length) with watertight fittings.
  - b. Dry, Interior Locations: Flexible Metallic Conduit (shall generally not exceed 24 inches in length).
8. Terminations at instruments:
- a. Liquidtight Flexible Metallic Conduit (shall generally not exceed 12 inches in length) with watertight fittings.
9. Transition from underground or concrete-encased to exposed:
- a. Convert PVC to PVC-Coated Rigid Steel utilizing PVC-Coated Rigid Steel 90 degree bends (and vertical conduits as required by application) prior to exiting concrete/grade (except at outdoor pull boxes and under freestanding electrical equipment, where terminations shall be by PVC end bells installed flush with top of slab). Exposed portions of these coated conduits shall extend a minimum of 6” above floor level, and shall be installed at uniform heights.

### 3.02 RACEWAY INSTALLATION

#### A. General:

1. Follow methods which are appropriate and approved for the location and conditions involved. Where not otherwise shown, specified, or approved in a particular case, run all wiring concealed.
2. Where conduit crosses a structural expansion joint an approved conduit expansion fitting shall be installed.
3. Where any run of rigid aluminum conduit (including bends) exceeds 50' in length, an approved conduit expansion fitting shall be installed (beginning at center of run) at intervals not to exceed 50' on center.
4. A non-conductive polypropylene pull string, properly tied/secured at either end, shall be installed in all empty conduits.
5. Metal conduit field-cuts shall be cut square with a hacksaw and the ends reamed after threading.
6. PVC conduit field-cuts shall be made with hacksaw, and ends shall be deburred.
7. All PVC joints shall be made as follows:
  - a. Clean the outside of the conduit to depth of the socket, and the inside of socket with an approved cleaner.
  - b. Apply solvent cement as recommended by the conduit manufacturer to the interior of the socket and exterior of conduit, making sure to coat all surfaces to be joined.
  - c. Insert conduit into the socket and rotate 1/4 to 1/2 turn and allow to dry.
8. All metallic conduit installed below grade or within concrete shall be coated with two (2) spiral-wrapped layers of 3M Scotchrap 50 PVC tape or two coats of asphaltum paint prior to installation.
9. Install ground wire sized per N.E.C. Table 250.122 in all conduits.
10. Use of running threads is absolutely prohibited. Conduit shall be jointed with approved threaded conduit couplings. Threadless and clamp type not acceptable.
11. Conduits shall be sized in accordance with latest National Electrical Code except when size shown on drawings.
12. Exposed, field-cut threads on all metal conduits shall be painted with zinc primer (for Galvanized Rigid or I.M.C.) or urethane paint (for PVC-Coated Rigid Steel) as recommended by conduit manufacturer .
13. Installation of PVC coated conduit systems shall be performed in strict accordance with the manufacturer's installation instructions. Damage to PVC coated conduit coating shall be touched up with patching compound as directed by manufacturer. To assure correct installation, the installer shall be certified by the manufacturer to install coated conduit.

**B. Routing/Locating:**

1. Exposed conduit runs shall be run level and plumb and shall, on interior of buildings, be run parallel and/or at right angles to building walls and/or partitions.
2. Conduit with an external diameter larger than 1/3 the thickness of a concrete slab shall not be placed in the slab. Conduits in slab shall not be spaced closer than 3 diameters on center.
3. Conduit run in ceiling spaces shall be run as high as possible, all at same level, and shall be supported from building structure. Do not support conduit from any other installation.
4. Conduit run within exterior CMU, concrete or other similar walls shall be run within the CMU cells / concrete structure / etc. Conduits shall not be run on the outside surface of CMU cells / concrete structure / etc. underneath exterior veneers / etc., which could cause a thermal break in the wall insulation or a future water intrusion problem.

5. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 6" of such pipes except where crossing is unavoidable, then conduit shall be kept at least 3" from the covering of the pipe crossed.
6. Before installing raceways for motors, HVAC equipment and other fixed equipment, check location of all equipment connections/terminal boxes with equipment supplier and locate and arrange raceways appropriately.
7. No conduit for instrumentation shall be run closer than 12 inches to parallel power conduits.
8. A minimum of 12" of clearance (or more as required by associated utility companies) shall be provided between the finished lines of exterior, underground conduit runs and exterior, underground utilities (gas, water, sewer, etc.).
9. Where any portion of raceway is installed in a wet environment (such as below grade) and located at a higher elevation than the raceway termination point in a dry environment, install watertight compound inside raceway at termination around cabling to prevent transfer of water through conduit system. Watertight compound shall be rated for the potential water head pressure, based on the assumption that ground water level would be at grade level.

C. Bends:

1. Do not make bends (in any raceway, including flexible conduits) that exceed allowable conductor bending radius of cable to be installed or that significantly restrict conductor flexibility.
2. All bends within concrete-encased ductbanks installed in exterior locations shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
3. All bends in raceways containing multi-conductor power cables (such as shielded VFD cables) shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
4. Where numerous exposed bends or grouped together, all bends shall be parallel, with same center and shall be similar in appearance
5. All PVC elbows, bends, etc., shall be either factory bends or made with an approved heat bender.

D. Support:

1. Anchor conduit securely in place by means of approved conduit clamps, hangers, supports and fastenings. Arrangement and methods of fastening all conduits shall be subject to Engineer's direction and approval. All conduits shall be rigidly supported (wire supports may not be used in any location). Use only approved clamps on exposed conduit.
2. Rigid Aluminum Conduits shall be supported at intervals not to exceed 5' on center.
3. Conduit in riser shafts shall be supported at each floor level by approved clamp hangers.
4. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameters of conduits.
5. Where installed in seismic zones, suspended raceways shall be braced in two (2) directions as required to prevent swaying and excessive movement.
6. Raceways installed on top of flat roofing shall be supported a minimum of 3 ½" above roof with rubber block supports (Cooper B-Line Dura-Blok or equal). Installation shall be in strict accordance with support manufacturer's instructions and recommendations.

E. Terminations:

1. All conduit connections to sheet metal cabinets or enclosures located in exterior or wet locations shall terminate by use of rain tight (Meyers) hubs.
2. In wet, exterior or process areas, conduits shall NOT enter tops of enclosures. All conduits shall enter enclosures from bottom, left or right sides of the enclosure (utilizing rain-tight Meyers hubs as indicated above).
3. Where rigid or I.M.C. conduits enter sheet metal boxes, they shall be secured by approved lock nuts and bushings.
4. Where metal conduits enter outdoor pull boxes, manholes, under freestanding electrical equipment or other locations where direct metal-to-metal contact does not exist between enclosure and conduit, grounding bushings shall be installed. Each grounding bushing shall be connected to the enclosure ground and all other grounding bushings with properly sized grounding conductors.
5. Where E.M.T. enters sheet metal boxes they shall be secured in place with approved insulating fittings.
6. Where PVC enters outdoor pull boxes, manholes or under freestanding electrical equipment, PVC end bells shall be installed.
7. Contractor shall be responsible for coordinating required conduit sizes with equipment hubs/conduit entry provisions (such as at motor tap boxes) prior to installation of conduit systems. Contractor shall field adjust final conduit sizes at terminations where so required (only as allowed by code) from those indicated on plans to coordinate with equipment hubs/conduit entry provisions.
8. Where conduit terminates in free air such that associated cabling/circuitry becomes exposed (such as at cable trays, etc.), conduit shall generally terminate in a horizontal orientation (to prevent dust/debris/etc. from entering conduit system). Where vertical conduit termination is necessary, the termination shall be provided with cord-grip conduit terminations to seal the conduit system.
9. Conduit ends shall be carefully plugged during construction.
10. Permanent, removable caps or plugs shall be installed on each end of all empty raceways with fittings listed to prevent water and other foreign matter from entering the conduit system.

F. Penetrations:

1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly. Refer to drawings and other specifications for additional requirements.
2. All penetrations shall be at right angles unless shown otherwise.
3. Structural members (including footings and beams) shall not be notched or penetrated for the installation of electrical raceways unless noted otherwise without specific approval of the structural engineer.
4. Dry-packed non-shrink grout or watertight seal devices shall be used to seal openings around conduits at all penetrations through concrete walls, ceilings or aboveground floors.
5. All raceways entering structures shall be sealed (at the first box or outlet) with polyurethane grout compound that expands to form a flexible foam seal that prevents the entrance of gases or liquids from one area to another (Prime Resins Prime-Flex or equal).
6. All raceways passing through concrete roofs or membrane-waterproofed walls or floors shall be provided with watertight seals as follows:
  - a. Where ducts are concrete encased on one side: Install watertight entrance seal device on the accessible side of roof/wall/floor as directed by equipment manufacturer.

- b. Where ducts are accessible on both sides: Install watertight entrance seal device on each side of roof/wall/floor as directed by equipment manufacturer.
7. All raceways passing through walls of rooms containing/storing noxious chemicals (chlorine, ammonia, etc.) or through hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS or equal).
8. All raceways terminating into electrical enclosures/devices/panels/etc. located in hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS, EZS or equal) within 18" of the termination.

G. Exterior Electrical Ductbanks:

1. Where exterior electrical concrete-encased ductbanks are indicated on drawings, conduit runs between buildings or structures shall be grouped in concrete-encased ductbanks as follows:
  - a. A minimum of 3" of concrete shall encase each side of all ductbanks.
  - b. A minimum of 1 ½" of separation shall be provided between each conduit within ductbanks. PVC spacers shall be installed at the necessary intervals prior to placement of concrete to maintain the required spacing and to prevent bending or displacement of the conduits.
  - c. Top of concrete shall be a minimum of 30" below grade. A continuous magnetic marking tape shall be buried directly above each ductbank, 12" below grade.
  - d. Exact routing of ductbanks shall be field verified and shall be modified as necessary to avoid obstruction or conflicts.
  - e. Underground electrical raceways shall be installed to meet the minimum cover requirements listed in NEC Table 300.5. Refer to drawings for more stringent requirements.

END OF SECTION 26 05 33



## SECTION 26 05 34 - OUTLET BOXES, JUNCTION BOXES, WIREWAYS

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Outlet and Junction Boxes
- B. Pull Boxes
- C. Wireways

### PART 2 - PRODUCTS

#### 2.01 OUTLET BOXES & JUNCTION BOXES (THROUGH 4-11/16")

- A. Sheet Metal: Shall be standard type with knockouts made of hot dipped galvanized steel as manufactured by Steel City, Raco, Appleton, Bowers or equal.
- B. Cast: Shall be type FS, FD, JB, GS, or SEH as required for application as manufactured by O-Z/Gedney, Appleton, or equal.
- C. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal.

### PART 3 - EXECUTION

#### 3.01 APPLICATION

- A. General
  - 1. All boxes and wireways shall be of sufficient size to provide free space for all enclosed conductors per NEC requirements. Fill calculations shall be performed by contractor per NEC requirements.
- B. Outlet Boxes & Junction Boxes (through 4-11/16")
  - a. Sheet metal boxes shall be used on concealed work in ceiling or walls.
  - 2. Cast boxes shall be used wherever Rigid or I.M.C. conduits are installed.
  - 3. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
  - 4. Except when located in exposed concrete block, switch and receptacle boxes shall be 4" square for single gang installation. Appropriate gang boxes shall be used for mounting ganged switches.
  - 5. When installed in exposed concrete block, switch and receptacle boxes shall be square type designed for exposed block installation.
  - 6. Ceiling outlet boxes shall be 4" octagon 1-1/2" deep or larger required due to number of wires.

7. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.

C. Junction & Pull Boxes (larger than 4-11/16")

1. For all below grade exterior use and elsewhere as shown:
  - a. In areas subject to future vehicular traffic: shall be galvanized cast iron (rated AASHTO H-20 Loading unless noted otherwise).
  - b. In areas not subject to vehicular traffic: shall be galvanized cast iron or pre-cast polymer concrete (rated for Tier 15 Loading unless noted otherwise).
2. All boxes installed exposed in exterior or wet areas shall be stainless steel (NEMA 4X).
3. All boxes installed exposed in corrosive areas shall be stainless steel (NEMA 4X).
4. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
5. Padmounted Pull Boxes shall be installed as shown on Plans or as required by project conditions. Transclosure-style Padmounted boxes shall be installed wherever required by the quantities and sizes of conductors. Contractor shall submit all Padmounted Pull Box types prior to ordering for engineer's review and comment.
6. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.
7. All others shall be oil tight JIC box not less than 16 gauge.

### 3.02 INSTALLATION

A. General

1. All boxes and wireways shall be securely anchored.
2. All boxes shall be properly sealed and protected during construction and shall be cleaned of all foreign matter before conductors are installed.
3. All boxes and wireways shall be readily accessible. Contractor shall be responsible for furnishing and installing access panels per architect's specifications. Locations shall be as directed by the architect as required to make boxes, wireways, electrical connections, etc. accessible where above gypsum board ceilings or in other similar locations.
4. All metallic boxes and wireways shall be properly grounded.
5. Refer to Specification Section 26 05 53 for identification requirements.

B. Outlet Boxes & Junction Boxes (through 4-11/16")

1. Boxes shall be provided with approved 3/8" fixture studs were required.
2. Recessed boxes for wiring devices, surface fixtures, or connections, shall be set so that the edge of cover comes flush with finished surface.
3. There shall be no more knockouts opened in any sheet metal box than actually used.
4. Any unused opening in cast boxes shall be plugged.
5. Back to back boxes to be staggered at least 3 inches.
6. Under no circumstances shall through-the-wall boxes be used.

C. Junction & Pull Boxes (larger than 4-11/16")

1. Pull boxes shall be installed as indicated on plans and/or as required due to number of bends, distance or pulling conditions.

2. Boxes to be imbedded in concrete shall be properly leveled and anchored in place before the concrete is poured.
3. All pull boxes and/or junction boxes installed exterior below grade, shall have their tops a minimum of 1-1/2 inches above surrounding grade and sloped so that water will not stand on lid. A positive drain shall be installed, to prevent water accumulation inside.
4. Above grade pull boxes shall be installed on concrete anchor bases as shown on Plans.

D. Wireways and/or wall-mounted equipment

1. Mount each wireway to channels of the same metal type as the wireway.
2. Conductors serving a wireway shall be extended without reduction in size, for the entire length of the wireway. Tap-offs to switches and other items served by the wireway shall be made with ILSCO type GTA with GTC cap.

END OF SECTION 26 05 34

## SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Wire and cable identification.
- B. Pullbox & Junction Box Identification
- C. Electrical distribution & utilization equipment identification.
- D. Emergency and Standby Power receptacle identification.
- E. Instrument and control device identification.
- F. Raceway identification.

### PART 2 - PRODUCTS

#### 2.01 WIRE AND CABLE IDENTIFICATION

- A. Intermediate Locations:
  - 1. Wires and cable labels shall be white, thermal transfer, halogen-free, flame-retardant marker plates (sized to accommodate three lines of text) permanently affixed to the associated cable with UV-resistant plastic wire ties. Labels shall be Panduit #M200X/300X series or equal.
- B. Circuit/Cable Termination Locations:
  - 1. Wires and cable labels shall be non-ferrous identifying tags or pressure sensitive labels unless noted otherwise.

#### 2.02 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

- A. Labels on electrical distribution & utilization equipment shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment with rivets or silicone adhesive unless noted otherwise.

#### 2.03 EMERGENCY AND STANDBY POWER RECEPTACLE IDENTIFICATION

- A. Receptacles fed from emergency or standby power sources (such as emergency generators) shall be provided with factory-marked engraved coverplates as follows:
  - 1. Emergency System source: Red engraved lettering to read "EMERGENCY".
  - 2. Legally-Required or Optional Standby Generator source:
    - a. If only part of facility is fed with generator backup: Black engraved lettering to read "FED FROM GENERATOR".

- b. If entire facility is fed with generator backup: No "...GENERATOR..." label required.

## 2.04 INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

- A. Instruments and control device labels shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment or the adjacent, visible mounting surface with silicone adhesive or stainless steel wire ties.

## 2.05 RACEWAY IDENTIFICATION

- A. Raceway labels shall be white thermal transfer marker plates permanently affixed to the associated raceway with stainless steel wire ties, with two wire ties (one on either end of marker plate to provide a flush installation) where possible. Labels shall be Panduit #M300X series or equal.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Any proposed deviation in identification methods and materials from those described herein shall be submitted to Engineer for review and comment prior to installation.
- B. Contractor shall provide all labeling or identification required by applicable local, state and national codes. These specifications do not intend to itemize all code-required labeling or identification requirements.
- C. All labels/identification shall be positioned such as to be readable from the normal perspective without adjusting wiring/cables/labels. For example, labels/identification of wires/cables within cable trays shall be positioned to point towards the viewer (typically downward for overhead cable trays, or upward for cable trays within trenches).
- D. All labels/identification (except for handwritten labels on concealed pullbox/junction box covers as noted below) shall be typewritten/printed/engraved in a neat, workmanlike, permanent, legible, consistent and meaningful manner. Labels shall not be handwritten unless specific approval is granted by engineer.

### 3.02 WIRE AND CABLE IDENTIFICATION

#### A. General:

- 1. Where cabling is exposed (such as within cable trays), provide two wire ties per cable (one on either end of marker plate to provide a flush installation). Where cabling is concealed (such as within pullboxes/wireways), one wire tie per cable will be acceptable.

#### B. Intermediate Locations:

- 1. Thermal transfer labels shall be securely fastened to all wiring and cabling in the following locations:
  - a. Wireways
  - b. Pullboxes/Junction boxes larger than 4-11/16"

- c. Pullboxes/Junction boxes through 4-1 1/16" where wires and cables are not easily identifiable via the color coding and box labeling
  - d. Vaults & Manholes
  - e. Approximately every 50 feet within cable trays (especially at locations where cables exit or diverge). Labels within cable trays shall be grouped (rather than being pre-labeled on cables and pulled into cable trays).
  - f. Other similar intermediate locations.
2. Labels shall be stamped or printed with the following data so that the feeder or cable can be readily identified and traced:
- a. From where the circuit originates (including panel designation and circuit number):
    - 1) Ex: "FROM: PP-A CIR. 3 (IN MAIN ELEC ROOM)"
  - b. To where the circuit extends (using the common name of the equipment):
    - 1) Ex: "TO: RTU-6 (ON ROOF)"
  - c. The purpose of the circuit:
    - 1) Ex: "POWER"
  - d. The set number (If parallel power feeds are used).
    - 1) Ex: "SET NO. 3 OF 4"

C. Circuit/Cable Termination Locations:

- 1. Where multiple termination points exist within a circuit origination point (panelboard, switchboard, MCC, starter, etc.) or other similar circuit endpoint (control panel, etc.), labels shall be securely fastened to all ungrounded and neutral conductors to clearly identify the terminal and/or circuit number associated with each conductor. For example, within lighting panels, each phase and neutral conductor shall be labeled near the terminals at a clearly visible location with the associated circuit number(s), so that if all conductors were unterminated, the labels would clearly indicate which conductor was associated with each circuit.

D. Refer to Specification Section 26 05 19 for all color-coding requirements of wires and cables.

### 3.03 PULLBOX & JUNCTION BOX IDENTIFICATION

A. Concealed pullboxes/junction boxes:

- 1. Front surface of all pullbox/junction box covers in concealed areas (such as above lay-in ceilings) or within mechanical/electrical rooms (and other similar areas where appearance of boxes is not an issue) shall be neatly marked with the ID of circuits/cables contained with permanent black marker on cover of box (Ex: "RP-1A Cir. 1, 2 & 3"). Additionally, front surface of box shall be painted red where box contains fire alarm system cabling.

B. Exposed pullboxes/junction boxes:



1. Interior surface of all pullbox/junction box covers in exposed areas shall be labeled “Power”, “Telecommunications”, “Fire Alarm” or with other similar general text neatly with permanent black marker to indicate function of box. Circuit/cable labeling within box (see above) shall identify specific cables contained. Additionally, interior surface of cover shall be painted red where box contains fire alarm system cabling.
- C. Where pullboxes/junction boxes are named on contract documents (Ex:”PULLBOX #3”), an engraved nameplate shall be installed on the front surface of the box to identify the name.

### 3.04 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

#### A. General:

1. All new and existing equipment modified by this project shall include arc-flash warning labels in accordance with NEC article 110.16.

#### B. All Panels, Motor Control Centers, Switchboards, Switchgear, Transformers, Etc.:

1. Engraved nameplates identifying name of equipment, nominal voltage and phase of the equipment and where the equipment is fed from shall be installed on front surface of all panels, motor control centers, switchboards, switchgear, transformers, etc.:
  - a. Ex: First Line: “NAME: RP-A”, Second Line: “120/208V-3Ø-4W”, Third Line: “FED FROM: PP-A CIR. 4 (IN MAIN ELEC ROOM)”
2. Refer to Panelboard Specification Sections for additional labeling requirements (circuit directory cards, permanent circuit labels, permanent circuit numbers, etc.) required inside panelboards.

#### C. Safety/Disconnect Switches and Utilization Equipment (HVAC Equipment, Pumps, Powered Valves, Control Panels, Starters, Etc.)::

1. Engraved nameplates identifying equipment being fed and where the equipment is fed from shall be installed on front surface of all disconnect switches (including both visible blade type switches and toggle-type switches) and on utilization equipment (where not clearly identified by immediately adjacent local disconnect switch):
  - a. Ex: First Line: “RTU-6”, Second Line: “FED FROM: PP-A CIR. 5”
2. Where safety/disconnect switches are installed on the load side of variable frequency drives, the safety/disconnect switch shall be furnished with an additional engraved nameplate to read: “WARNING: TURN OFF VFD PRIOR TO OPENING THIS SWITCH”.
3. Safety/Disconnect switches feeding equipment that is fed from multiple sources (such as motors with integral overtemperature contacts that are monitored via a control system) and Utilization Equipment fed from multiple sources shall be furnished with an additional BLACK-ON-YELLOW engraved nameplate to read: “WARNING: ASSOCIATED EQUIPMENT FED FROM MULTIPLE SOURCES – DISCONNECT ALL SOURCES PRIOR TO OPENING COVER”.

### 3.05 INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

- A. New Instruments and control devices (whether furnished by contractor or not) shall be labeled with black-on-white engraved nameplates permanently affixed to the equipment or to the adjacent, readily-visible mounting surface with silicone adhesive or stainless steel wire ties.
  - 1. Instruments and process control devices (float switches, etc.) shall be labeled with instrument name and, where available, instrument ID number.
  - 2. Pushbutton stations shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all pushbutton stations.
  - 3. Thermostats and other similar HVAC control devices installed in process areas shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all thermostats and other similar HVAC control devices.

### 3.06 RACEWAY IDENTIFICATION

- A. Each exposed raceway shall be labeled at the point where it becomes concealed, such as where it enters a concrete floor slab, a concrete wall, the ground, etc.
- B. Each raceway entering in-grade or on-grade pullboxes/junction boxes, where the conduits are only visible inside the box, shall be labeled within the box at the point where the raceway becomes concealed.
- C. Raceway nameplates shall identify:
  - 1. The location of the other end of the raceway (“TO MCC-1” or similar). If the other end of the raceway is at an intermediate, named pullbox (“INSTRUMENTATION PULLBOX #4” or similar), that pullbox name shall be labeled rather than the endpoint of the circuitry.

### 3.07 OTHER IDENTIFICATION

- A. Factory-engraved coverplates identifying functions of light switches and other similar devices shall be installed where so required by plans/specifications.

END OF SECTION 26 05 53

## SECTION 26 05 73 - POWER DISTRIBUTION SYSTEM ELECTRICAL STUDIES

### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

1. Power Distribution System Electrical Studies.

### PART 2 - PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. Short Circuit Studies, Protective Devices Evaluation Studies, Protective Device Coordination Studies and Arc Flash Hazard Studies shall be performed by the same entity, which shall be a Professional Engineer registered in the state where the equipment will be installed. The studies shall be per the requirements set forth in the latest edition of NFPA 70E-Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E, Annex D.
- B. The studies shall be submitted to the Engineer prior to shipment of any electrical distribution equipment.
- C. The studies shall include all portions of all electrical systems affected by the project (including any existing systems/equipment) from the utility service to any existing equipment at the facility (including all existing equipment fed from the same service point as any new equipment) and to all new equipment installed under this contract. All induction motors 50 HP or below and fed from the same bus may be grouped together. All induction motors greater than 50 HP shall be included individually with associated starters and feeder impedance. See individual study sections below for additional scope requirements.
- D. The studies shall be performed using the latest revision of the SKM Systems Analysis Power\*Tools for Windows (PTW) or EasyPower software program.
- E. Normal system connections and those which result in maximum fault conditions shall be adequately covered in the study.
- F. The contractor shall be responsible for collecting data on any existing or proposed electrical equipment, devices, conductors, etc. as required to prepare the study, and shall supply pertinent electrical system conductor, circuit breaker, generator, and other component and system information in a timely manner to allow the studies to be completed prior to shipment of equipment.
- G. The Power Distribution System Electrical Studies shall be performed by Square 'D' or Cutler Hammer; or a third-party vendor if specifically approved by the engineer prior to preparation of the studies.
- H. The proposed vendor shall have completed a minimum of five (5) equivalent Arc-Flash

Hazard Studies in the past three (3) years.

## 2.02 SHORT CIRCUIT STUDY

- A. The Short Circuit Study shall be performed with aid of a computer program. The study input data shall include the power company's short circuit contribution, resistance and reactive components of the branch impedances, X/R ratios, base quantities selected, and other source impedances.
- B. Short circuit momentary duty values and interrupting duty shall be calculated on each individual basis with the assumption that there is a three-phase bolted short circuit at the respective switchgear bus, switchboard, low voltage motor control center, distribution panelboard, and other significant locations throughout the system.
- C. The short circuit tabulation shall include symmetrical and asymmetrical fault currents, and X/R ratios. For each fault location, the total duty on the bus, as well as the individual contributions from each connected branch, including motor back EMF current contributions shall be listed with its respective X/R ratio.

## 2.03 PROTECTIVE DEVICE EVALUATION STUDY

- A. The Protective Device Evaluation Study shall be performed to determine the adequacy of circuit breakers, switches, transfer switches, and fuses by tabulating and comparing the short circuit rating of these devices with the calculated fault currents. Appropriate multiplying factors based on system X/R ratios and protective device rating standards shall be applied.
- B. Any problem areas or inadequacies in the equipment due to short circuit currents shall be promptly brought to the Engineer's attention.

## 2.04 PROTECTIVE DEVICE COORDINATION STUDY

- A. The Protective Device Coordination Study shall be performed to provide the necessary calculation and logic decisions required to select or to check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage breaker trip characteristics and settings. The objective of the study is to obtain optimum protective and coordination performance from these devices.
- B. The coordination study shall show the best coordination attainable for all breakers down through the largest breaker at each piece of distribution equipment. Coordination study shall demonstrate selective coordination where required by applicable codes or contract documents.
- C. Phase and ground overcurrent protection shall be included as well as settings of all other adjustable protective devices. Where ground fault protection is used, coordination of the ground fault protection with the first downstream overcurrent phase protection device shall be demonstrated.
- D. All restrictions of the National Electrical Code shall be adhered to and proper coordination intervals and separation of characteristic curves be maintained.

## 2.05 ARC-FLASH HAZARD STUDY

- A. The Arc-Flash Hazard Study shall be performed with the aid of computer software intended for this purpose in order to calculate Arc-Flash Incident Energy (AFIE) levels and flash protection boundary distances.
- B. The Arc-Flash Hazard Study shall be performed in conjunction with a short-circuit Study and a time-current coordination Study.
- C. The Arc-Flash Hazard Study shall be performed for the following equipment:
  - 1. All Distribution Equipment – This includes but is not limited to the following:
    - a. Switchgear
    - b. Switchboards
    - c. Motor Control Center
    - d. All Lighting and Power Panelboards
    - e. Fused Disconnect Switches rated greater than 100A
  - 2. Separately enclosed devices fed from protection device rated greater than 100A - This includes but is not limited to the following:
    - a. Control Panels
    - b. VFD's
    - c. RVSS
- D. A generic Arc-Flash label shall be applied to other electrical equipment that has not been included in the study. This includes but is not limited to the following equipment:
  - 1. Non-fused Disconnect Switches
  - 2. Fused Disconnect Switches rated 100A or less
  - 3. Transformers
  - 4. Control Panels, VFD's, RVSS, etc. rated 100A or less
- E. Where a main protective device is provided, the study shall be performed on the line side and load side of the main. The worst-case result shall be used for the study result and label.
- F. The Study shall be performed under worst-case Arc-Flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.
- G. Where incident energies are calculated to fall within the high marginal region of a given Hazard/Risk Category Level, the Hazard/Risk Category Level shall be increased one level.
- H. The Arc-Flash Hazard Study shall be performed in compliance with the latest IEEE Standard 1584, the IEEE Guide for Performing Arc-Flash Calculations. Where IEEE 1584 does not have a method for performing the required arc-flash calculations (such as for single phase equipment), calculations shall be performed and system shall be modeled using modules/methods as recommended by the arc flash software supplier (for example, using SKM Unbalanced/Single Phase Studies module for modeling single phase systems).
- I. Equipment labels to identify AFIE and appropriate Hazard/Risk Category in compliance with

NFPA 70E and ANSI Z535.4 (latest version of these requirements) shall be provided to the Electrical Contractor. The Electrical Contractor shall affix the labels to the distribution equipment devices as directed by the equipment manufacturer. These labels shall, at a minimum, include the following:

1. WARNING label.
2. Hazard/Risk Category.
3. Arc Flash Boundary Distance.
4. Incident Energy (in cal/cm<sup>2</sup>) at Working Distance.
5. Shock Hazard Voltage.
6. Limited Approach Boundary Distance.
7. Restricted Approach Boundary Distance.
8. Prohibited Approach Boundary Distance.
9. Equipment Name.
10. Name of Firm who prepared the Study.
11. Project Number of the Firm who prepared the Study.
12. Date that the Study was prepared.
13. Method for calculating analysis data.
14. Statement to read: "Any system modification, adjustment of protective device settings, or failure to properly maintain equipment will invalidate this label" (or equivalent).

## PART 3 - EXECUTION

### 3.01 SUBMITTAL REQUIREMENTS

- A. The results of the studies shall be summarized in a final report. The report shall include the following sections:
  1. General:
    - a. Description, purpose, basis and scope of the studies
    - b. Single line diagram of the portion of the power system which is included within the scope of the work. The single line diagram shall fit on one sheet of paper (size as required) unless approved otherwise by engineer. The following information shall be shown on the single line diagram:
      - 1) Device Name
      - 2) Branch Fault Currents with directional indicators
      - 3) General Location (for busses only)
      - 4) Other basic component information such as cable type, cable length, breaker rating, buss short circuit rating, transformer voltages, transformer size, fuse size, etc..
  2. Short Circuit Study:
    - a. Tabulation of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding same.
  3. Protective Device Evaluation/Coordination Study:
    - a. Protective devices time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.

- b. Fault current calculations including definitions of terms and a guide for interpretation of computer printout.
  - c. Documentation from utility company on their letterhead showing their anticipated values of available short circuit currents X/R ratios and protective devices with which the power distribution system will coordinate.
  - d. Time-current characteristics of the respective protective devices shall be plotted on log-log paper. Plots shall be printed in color with a dedicated color and pattern for each curve for clear identification.
  - e. Plots shall include complete titles, respective single line diagrams and legends, and associated power company's relay or fuse characteristics, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breakers trip curves and fuses.
  - f. The coordination plots shall indicate the type of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents.
  - g. The coordination plots for phase and ground protective devices shall be provided on a system basis.
  - h. A sufficient number of separate curves shall be used to clearly indicate the coordination achieved.
4. Arc-Flash Hazard Study:
- a. Tabulation of device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.
  - b. Recommendations for reducing AFIE levels and enhancing worker safety.
- B. Furnish all labor, materials, calculations, electrical equipment, technical data and incidentals required to provide a complete short circuit study, coordination study and arc flash hazard study of protective devices, busses, etc. from the utility service to any existing equipment at the facility and all new equipment installed under this contract.
- C. The study shall comply with the following applicable provisions and recommendations of the latest revisions of the following: ANSI C37.5, IEEE Standard No. 399, and IEEE Standard No. 141.
- D. Submit calculations and results of the short circuit, protective device evaluation and coordination and arc flash hazard studies prior to submitting shop drawings for new equipment. Contractor shall verify that all proposed equipment is properly rated per the short circuit and protective device evaluation portions of the study prior to releasing equipment for manufacturing.
- E. Submit a copy of a sample typical arc flash label layout (meeting requirements outlined above) that will be used for the project.
- F. Submit final electronic copies of all SKM program files/models/input data/etc. used to perform the study to the owner with final close-out documents. These files shall be complete as required to allow future users to recreate the study.



### 3.02 INSTALLATION

- A. Contractor shall adjust all breaker settings as recommended by the coordination study prior to energizing equipment.
- B. Contractor shall affix arc flash hazard notification labels (as determined by the results of this study) to each piece of distribution equipment prior to energization of equipment. A generic arc-flash warning label shall be affixed to any electrical equipment not included in the analysis as outlined above.
- C. Where short circuit rating of equipment is dependent on setting of upstream overcurrent device, provide and install label for equipment indicating the required settings of the associated device.

END OF SECTION 26 05 73

## SECTION 26 24 17 - LIGHTING PANELBOARDS

### PART 1 - GENERAL

#### 1.01 GENERAL

A. The work under this section includes but is not limited to the following:

1. Lighting Panelboards
2. Circuit Breakers

### PART 2 - PRODUCT

#### 2.01 PANELBOARDS

A. Enclosure:

1. Panelboards shall be dead front type and shall be in accordance with Underwriter's Laboratories, Inc., standard of panelboards and enclosing cabinets and so labeled.
2. Panelboards installed in dry locations shall have enclosures fabricated from sheet steel and shall be finished in ASA #49. Panelboards installed in corrosive, exterior or wet locations shall have NEMA 4 stainless steel enclosures.
3. The door shall have a cylinder type lock. Lock shall be held in place by concealed screw to a captive nut, welded to inside of door. All locks shall be keyed alike.
4. A metal framed circuit directory card holder with clear plastic covering shall be factory-mounted on the inside of door.
5. Panels for 20 or more circuits, including spares and spaces, shall be 20 inches wide.
6. Panelboards enclosures shall be as shown on panel schedule on plans for surface, flush or motor control center mounting.
7. Provide hinged trim with piano-hinge down full length of one side to allow access to wiring without complete removal of outer trim.
8. Each section of multi-section panelboards shall be of matching heights and depths.

B. Bussing/Lugs:

1. Ampacity and service voltage of main buss, lugs or main breakers and branch circuit breakers shall be as shown on drawings.
2. All bussing and associated connectors shall be tin-plated copper.
3. All panelboards shall contain ground buss.
4. Entire panelboard shall be capable of withstanding a short circuit not less than the interrupting capacity of any breaker in the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. Interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
5. Buss connectors shall be for distributed phase arrangement.
6. Main and sub-feed lugs shall be provided with AL/CU compression lugs suitable for the quantities and sizes of conductors required.
7. Top/bottom feed arrangement and lug sizes/quantities shall be coordinated by the contractor.

8. Entire panelboard assembly, including all bussing, shall have SCCR ratings meeting or exceeding the minimum AIC ratings listed on the plans for the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. All ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.

C. Breaker arrangement and numbering:

1. Panelboards shall be factory assembled with branch breakers arranged exactly as indicated on plans.
2. Breakers shall be numbered vertically beginning top left. Multi-section panelboards shall be numbered consecutively through all sections.
3. Breaker numbers shall be permanently attached to trim.
4. Main breakers shall be vertically-mounted (branch-mounted or back-fed main breakers will not be acceptable unless specifically so shown on plans).

## 2.02 CIRCUIT BREAKERS

- A. Circuit breakers shall be quick break, quick make, thermal magnetic type, for alternating current. Breakers shall trip free for the handle and tripping shall be indicated by the handle assuming a position between OFF and ON.
- B. Circuit breakers shall be of the bolt-on type.
- C. Multi-pole breakers shall be internal common trip with single operating handle; external handle ties are not acceptable, unless specifically noted otherwise (such as for multi-wire branch circuits described below).
- D. Circuit breakers feeding multiwire branch circuits (as defined by NEC) consisting of separate single phase loads sharing a common neutral shall be provided with multi-pole breakers or handle ties to simultaneously disconnect all ungrounded conductors per NEC Article 210.4(B). The necessary locations of these multi-pole breakers or handle ties shall be coordinated by the contractor. Where necessary, the contractor may rearrange circuit breakers (as minimally as possible) as required to meet this requirement.
- E. All breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated panel. All interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
- F. All branch circuit breakers shall be listed to UL489 or shall be specially-tested to be HACR listed.

## 2.03 SPECIAL REQUIREMENTS

- A. Any special requirements on the drawings, such as for increased interrupting rating, ground fault protection, etc., shall supersede these specifications, but only insofar as that particular requirement is concerned.
- B. Lighting panels larger than 400A shall conform to the requirements for power panels.

## 2.04 MANUFACTURER

- A. Panelboards shall be as manufactured by Square 'D' or Cutler Hammer.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. All panelboard dimensions and clearances shall be carefully checked and coordinated with the proper trades to insure proper mounting space and support prior to roughing in equipment. In no case shall any circuit breaker be located above 6'-7" A.F.F..
- B. Wiring in panelboard wireways shall be done in a neat and workmanlike manner. Wiring shall be grouped into neat bundles and secured with approved tie wraps.
- C. For all flush-mounted panelboards, a minimum of three (3) one-inch empty conduits shall be stubbed out above the nearest accessible ceiling space for future use.

### 3.02 PANEL IDENTIFICATION

- A. Refer to Specification Section 26 05 53.

END OF SECTION 26 24 17

## SECTION 26 27 26 - WIRING DEVICES

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Wiring Devices
- B. Plates
- C. Finishes

### PART 2 - PRODUCTS

#### 2.01 WIRING DEVICES AND PLATES

- A. Switches shall be AC type, extra-heavy duty industrial grade (unless otherwise shown) of ratings shown on drawings. Switches shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.
- B. Receptacles shall have blade configuration and shall be extra-heavy duty industrial grade (unless otherwise shown) of current and voltage rating as shown on drawings. Receptacles shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.
- C. All GFCI-type receptacles shall continuously self-test and shall trip/deny power if the receptacle does not provide proper GFCI protection or if the line/load terminations are miswired and shall provide visual indication of power status, trip conditions, ground fault conditions and end-of-life status.
- D. Each wiring device shall have a plate (see "Finishes" section below for specific requirements).

#### 2.02 FINISHES

- A. All wiring devices (switches, receptacles, etc.) shall be colored to match the coverplates described below. For instance, all items covered by stainless steel, aluminum or malleable iron plates shall be gray in color.
  - 1. Exceptions:
    - a. Emergency wiring devices shall be red.
    - b. Isolated ground wiring devices shall be orange.
- B. Coverplates for recessed, wall-mounted electrical items (switches, receptacles, telephone outlets, etc.) shall be stainless steel unless shown otherwise.
- C. Coverplates, trim rings, etc. for recessed, floor-mounted electrical items (floor outlets, underfloor duct junctions, etc.) shall match finish of building hardware (302/304 stainless steel, brass, etc.) in area installed.
- D. Coverplates for exposed electrical items (switches, receptacles, telephone outlets, etc.) shall be

of same material as exposed boxes (see Outlet Box Specification for required material type) and shall have beveled edges.

- E. Coverplates for receptacles in wet locations shall be metallic, in-use type, rated for wet locations per NEC requirements unless noted otherwise.
- F. See “Electrical Identification” specification section for coverplate labeling requirements.

## PART 3 - EXECUTION

### 3.01 GENERAL MOUNTING

- A. Symbols on drawings and mounting heights are approximate. The exact locations and mounting heights shall be determined on the job, and it shall be the Contractor's responsibility to coordinate with all trades to secure correct installation. For example, Contractor shall coordinate exact mounting heights over counters, in or above backsplashes, in block walls, and at other specific construction features.
- B. Verify all door swings with Architectural. Locate boxes for light switches within four inches of door trim on swing side (not hinge side) of door.
- C. Devices and associated plates shall not be used as support; outlet boxes shall be rigidly supported from structural members.
- D. Mount all straight-blade receptacles vertically with ground pole up, unless specifically noted otherwise.
- E. Unless otherwise shown or required by local handicap codes, outlet boxes shall be the following distances above the finished floor unless otherwise noted.
  - 1. Receptacles and telephone outlets in offices and other finished areas: 1'-6" to the center of the box.
  - 2. Receptacles and telephone outlets in equipment rooms and other unfinished areas: 4'-0" to the center of the box.
  - 3. Receptacles over counters: As Noted
  - 4. Clock outlet, general: 7'-6" to the center of the box.
  - 5. Switches, general: 4'-0" to the top of the box.
  - 6. Push-button, etc., general: 4'-0" to the top of the box.

END OF SECTION 26 27 26

## SECTION 26 28 16 - SAFETY SWITCHES AND FUSES

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Safety Switches
- B. Fuses
- C. Branch Feeders
- D. Feeders

### PART 2 - PRODUCTS

#### 2.01 SAFETY SWITCHES

- A. Safety switches shall be quick-make, quick-break, NEMA heavy duty type HD, fused or nonfused as shown. Switch blades shall be fully visible in the off position.
- B. Safety switches shall be furnished with transparent internal barrier kits to prevent accidental contact with live parts. Barriers shall provide finger-safe protection when the switch door is open and shall allow use of test probes and removal of fuses without removing barrier.
- C. Fused switches shall have provisions for class R, rejection type fuses.

#### 2.02 FUSES (600V)

- A. Fuses for all branch switches shall be Bussman Mfg. Co., Dual Element, Class "R" Fusetron.
- B. Fuses for main switch/switches shall be Bussman Mfg. Co. Hi-Cap.

#### 2.03 MANUFACTURER

- A. Safety switches shall be as manufactured by Square 'D' or Cutler Hammer.
- B. Fuses shall be as manufactured by Bussman Mfg. Co. or equal.

### PART 3 - EXECUTION

#### 3.01 SAFETY SWITCHES

- A. Safety switches shall be installed as shown on the plans and in accordance with N.E.C.
- B. Locations shown for safety switches on plans are diagrammatical only. Exact locations shall be field coordinated by contractor as required to provide code-required clearances.
- C. Switch enclosures shall be rated NEMA I indoors in dry locations and NEMA 4 stainless steel outdoors and in wet or process areas.



- D. Adequate support shall be provided for mounting safety switches. Safety switches shall not be mounted to the associated equipment (unless the safety switch is furnished with the equipment).

### 3.02 FUSES

- A. Fuses shall be sized as shown on drawings, unless a smaller size is required by the associated equipment supplier, in which case the contractor shall provide fuses sized as directed by the associated equipment supplier at no additional cost.
- B. Provide not less than one spare set of fuses for each size used. Provide an additional spare set for each five sets of same size fuses used.

END OF SECTION 26 28 16

## SECTION 26 29 00 - MANUFACTURED CONTROL PANELS

### PART 1 - GENERAL

#### 1.01 SCOPE

- A. This section describes control stations, PLC panels, motor control panels, manufactured control panels, and other similar panels specified herein. Specifications herein are intended as an extension of requirements in other Divisions of these specifications where reference is made to Electrical Specifications.

#### 1.02 DEFINITIONS

- A. "Control Stations": Enclosures (with all required accessories) containing only door-mounted pushbuttons, indicator lights and/or selector switches (no electronic components or starter/controller equipment).
- B. "Control Panels": Enclosures (with all required accessories) containing equipment/devices other than door-mounted pushbuttons, indicator lights and/or selector switches (such as electronic components, starter/controller equipment, etc.).

#### 1.03 SUBMITTALS

- A. Provide the following for each control panel:
  - 1. A job-specific, custom wiring diagram
    - a. The wiring diagram shall clearly show all components (whether the components are mounted internal or external to the control panel enclosure).
    - b. All wires and terminal blocks shall be clearly labeled.
    - c. Diagram shall be in accordance with NEMA/ICS standards.
  - 2. Size, type and rating of all system components.
  - 3. Unit frontal elevation and dimension drawings.
  - 4. Internal component layout diagrams.
  - 5. Manufacturer's product data sheets for all components.
- B. A Bill of Materials shall be included with catalog information on all components.
- C. Information shall be included on any proprietary logic component sufficient to demonstrate its ability to perform the required functions.
- D. The following calculations shall be submitted:
  - 1. Thermal calculations showing amount of air conditioning or ventilation and heating required for each control panel, per ambient requirements listed below and operating temperature limitations of all equipment/devices within each control panel. Where possible, forced air ventilation shall be utilized rather than air conditioning. Panel shall be oversized, interior equipment/devices shall be derated, and solar shielding shall be provided as required to allow the use of forced air ventilation as the cooling method. Air

conditioning, ventilation, and/or heating equipment shall each have ratings/capacities at least 20% larger than required by calculations below unless noted otherwise:

- a. Thermal calculations used for sizing cooling/ventilation systems for each control panel located in exterior or non-conditioned spaces shall assume:
  - 1) Ambient exterior air temperature ranges of -5 degrees F to 105 degrees F.
  - 2) Full solar contact where applicable (not applicable where enclosures are fully protected from solar contact using solar shields separated from panel enclosure with standoffs or similar).
  - 3) No wind.
  - 4) Heat loss from interior equipment (electronics, etc.) per equipment supplier's information.
- b. Thermal calculations used for sizing heating systems for each control panel shall assume:
  - 1) Ambient exterior air temperature ranges of -5 degrees F to 105 degrees F.
  - 2) No heat loss by interior components of control panel.
  - 3) No solar gain on exterior of control panel.
  - 4) Doubling of heating wattage required to account for wind where control panels are located outdoors.
  - 5) Minimum temperature difference (due to heating) of 10 degrees F to prevent condensation, regardless of equipment temperature limitations.
2. Load calculations showing the sizing of all power supplies provided (with spare capacity as specified). Power supplies shall each have ratings/capacities at least 20% larger than required by load calculations unless noted otherwise.
3. Load calculations showing the sizing and anticipated runtime of all Uninterruptible Power Supply systems provided (with spare capacity as specified).

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. Control panels shall be Underwriters' Laboratories labeled by the panel manufacturer. Control panel manufacturers not capable of applying the U.L. label to their products are unacceptable.
- B. All human interface equipment/devices (indicator lights, selector switches, pushbuttons, time switches, displays, keypads, and other similar items used for control, adjustments or monitoring) shall be mounted on the non-energized side of enclosure door(s) in such a way as to be accessible without exposing the user to energized parts.

### 2.02 RATINGS

- A. All Control Panels shall have short circuit current ratings at least equal to the lesser of the following, unless noted otherwise on plans:
  1. The short circuit current rating of the electrical distribution equipment that feeds the Control Panel.

2. 150% of the available fault current at the Control Panel as determined by a Short Circuit Current study prepared by a licensed professional electrical engineer.
- B. All equipment/devices installed within control panels shall be rated to operate in ambient temperatures of 50 degrees C (122 degrees F) or higher.

### 2.03 ENCLOSURES

- A. All enclosures (with any required accessories or auxiliary items) shall fit within the space shown on the Plans. Any costs associated with furnishing equipment which exceeds the available space shall be borne by the Contractor.
- B. Enclosures (with any required accessories or auxiliary items) shall be suitable for the environment where installed.
- C. Enclosure materials shall be as follows unless noted otherwise:
1. Control Stations:
    - a. Where located in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.): NEMA 4X of non-metallic construction (with non-metallic hardware) compatible with the associated chemical(s).
    - b. Where located in other wet, process or outdoor areas: NEMA 4X of type 304 stainless steel construction (with stainless steel hardware).
    - c. Where located in dry, non-process, indoor areas (such as electrical rooms): NEMA 1 of die cast zinc/aluminum construction.
  2. Control Panels:
    - a. Where located in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.): NEMA 4X of non-metallic construction (with non-metallic hardware) compatible with the associated chemical(s).
    - b. Where located in other wet, process or outdoor areas: NEMA 4X of type 316 stainless steel construction (with stainless steel hardware).
    - c. Where located in dry, non-process, indoor areas (such as electrical rooms): NEMA 1 or 12.
- D. Control Panel Enclosure Construction:
1. Non-metallic control panel enclosure material, where specified, shall be reinforced polyester resin or equivalent, with a minimum thickness of 3/16 inch for all surfaces except those requiring reinforcement. Panels shall be precision molded to form a one piece unit with all corners rounded. Exterior surfaces shall be gel-coated to provide a corrosion-resistant maintenance-free satin finish which shall never need painting. Color pigments shall be molded into the resin. Color shall be grey.
  2. Metallic control panel enclosures, where specified, shall be fabricated using a minimum of 14 gauge steel for wall or frame mounted enclosures and a minimum of 12 gauge for freestanding enclosures. Continuously weld all exterior seams and grind smooth. Reinforce sheet steel with steel angles where necessary support equipment and ensure rigidity and preclude resonant vibrations.
  3. Use pan-type construction for doors.
  4. Door widths shall not exceed 36-inches.

5. Mount doors with full length, heavy duty piano hinge with hinge pins.
  6. Provide gasket completely around each door opening.
  7. Mount and secure all internal components to removable back plate assembly.
  8. For NEMA 1 or 12 enclosures, provide handle-operated key-lockable three point stainless steel latching system for each door.
  9. For NEMA 4X enclosures, provide provisions for padlocking all doors and provide clamps on three (3) sides of each door.
- E. Control panel enclosures (and associated backpanels and other similar accessories) shall be manufactured by Hoffman Engineering Co., or Saginaw Control & Engineering.

#### 2.04 CONTROL PANEL ACCESSORIES:

- A. Cooling systems shall be provided if so required by the application to maintain temperatures within the acceptable ranges of the interior equipment. In no case (regardless of temperature ratings of internal equipment) shall maximum temperatures within control panels be allowed to exceed 50 degrees C (122 degrees F). Thermostats shall be provided to control cooling without need of manual operation. Thermostat setpoints shall be as per recommendations of the equipment suppliers. See above for thermal calculation requirements. Cooling units shall be as manufactured by Hoffman Engineering Co., Rittal or approved equal and shall be thermostatically controlled.
- B. Space heaters shall be provided for condensation and temperature control. Thermostats AND hygrometers (or combination hygrometers) shall be provided to control heating requirements (based on temperature and relative humidity within enclosure) without need of manual operation. Setpoints shall be as per recommendations of the equipment suppliers. See above for thermal calculation requirements. Space heaters and associated control devices shall be as manufactured by Hoffman Engineering Co., Rittal, Stego or approved equal.
- C. NEMA 4X control panels shall be provided with vapor-phase corrosion inhibitor(s) (chemical combinations that vaporize and condense on all surfaces in the enclosed area, to protect metal surfaces/devices within the enclosed area from corrosion). Corrosion inhibitor shall be Hoffman #AHCI series (sized as required by the enclosure volume to be protected) or equal.
- D. For outdoor panels, stainless steel solar shields for front, top and each side of panel, supported to associated panel face with standoffs as required (to allow free air flow between solar shield and panel enclosure), shall be provided where required to limit solar loading on panel to allow use of a ventilated panel design rather than an air-conditioned panel design.
- E. Provide a sun shield over all LCD displays in exterior-mounted panels. Sun shield shall be collapsible to fully protect LCD display from UV light when not in use, shall provide side and top shielding when in use, shall be constructed of stainless steel and shall be installed such as to maintain NEMA 4X ratings of enclosures.
- F. Provide a clear polycarbonate gasketed hinged door or window to encompass all indicators, controllers, recorders, etc. mounted on NEMA 4 and 4X enclosures.
- G. Provide interior mounting panels and shelves constructed of minimum 12 gauge steel with white enamel finish. Provide metal print pocket with white enamel finish on inside of door.

- H. Provide interior LED light kit, mounted at top of interior of panel, and switched to turn “ON” when door is opened for the following control panels:
  - 1. Control panels with outer dimensions greater than 20” wide or 30” high.
  - 2. Control panels containing PLCs or other similar programmable devices.
- I. Control panels containing VFDs or Reduced Voltage Soft Starters shall include a door mounted digital keypad for adjusting the starter parameters and viewing process values and viewing the motor and starter statuses without opening the enclosure deadfront door.

## 2.05 CONTROL COMPONENTS

### A. General:

- 1. All pushbuttons, pilot lights, selector switches and other control devices shall be separate, standard size (full 30mm) and shape, heavy duty oil-tight units.
  - a. Devices in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.) shall be of non-metallic construction.
  - b. Devices in other areas shall be of chrome-plated construction.
- 2. All components and devices so that connection can be easily made and so there is ample room for servicing each item.
- 3. Door-mounted indicators, recorders, totalizers and controllers shall be located between 48” and 72” above finished floor level.
- 4. Door-mounted indicator lights, selector switches and pushbuttons shall be located between 36” and 80” above finished floor level.
- 5. All devices and components shall be adequately supported to prevent movement. Mounting strips shall be used to mount relays, timers and other devices suitable for this type of mounting.

### B. Pilot Lights:

- 1. All pilot lights to be cluster LED type & push to test.

### C. Pushbuttons:

- 1. All STOP operators within control stations located at equipment shall be provided with lockout provisions and a minimum of two (2) sets of contact blocks.
- 2. Emergency shutoff pushbutton devices shall be as follows unless noted otherwise:
  - a. 2 ¼” diameter, mushroom-style, maintained contact push buttons
  - b. With a minimum of one (1) normally open dry contact and three normally closed dry contacts.
  - c. Connections made such that pushing “in” the button will shutoff the associated equipment.
  - d. Provided with a red engraved nameplate with ½” lettering to read “Emergency Shutoff”.

### D. Relays:

- 1. Control relays shall have the following characteristics, unless noted otherwise:

- a. General purpose, plug-in type.
  - b. Minimum mechanical life of 10 million operations.
  - c. Coil voltage as indicated or required by application.
  - d. Single-break contacts rated 12 amperes, resistive at 240 volts.
  - e. Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each individual relay shall have 3PDT contacts. Where required, multiple control relays shall be provided (to provide the required quantities of contacts) for each “relay” function shown on plans/diagrams.
  - f. Furnished with RC transient suppressor to suppress coil-generated transients to 200% of peak voltage.
  - g. LED on/off indicator light and manual operator.
  - h. Industry standard wiring and pin terminal arrangements.
  - i. Equal to Square D 8501KP series with matching plug-in socket.
2. Interposing/isolation relays used to isolate discrete output field wiring (and where required for voltage translation for other discrete signals) to/from PLC inputs/outputs shall be terminal-block style. Terminal-block style relays shall have the following characteristics, unless noted otherwise:
- a. Minimum mechanical life of 10 million operations.
  - b. Single-break contacts rated 6 amperes, resistive at 120 volts.
  - c. One (1) N.O. contact per relay.
  - d. Furnished with integral transient protection.
  - e. LED on/off indicator light.
  - f. DIN-rail mounted.
  - g. Equal to Square D type Zelio RSL.
3. Timer relays shall be electronic, adjustable plug-in devices meeting the following characteristics, unless noted otherwise:
- a. General purpose, plug-in type.
  - b. Minimum mechanical life of 10 million operations.
  - c. Single-break contacts rated 10 amperes, resistive at 240 volts.
  - d. Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each relay shall have DPDT contacts (2 N.O. & 2N.C.). Where required, multiple timer or control relays shall be provided (to provide the required quantities of contacts) for each “relay” function shown on plans/diagrams.
  - e. Rotary-thumbwheel adjustments for time value, timing range and function.
  - f. Time value adjustments from .05 seconds to 999 hours
  - g. Selectable Timing Functions, including the following:
    - 1) On Delay
    - 2) Interval
    - 3) Off Delay
    - 4) One Shot
    - 5) Repeat Cycle-Off
    - 6) Repeat Cycle-On
    - 7) On/Off Delay
    - 8) One Shot Falling Edge



- 9) Watchdog
- 10) Trigger On Delay

- h. Accuracy shall be  $\pm 2\%$  and repeatability shall be  $\pm 0.1\%$ .
- i. Furnished with integral transient protection.
- j. LED indicator light(s) for “timing” and “on/off status”
- k. Held in place with hold-down spring
- l. Equal to Square D type JCK with matching plug-in socket.

## 2.06 CONFORMAL COATINGS

- A. All printed circuit boards within electronic devices (PLCs, RTUs, controllers, I/O modules, power supplies, touchscreens, Ethernet switches, radios, etc.) installed in panels located in non-conditioned or exterior/process areas shall be conformal-coated for harsh environments.

## 2.07 DC POWER SUPPLIES

- A. DC Power supplies shall be provided where specified elsewhere, or as required by design of system. Power supplies shall be industrial type, AC-to-DC switching, output voltage as required, 120vac input, size as required for the initial application plus 50% spare capacity.
- B. Redundant power supplies with diode isolation shall be provided so that the loss of one power supply does not affect system operation. The back-up supply systems shall be designed so that either the primary or the back-up supply can be removed, repaired, and returned to service without disrupting the system operation.
- C. Power supply output shall be protected by secondary overcurrent protection device(s).
- D. The power distribution from multiloop supplies shall be selectively fused so that a fault in one instrument loop will be isolated from the other loops being fed from the same supply.
- E. Each power supply shall meet the following requirements.
  - 1. Regulation, line: 0.4% for input from 105 to 132vac.
  - 2. Regulation, load: 0.8%
  - 3. Ripple/Noise: 15mV RMS / 200 mV peak to peak
  - 4. Operating temperature range: 0 deg C - 60 deg C
  - 5. Overvoltage protection
  - 6. Overload Protection
  - 7. Output shall remain within regulation limits for a least 16ms after loss of AC power at full load.
  - 8. Output status indicator.
  - 9. UL listing
- F. Power supplies shall be manufactured by Puls, Sola, Phoenix Contact or equal.

## 2.08 UNINTERRUPTIBLE POWER SUPPLIES

- A. Uninterruptible power supplies (UPSs) shall be provided where specified elsewhere, or as required by design of system. Power supplies shall be industrial type, size as required for the initial application plus 50% spare capacity unless noted otherwise.

- B. Battery runtime shall be as specified elsewhere. If no other specification for battery runtime is specified, battery runtime shall be 12.5 minutes at full load.
- C. UPSs shall be double-conversion, on-line type.
- D. UPSs shall be rated for operation in -20 degrees C to 55 degrees C ambient temperatures.
- E. UPS batteries shall be hot-swappable and 12-year rated when installed in 25 degrees C environment and 4-year rated when installed in 50 degrees C environment.
- F. UPSs shall include dry contacts for the following alarm points:
  - 1. Loss of Input Power Alarm
  - 2. Low Battery Alarm
- G. UPSs shall be manufactured by Falcon UPS or approved equal.

## 2.09 DISCONNECTS

- A. A main disconnect switch or circuit breaker shall be supplied integral to all control panels. The main disconnect or circuit breaker shall be accessible/operable without exposing the operator to energized sections of the control panel(s).
- B. Individual circuit breakers shall be provided integral to the manufactured control panel for each separate power circuit originating within the control panel.
- C. Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated (or can be adjusted to is 1200A or higher, breakers shall be electronic trip and shall be provided with arc energy-reducing maintenance switching (with local status indicator) to reduce arc flash energy per NEC 240.87 requirements.
- D. Manufacturers:
  - 1. Square 'D' or Cutler Hammer.

## 2.10 COMBINATION STARTERS

- A. All combination starters shall utilize a unit disconnect. Magnetic starters shall be furnished in all combination starter units unless specifically shown otherwise. All starters shall utilize full NEMA/EEMAC rated contactors (size 1 minimum).
- B. Starters shall be provided with a three-pole, external (door mounted) manual reset, solid state overload relay. Solid state overload relay shall have switch-selectable trip class and shall provide protection from:
  - 1. Overload.
  - 2. Phase Unbalance.
  - 3. Phase Loss.
  - 4. Ground Fault (Class II detection).
- C. Unless specifically shown otherwise, each combination starter shall be furnished with a control circuit transformer including two primary protection fuses and one secondary fuse

(in the non-ground secondary conductor). The transformer shall be sized to accommodate the contactor(s) and all connected control circuit loads (including motor space heaters and other similar loads where specified). The transformer rating shall be fully visible from the front when the unit door is opened. Unless otherwise indicated, control voltage shall be 120V AC. Control power shall be provided by individual unit control power transformers.

- D. When a unit control circuit transformer is not provided, the disconnect shall include an electrical interlock for disconnection of externally powered control circuits.
- E. Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed operation.
- F. NEMA/EEMAC Size 1-4 starters shall be mounted directly adjacent to the wireway so that power wiring (motor leads) shall connect directly to the starter terminals without the use of interposing terminals. Larger starters shall be arranged so that power wiring may exit through the bottom of the starter cubical without entering the vertical wireway.
- G. Each starter shall be equipped with a minimum of the following control devices:
  - 1. Door-mounted reset button.
  - 2. Two (2) field-reversible (N.O./N.C.) auxiliary contacts
  - 3. For reversing and two-speed starters: Four (4) field-reversible (N.O./N.C.) auxiliary contacts
  - 4. Additional control devices as indicated on plans.
- H. Control Wiring Terminal Blocks
  - 1. Terminal blocks shall generally be:
    - a. Feed-thru, screw-in type
    - b. DIN rail mounted
    - c. Furnished with the stationary portion of the block secured to the unit bottom plate
    - d. Furnished with unit-mounted control terminal blocks for each field wire.
    - e. Rated for the voltage and current of the proposed application per UL/NEC standards.
    - f. Sized (by supplier) for the associated wire gauges/types/quantities.
    - g. Phoenix Contact UT-4 series, Weidmuller WDU-4 series (or equivalent) unless required otherwise by application.
- I. Nameplates
  - 1. Each unit shall be properly labeled with an engraved phenolic nameplate with a white background and black letters.
  - 2. Each pilot device shall be properly labeled with a legend plate or an engraved phenolic nameplate.
- J. Manufacturers:
  - 1. Square 'D' or Cutler Hammer.

## 2.11 WIRING

- A. Refer to Section 26 05 19 for all wiring types/applications.
- B. All wiring shall be identified on each end with hot stamped, shrink tube type, or self-laminating vinyl permanent wire markers to correspond with numbering shown on wiring diagrams.
- C. All connections shall be made on terminals with no splices.
- D. All wiring runs shall be along horizontal or vertical routes to present a neat appearance. Angled runs will not be acceptable. Group or bundle parallel runs of wire in plastic wire duct where practical.
- E. All wiring runs shall be securely fastened to the panel or wire duct by means of plastic wire ties. Adequately support and restrain all wire runs to prevent sagging or movement.
- F. AC power wiring and instrumentation/analog wiring shall be run separate.
- G. Color code all internal wiring (not field wiring) as follows:
  - 1. Line and load circuits: Black (B)
  - 2. AC control wiring: Red (R)
  - 3. Externally-Powered control wiring: Yellow (Y)
  - 4. Neutral wiring: White (W)
  - 5. Low voltage DC(+)pos: Blue (BL)
  - 6. Low voltage DC(-)neg: Blue/White Tracer (BL/W)
  - 7. Grounding: Green (G)
- H. Terminal strips shall be provided for all input and output wiring. No more than two (2) wires shall be connected to one (1) terminal block.

## 2.12 ELECTRICAL SURGE AND TRANSIENT PROTECTION

- A. General
  - 1. Function: Protect the system against damage due to electrical surges.
- B. Application: As a minimum, provide surge and transient protection (with proper grounding) at the following locations as described below:
  - 1. Power Input High Frequency Noise Filtering:
    - a. 120VAC Control panels with integral UPSs, PLCs, or other electronic/microprocessor equipment that is susceptible to failure or improper operation due to high frequency/harmonic input transients shall be provided with series-connected high-frequency noise filters on the line input (downstream of any panel main disconnects/breakers). Filters shall be as manufactured by Edco/Emerson/Islatrol or equal (exact type(s) as required by application).
  - 2. Power Input Surge Protection:
    - a. Provide surge protection device at any connection of 120VAC power to panels containing programmable logic controllers, remote I/O equipment, UPS's,

transmitters, radios, VFDs, Reduced Voltage Soft Starters or other electronic equipment. Device shall:

- 1) Be mounted internal to the associated panel, with dedicated overcurrent protection.
  - 2) Be of two-part (base and SPD), DIN-rail mountable construction.
  - 3) Have 15kA total nominal discharge current per line (based on 8/20 $\mu$ s waveform).
  - 4) Have maximum continuous operating voltage (MCOV) rating as required by the associated circuit voltage.
  - 5) Visually indicate operational status.
  - 6) Be Dehn DEHNguard series or equal by MTL Technologies, or may be combined with the High Frequency Noise Filtering device required above.
- b. Provide surge protection device at any connection of multi-pole AC power to panels containing programmable logic controllers, remote I/O equipment, UPS's, transmitters, radios, VFDs, Reduced Voltage Soft Starters or other electronic equipment. Device shall:
- 1) Be mounted internal to the associated panel, with dedicated overcurrent protection.
  - 2) Provide protection for all phases.
  - 3) Have 40kA (per phase) peak surge current rating.
  - 4) Have maximum continuous operating voltage (MCOV) rating as required by the associated circuit voltage.
  - 5) Visually indicate operational status.
  - 6) Be Square D SDSA or HWA series or equal.
3. Analog I/O Panel Terminations Surge Protection:
- a. Provide surge protection device at the PLC (or similar) panel connection of each analog I/O signal. Device shall:
    - 1) Be mounted internal to the associated panel.
    - 2) Be of two-part (base and SPD), DIN-rail mountable construction.
    - 3) Have 10kA total nominal discharge current per line (based on 8/20 $\mu$ s waveform).
    - 4) Have maximum continuous operating voltage (MCOV) rating as required by the associated signal.
    - 5) Be Dehn Blitzductor XT series or equal by MTL Technologies.
4. Discrete I/O Panel Terminations Surge Protection:
- a. Provide isolation relay at the PLC (or similar) panel connection of each discrete output signal (within the associated panel). See above for isolation relay requirements.
5. Low Voltage Power Supply Load Side Surge Protection:
- a. Provide surge protection device at the PLC (or similar) panel on the load side of each low voltage power supply that has low voltage connections extending external to the panel. Device shall:

- 1) Be mounted internal to the associated panel.
  - 2) Be of two-part (base and SPD), DIN-rail mountable construction.
  - 3) Have 10kA total nominal discharge current per line (based on 8/20 $\mu$ s waveform).
  - 4) Have maximum continuous operating voltage (MCOV) rating as required by the associated utilization voltage.
  - 5) Be as manufactured by Dehn, MTL Technologies, or Phoenix Contact.
6. Network Panel Terminations Surge Protection:
- a. Provide surge protection device at the PLC (or similar) panel connection of each network cable. Device shall:
    - 1) Be mounted internal to the associated panel.
    - 2) Be of DIN-rail mountable construction.
    - 3) Have 1kA total nominal discharge current per line (based on 8/20 $\mu$ s waveform).
    - 4) Be designed specifically for the associated network connection type (Ethernet, RS485, RS232, etc.).
    - 5) Be MTL Zonebarrier series or equal.
7. Antenna Cable Terminations Surge Protection:
- a. Provide surge protection device at the connection of antenna cable to the radio panel. Device shall:
    - 1) Be mounted internal to the associated panel.
    - 2) Provide coarse protection via replaceable gas-filled surge voltage arrestor
    - 3) Be Phoenix Contact COAXTRAB series or equal.
- C. Installation and grounding of suppressor: As directed by manufacturer. Provide coordination and inspection of grounding.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Provide enclosure mounting supports as required for floor, frame or wall mounting. All supports in exterior, wet or process areas shall be stainless steel unless noted otherwise. All floor-mounted panels or other similar distribution equipment shall be mounted on 6" concrete housekeeping pads unless specifically shown otherwise.
- B. All enclosures used outside shall be solid bottom unless otherwise specified. All cable and piping openings shall be sealed watertight. Cable and piping shall enter the enclosure as shown on drawings or specified herein.
- C. All equipment and components shall be solidly grounded to the control panel. One grounded terminal unit shall be provided in each control panel for connection to plant ground system. Grounding digital and analog components shall be performed in accordance with the instrument supplier's installation recommendations. Signal ground shall be solidly connected to the ground system so as to prevent ground loops

### 3.02 PAINTING

- A. For enclosures other than NEMA 4X stainless steel or fiberglass:
  - 1. Completely clean all surfaces so that they are free of corrosive residue. Then, phosphatize all surfaces for corrosion protection.
  - 2. Prime with two (2) coats and finish with one coat of factory finish textured polyurethane. Paint shall be Sherwin-Williams Polane "T" or approved equal.
  - 3. Color to be selected during shop drawing review phase.

### 3.03 IDENTIFICATION & DOCUMENTATION

- A. Refer to specification section 26 05 53 for additional requirements.
- B. Control panel power supply source, type, voltage, number or circuit ratings shall be identified inside control panels and on drawings.
- C. All interior devices and components shall be identified with thermal transfer labels with black letters on white background. Labels shall be placed on the subpanel and not the component. Marking system shall be a Brother "PTouch II" or equal. Lettering shall be 1/4" high.
- D. All front panel mounted devices such as push buttons shall be identified by the use of engraved bakelite nameplates or legend plates. Nameplates shall be 1/8" thick, white with black core.
- E. Where a panel includes a PLC or other network-connected device that is intended to be connected to another system (such as a plant SCADA system) via a network connection, the panel supplier shall provide an Interface Control Document (ICD) to the other system supplier (such as the SCADA Integrator). This document shall itemize the following for each networked parameter that is capable of being monitored or controlled by the other system:
  - 1. Parameter Name/Function (ex: Pump No. 1 On/Off Status)
  - 2. Parameter Type (discrete or analog, input or output)
  - 3. Parameter register ID/location
- F. Where a panel includes a touchscreen or other programmable HMI display and is to be monitored by another system (such as a plant SCADA system), the panel supplier shall provide copies of the HMI display code and screenshots of all proposed HMI screens to the other system supplier (such as the SCADA Integrator) for their use in duplicating the associated HMI.
- G. A job-specific, custom wiring diagram for each control panel (not including control stations without relays) shall be provided to the contractor prior to installation for making the appropriate electrical connections. The wiring diagram shall clearly show all control components connected to the panel (whether the components are mounted internal or external to the enclosure). All wires and terminal blocks shall be clearly labeled. A laminated copy of the final wiring diagram for each unit shall be installed inside the door of the associated panel, and submitted to the owner with the as-built documentation.

### 3.04 OWNER TRAINING



- A. Fully train the owner in the proper operation of all control panels/equipment, describing and demonstrating full operation, including function of each door-mounted device.

### 3.05 SPARE EQUIPMENT

- A. Provide the following spare equipment:
  - 1. Fuses: 10% (minimum of 3) of each size and type utilized, mounted within a pocket within the associated control panel.
  - 2. Where control panel contains programmable controller (or similar equipment): Flash drive containing copies of all final programs utilized within the control panel, with provisions/cable assemblies as required to connect the flash drive provided to the controller to download the programs. Flash drive shall be attached to retractable cord (long enough to reach the associated port) attached to the inside of the panel door.

END OF SECTION 26 29 00

## SECTION 26 50 00 - LIGHTING MATERIALS AND METHODS

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Lighting
- B. Ballasts/Drivers
- C. Lamps

#### 1.02 SUBMITTALS

- A. Complete submittals shall be provided identifying all lighting fixture types and options, all lamp types (where applicable) and compliance with all contract requirements. The absence of clear submittal information specifically listing exceptions/deviations from detailed contract requirements will be understood to indicate that the contractor/supplier intends to meet all contract requirements. Refer to specification section 26 05 00 for additional requirements.

### PART 2 - PRODUCTS

#### 2.01 GENERAL

- A. Lighting fixtures shall be furnished as shown on plans and specified herein. It shall specifically be the responsibility of Contractor to verify exact types ceilings, walls, etc. and recessing depth of all recessed fixtures and furnish the specific mounting trims and accessories of the specified and/or accepted fixture specifically for the ceiling, wall etc. in which each fixture is to be installed.
- B. Base bid manufacturers are listed on the lighting fixture schedule. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards, efficiency, maximum wattages and photometric distributions set by the specified product.
- C. All lighting fixtures shall be so designed and shall have ballasts, drivers and other similar items so installed as to function without interruptions or failures when operating in the environment in which they are proposed to be installed. Special attention shall be given to environments with potentially high ambient temperatures such as attic spaces, exterior soffits, confined interior soffits, coves, unconditioned spaces, etc. and shall be addressed by providing fixtures with suitable high ambient temperature ratings, remote mounting of drivers/ballasts, providing approved ventilation, etc. as directed by fixture manufacturer and approved by engineer, at contractor's expense.
- D. All fixtures installed such as to create penetrations through fire rated ceiling or wall assemblies shall be labeled as suitable for that purpose or installed with covers, tenting or other means as required to maintain the fire rating of the assembly.

#### 2.02 LED LUMINAIRES

- A. For the purpose of these specifications, LED Luminaires shall be defined as the entire LED fixture assembly including LED array, drivers, housing, electronics, etc. that compose the lighting fixture.
- B. Furnish and install LED Luminaire of proper size, type, efficacy, delivered lumen output, color temperature, distribution pattern, operational life, and CRI as shown on drawings.
- C. LED Luminaires shall be tested in accordance with LM-79 and LM-80 standards.
- D. LED drivers shall comply with NEMA 410 standards for inrush current, etc.
- E. Exterior, pole mounted LED Luminaires shall be provided with an easily-serviceable, UL recognized surge protection device that meets a minimum 10kA Category C Low operation (IECC C62.41.2-2002). Device shall be wired in front of light engine(s) and driver(s) and shall fail "open" such as to prevent fixture operation after a surge protection failure.
- F. LED Luminaires shall have a guarantee-warranty of at least five years unless specifically noted otherwise on contract documents.
- G. LED Luminaire assembly shall comply with ambient temperature requirements specified in General section above.

### 2.03 MANUFACTURER

- A. Fixtures and stems shall be manufactured as shown in fixture schedule or approved equals.
- B. Ballasts/drivers shall be as manufactured by Philips/Advance, GE, Lutron, Magnatec, Motorola, EldoLED or approved equal.
- C. Lamps shall be as manufactured by General Electric, Sylvania, Philips or approved equal.

## PART 3 - EXECUTION

### 3.01 INSTALLATION OF LIGHTING FIXTURES

- A. Support:
  - 1. Support of all lighting fixtures shall be responsibility of electrical contractor. All lighting fixture supports shall be installed in accordance with lighting fixture supplier's recommendations.
- B. Coordination:
  - 1. Contractor shall coordinate all dimensions & locations of light fixtures prior to rough-in to insure proper fit and coordination with other trades.
  - 2. Contractor shall verify exact ceiling types being installed and shall adjust fixture trim types accordingly (prior to submitting light fixture shop drawings).

END OF SECTION 26 50 00

## SECTION 27 05 00 - AUXILIARY SYSTEM CABLES, 0-50V

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Cables rated for 0V-50V application

### PART 2 - PRODUCTS

#### 2.01 GENERAL

- A. Unless specified otherwise, all cables within the scope of this specification section shall:

1. Be rated for exposed cable tray installation.
2. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).
3. Be UL-rated for the proposed application.
4. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
5. Utilize copper conductors.
6. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
7. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
8. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.

#### 2.02 INSTRUMENTATION CABLING

- A. In addition to above requirements, and unless specified otherwise, Instrumentation cabling shall:

1. Be #16awg minimum.
2. Be rated for 300V.
3. Have aluminum foil shielding.
4. Have stranded, twisted conductors.
5. Have PVC insulation/jacket with ripcord.
6. Be manufactured by Belden, AlphaWire or General Cable.

#### 2.03 CLASS 1 CONTROL CABLING (120VAC CONTROL CIRCUITS, ETC.)

- A. In addition to above requirements, and unless specified otherwise, Class 1 control cabling shall:

1. Be rated for 600V.
2. Be industrial grade.

3. Have stranded conductors.
4. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
5. Be manufactured by Belden, AlphaWire or General Cable.

#### 2.04 CLASS 2 & 3 CONTROL CABLING (FED FROM CLASS 2 OR 3 POWER SUPPLIES)

A. In addition to above requirements, and unless specified otherwise, Class 2 & 3 control cabling shall:

1. Be rated for 300V.
2. Be shielded if so recommended by the system supplier/integrator.
3. Have twisted conductors.
4. Have plenum-rated insulation/jacket with ripcord.
5. Be manufactured by AlphaWire, Belden, General Cable, Superior Essex or West Penn.

#### 2.05 NETWORK CABLING

A. Furnish and install all Ethernet, Fiber Optic and Backbone Copper Telephone cabling in accordance with all BICSI requirements and in accordance with other applicable specification sections.

### PART 3 - EXECUTION

#### 3.01 GENERAL INSTALLATION

A. Routing:

1. All wires and cables shall be installed in conduit unless specifically noted otherwise. Where conduit is not otherwise required by contract documents, 0-50V Cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:
  - a. Cabling is plenum-rated, multi-conductor.
  - b. Cabling is supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
  - c. Cabling is neatly formed, bundled and tied with plenum-rated Velcro straps on intervals not to exceed 30" on center.
  - d. Properly-sized conduit(s) are provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings, within walls or through walls).
  - e. Cabling is not a part of a Fire Alarm System, Smoke Control System, Emergency Generator Control System or other life-safety related system.
2. End bushings shall be provided on both ends of all raceway terminations.
3. No splices shall be pulled into conduit.
4. No cabling shall be pulled until conduit is cleaned of all foreign matter.

B. Penetrations:

1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.

2. For cabling not installed in conduit:
  - a. Fire/smoke barrier penetrations shall be sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.
3. For cabling installed within conduit from endpoint to endpoint:
  - a. Fire/smoke barrier penetrations shall sealed utilizing fire caulk or other equivalent firestop systems around perimeters of conduits per UL requirements.
4. For cabling installed within cable trays:
  - a. Fire/smoke barrier penetrations shall be sealed with one of the following methods:
    - 1) Continuous cable tray through the penetration, with a combination of large firestop pillows and small firestop pillows contained, supported and secured (to prevent unauthorized removal) on both sides by aluminum wire mesh and firestop putty. Firestop pillows shall be STI Series SSB or equal and Firestop putty shall be STI Spec Seal or equal.
    - 2) Cable tray broken at the penetration, with fire/smoke barrier penetrations sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.

C. Excess Cabling:

1. Excess cabling shall be neatly coiled within all junction boxes, pullboxes, wireways, etc. and at all terminations as required to allow future re-termination of cabling.

D. Terminations:

1. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See below for general termination hardware requirements.
2. Cabling shall be neatly formed, bundled and tied at all terminations.

3.02 SPLICES/CONNECTIONS/TERMINATIONS:

A. Network Cabling:

1. Network and fiber optic cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.

B. Control Cabling:

1. Connections shall be made with T & B Sta-Kon wire joints EPT66M, complete with insulating caps. To be installed with WT161 Tool or C nest of WT11M Tool, Ideal Super - Nuts (not wire nuts), Ideal Wing Nuts, or Buchanan Elec. Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators to be installed with C24 pressure tool.

C. Shielded cabling:

1. Unless directed otherwise by the system supplier, 0-50V cable shielding shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.
2. Shielded cabling shall be continuous from endpoint to endpoint and shall not be spliced without prior written approval from the Engineer.

3.03 LABELING

- A. Refer to Specification Section 26 05 53 for all labeling requirements.

END OF SECTION 27 05 00



## SECTION 31 22 20 - EXCAVATION AND BACKFILL

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Inspection
- B. Preparation
- C. Drainage
- D. Existing Structures and Utilities
- E. Sheeting, Shoring and Bracing
- F. Trench Excavation
- G. Foundation Backfill
- H. Pipe Bedding
- I. Pipe Initial Backfill
- J. General Backfill
- K. Backfill for Structures
- L. Tolerances
- M. Cleanup

#### 1.2 RELATED SECTIONS

- A. Section 31 27 00 - Slope Protection and Erosion Control
- B. Section 31 92 40 - Site Restoration

#### 1.3 REFERENCES

- A. ASTM C-33 - Concrete Aggregates.
- B. ASTM C-136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- C. ASTM D-698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. (2.49 kg.) Rammer and 12 inch (305 mm) Drop.
- D. ASTM D-1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- E. ASTM D-1557 - Test Method for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 kg.) Rammer and 18 inch (457 mm) Drop.

- F. ASTM D-2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- G. ASTM D-3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
- H. ASTM D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

#### 1.4 TESTING

- A. Tests and analysis of fill and borrow material shall be performed in accordance with ASTM D-698.
- B. Testing and analysis of backfill material for soil classification and compaction shall be performed by an approved independent commercial testing laboratory provided by the Owner, if desired. The Contractor shall coordinate testing. The cost for laboratory testing shall be borne by the Owner.
- C. Compaction testing will be performed in accordance with ASTM D-1556 or ASTM D-2292.
- D. If tests indicate Work does not meet specified requirements, the Contractor shall remove Work, replace, and retest at no cost to the Owner.

#### 1.5 SUBMITTALS

- A. Submittals shall conform to the requirements of Section 01 33 00 - Submittals.
- B. The Contractor shall submit a work plan for excavation and backfill for each structure with complete written description which identifies details of the proposed method of construction and the sequence of operations for construction relative to excavation and backfill activities. The descriptions, with supporting illustrations, shall be sufficiently detailed to demonstrate to the Engineer that the procedures meet the requirements of the Contract Documents.
- C. The Contractor shall submit a dewatering plan in accordance with the requirements of Section 31 14 00 - Dewatering.
- D. The Contractor shall submit backfill material sources and product quality information.
- E. The Contractor shall submit project record documents in accordance with the requirements of Section 01 77 00 – Closeout Procedures. The Contractor shall record location of sewers, as installed, referenced to survey benchmarks. The Contractor shall include location of utilities encountered or rerouted. The Contractor shall give horizontal dimensions, elevations, inverts, and gradients.

#### 1.6 JOB CONDITIONS

- A. All operations shall be performed, by the Contractor, in strict conformance with OSHA

and any applicable local safety requirements. Particular attention is directed to safety regulations for excavations and entering confined spaces.

- B. Test borings and other exploratory operations may be made by the Contractor at no cost to the Owner.
- C. The Contractor shall verify that survey benchmarks and intended elevations for the Work are as indicated.
- D. The Contractor shall locate existing underground utilities in areas of Work. If utilities are to remain in place, the Contractor shall provide adequate means of support and protection during earthwork operations.
- E. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, the Contractor shall consult the utility owner immediately for directions. The Contractor shall cooperate with utility companies in keeping respective services and facilities in operation. The Contractor shall repair damaged utilities to the satisfaction of utility owner.
- F. The Contractor shall not interrupt existing utilities serving facilities occupied and used by the Owner and others except when permitted in writing by the Engineer and then only after acceptable temporary, utility services have been provided.
  - 1. The Contractor shall provide a minimum of 48 hours notice to the Engineer, and receive written notice to proceed before interrupting any utility.
- G. The Contractor shall demolish and completely remove from the site existing underground utilities indicated on the Plans to be removed. The Contractor shall coordinate with utility companies for shut-off of services if lines are active. No separate payment shall be made.
- H. The Contractor shall notify the Engineer of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.
- I. It is intended that the Plans show the location of all known existing surface and subsurface structures. However, the location of many gas mains, water mains, conduits, sewers, etc., is unknown and the Owner assumes no responsibility for failure to show any or all of these structures on the Plans or to show them in their exact location. It is mutually agreed that such failure will not be considered sufficient basis for claims for extra Work or for increasing the pay quantities, unless an obstruction encountered is such as to necessitate substantial changes in the lines or grades or requires the building of special structures, provisions for which are not made in the Plans, in which case the provisions in these Specifications for Extra work shall apply.

## 1.7 MEASUREMENT AND PAYMENT

- A. Trench Excavation:
  - 1. In general the cost of excavation to perform the Work needed to install the sewer pipe as shown on the Plans shall be included in the unit price bid for various pipe, and such excavation will not be paid for separately.
- B. Structure Excavation:
  - 1. No payment will be made for excavation for structures, same being considered an

integral part of the Work.

- C. Foundation Backfill:
  - 1. Foundation backfill will be considered as an integral part of the pipeline work and no specific measurement or payment will be made.
- D. Pipe Bedding:
  - 1. Pipe bedding will be considered as an integral part of the pipeline work and no specific measurement or payment will be made.
- E. Pipe Initial Backfill:
  - 1. Pipe initial backfill will be considered as an integral part of the pipeline work and no specific measurement or payment will be made.
- F. Earth Backfill:
  - 1. No separate measurement or payment will be made for earth backfill, same being considered incidental to the work.
- G. Special Stone Aggregate Backfill:
  - 1. Special Stone Aggregate Backfill, if called for in the Plans and listed in the Bid Proposal Form, shall be paid by the cubic yard, when and where it is pre-approved by the Engineer. Where special stone aggregate backfill is called for under pavement, payment volume shall be calculated by multiplying the payline width P times the horizontal distance measured along the centerline as shown on the Plans times the depth from the surface elevation shown on the Plans to an elevation one (1) foot above the top of the sewer pipe. If special stone aggregate backfill is specified on the Plans for locations which are not under pavement then pay width will be width W for the depth and distance specified above. Payment in either case will be made under:
    - a. Special Stone Aggregate Backfill, per cubic yard.
- H. Impervious Ditch Checks
  - 1. When included as an item in the proposal, measurement for clay ditch check material will be made for the actual amount of material placed in the trench at each location. The quantity of material to be paid for will be determined by multiplying the width of the trench times the measured depth of the trench, times the measured length of the clay ditch check, converted to cubic yards, LESS the volume of the pipe (computed by multiplying the outside diameter of the pipe times the length of the clay ditch check, converted to cubic yards).
  - 2. When specifically provided for in the proposal or when indicated on the plans, payment for all work associated with the construction of clay ditch checks will be made to the Contractor on a cubic yard basis for the actual material placed in the trench and measured in place. This payment shall include all costs for procurement, testing, equipment, tools, labor, and incidentals necessary to complete the construction of the ditch checks. No special payment will be made for clay ditch checks located immediately downstream of creek crossings as shown on the Plans. Said ditch checks being considered incidental to the Work.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT

- A. The Contractor shall perform excavation with equipment suitable for achieving the requirements of these Specifications.
- B. The Contractor shall use equipment which will produce the degree of compaction specified. Backfill within 3 feet of walls shall be compacted with hand operated equipment. The Contractor shall use hand operated power compaction equipment where use of heavier equipment is impractical or restricted due to weight limitations.

## 2.2 FOUNDATION BACKFILL

- A. Foundation backfill is a term used to describe a course stone aggregate which may be used at the direction of the Engineer to stabilize the bottom of the pipe trench prior to placement of pipe bedding material.
- B. Foundation backfill shall be special stone aggregate backfill meeting the requirements of this Section or as approved by the Engineer, as specified in the Plans, or as specifically modified in the Plans or the Special Conditions.

## 2.3 PIPE BEDDING

- A. Pipe Bedding is defined as the material placed between the trench bottom or foundation backfill and the bottom of the pipe.
- B. All sanitary sewer pipes shall be bedded on special stone aggregate backfill meeting the requirements of this section, as approved by the Engineer, as specified in the Standard Drawings, or as specifically modified in the Plans or the Special Conditions. Aggregates used for pipe bedding shall be either crushed limestone or crushed dolomite. The use of slag will not be allowed.

## 2.4 PIPE INITIAL BACKFILL

- A. Pipe initial backfill is defined as material placed from the top of pipe bedding to one (1) foot above the top of the pipe.
- B. Pipe initial backfill shall be special stone aggregate backfill meeting the requirements of this section or as approved by the Engineer, as specified in the Plans, or as specifically modified in the Supplementary Conditions.

## 2.5 EARTH BACKFILL

- A. Unsuitable material: Unsuitable soil materials include the following:
  - 1. Materials that are classified as ML, CL-ML, MH, PT, OH, and OL according to ASTM D-2487.
  - 2. Materials that cannot be compacted to the required density or are otherwise unacceptable due to gradation, plasticity, or moisture content.
  - 3. Materials that contain large clods, aggregates, stone greater than 4 inches in any dimension, debris, vegetation, waste, or any other deleterious materials.
  - 4. Materials that are contaminated with hydrocarbons or other chemical contaminants.
- B. Suitable Material:

1. Suitable soil shall be free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, frozen, deleterious, or objectionable materials.
  2. Materials that are classified as GW, GP, GM, GC, SW, SP, SM, or SC according to ASTM D-2487.
  3. The decision regarding the suitability of a particular material for use as earth backfill will be at the sole discretion of the Engineer.
- C. Borrow: When insufficient fill material is available on site, the Contractor shall supply select fill materials from off-site for use in the Work at no additional cost to the Owner. Material from off-site must be suitable material as defined in the Specifications.
1. The Contractor shall identify the location of the borrow pit and provide laboratory testing showing the suitability of the borrow material.

## 2.6 SPECIAL STONE AGGREGATE BACKFILL

- A. Special stone aggregate backfill shall be crushed limestone, dolomite aggregate, or other suitable material as approved by the Engineer. The gradation shall be in accordance with ASTM C-136 #57 or as approved by the Engineer.
- B. The amount of deleterious substances in coarse aggregates shall not exceed the following limits:
- |    |  |        |
|----|--|--------|
| 1. | Soft Particles   | 5.00%  |
| 2. | Coal and Lignite   | 0.25%  |
| 3. | Coal Lumps   | 0.25%  |
| 4. | Material Passing the No. 200 Sieve   | 1.00%  |
| 5. | Thin or elongated Pieces (length greater than 5 times average thickness)                   | 10.00% |
| 6. | Other Deleterious Substances (Shale, Mica, highly absorbent particles and Marcasite, etc.) | 2.00%  |
| 7. | Total (1)-(6), excluding (5) above   | 6.00%  |
- C. Special stone aggregate backfill shall be free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, frozen, deleterious, or objectionable materials and the decision regarding the suitability of a particular material for use as special stone aggregate backfill will be at the sole discretion of the Engineer or their representative.

## 2.7 GENERAL BACKFILL

- A. Pipe trenches cut in natural soil:
1. General backfill for pipe trenches cut in natural soil shall be earth backfill placed in pipe trench from the top of the initial backfill to finished grade.
- B. Pipe trenches cut in pavement:
1. General backfill for pipe trenches cut in pavement shall be special stone aggregate backfill placed in pipe trench from the top of the initial backfill to sub-base of the pavement.
- C. Pipe trenches cut under structures:
1. General backfill for pipe trenches cut under structures shall be special stone aggregate backfill placed in pipe trench from the top of the initial backfill to sub-base of the structure.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. The Contractor shall verify that stockpiled material to be reused is acceptable to the Engineer.
- B. The Contractor shall verify that areas to be backfilled are free of debris, snow, ice, or water and surfaces are not frozen.

### 3.2 PREPARATION

- A. The Contractor shall stake, mark, or identify required lines, levels, slopes, grading, and datum.
- B. The Contractor shall compact subgrade to density as required for subsequent backfill materials.
- C. The Contractor shall cut out soft areas of subgrade not capable of insitu compaction and backfill with fill or foundation backfill as directed by the Engineer, and compact to density equal to or greater than the requirements for subsequent backfill material at the direction of the Engineer.
- D. The Contractor shall protect plant life, lawn, rock outcropping, and other features remaining as a portion of final landscaping.
- E. The Contractor shall protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.
- F. The Contractor shall protect above and below grade utilities which are to remain.

### 3.3 GENERAL

- A. For the purposed of this Section, backfill and excavation for structures shall be considered as backfill or excavation for any area immediately adjacent to, beared upon, or underneath physical structures such as buildings, utilities, retaining walls, sidewalks, pavements, etc.
- B. The Contractor shall comply with all Federal, State, and Local safety rules and regulations including those established by OSHA.
- C. The Contractor shall avoid settlement of surrounding soil due to equipment operations, excavation procedures, vibration, dewatering, or other construction methods.
- D. The Contractor shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

### 3.4 DRAINAGE

- A. Surface drainage shall be maintained at all times. Temporary diversion of surface



drainage may be permitted, if approved by the Engineer.

- B. The Contractor shall remove and dispose properly all water entering trenches and other excavations. Such excavations shall be kept dry until pipes, structures, and appurtenances to be built have been completed to such extent that they will not be floated or otherwise damaged. Dewatering shall be performed in accordance with requirements of Section 31 14 00 - Dewatering.
  - 1. The Contractor shall not allow water to accumulate in excavations. The Contractor shall provide and maintain pumps, well points, sumps, suction, discharge lines, and other components necessary to convey water away from excavations.
  - 2. The Contractor shall establish and maintain temporary drainage ditches and other diversions outside excavations to convey rain water and water removed from excavations to collecting or runoff areas. The Contractor shall not use trench excavations as temporary drainage ditches.
  
- C. Where the excavation area shown on the Plans falls under the water surface or near the banks of a flowing stream or other body of water, the Contractor may adopt and carry out any method he may deem feasible for the performance of the excavation Work and for the protection of the Work thereafter: provided the method and equipment to be used has received prior approval of the Engineer. In such cases, the excavation area shall be effectively protected from damage during the excavation period and until all contemplated construction work therein has been completed. This item shall consist of all temporary construction work necessary, including but not limited to, installing and removing sand bags, coffer dams, sheet piling, excavation and backfill, and pumping and dewatering.

### 3.5 EXISTING STRUCTURES AND UTILITIES

- A. All streets, sidewalks, and crossings are to be kept open and in a safe condition for their intended use unless written approval to close the street is obtained from authorities have jurisdiction, with a copy to the Engineer.
  - 1. Excavated material shall be removed from the street to minimize inconvenience to public traffic and to neighboring residents.
  - 2. To avoid obstruction of traffic, only materials to be installed shall be stored along the alignments.
  - 3. If at any time public traffic cannot be properly maintained when materials are stored on the street, as much materials as necessary to maintain traffic control are to be removed from the street and stockpiled. Suitable stockpiled materials are to be returned for backfilling as necessary and when appropriate.
  
- B. All fire hydrants, water valves, fire alarm boxes, and other similar public utilities are to remain accessible for their intended use. The Contractor must notify the Fire Department involved if any hydrant is made temporarily inaccessible.
  
- C. The Contractor shall conduct hauling operations so that trucks and other vehicles do not create a dirt nuisance in streets. The Contractor shall verify that truck beds are sufficiently tight and loaded in such a manner that objectionable materials will not spill onto streets. The Contractor shall promptly clear away any dirt, mud, or other materials that spill onto streets or are deposited onto streets by vehicle tires.

- D. The Contractor shall maintain permanent benchmarks, monumentation, and other reference points. Unless otherwise directed, the Contractor shall replace those which are damaged or destroyed by the Work.
- E. Upon discovery of unknown utilities, badly deteriorated utilities not designated for removal, or concealed conditions, the Contractor shall discontinue work and notify the Engineer to obtain instructions before proceeding in such areas.
- F. The Contractor shall immediately notify the agency or company owning any line which is damaged, broken, or disturbed. The Contractor shall obtain approval from the Engineer and agency for any repairs or relocations, either temporary or permanent.

### 3.6 SHEETING, SHORING, AND BRACING

- A. The Contractor shall provide sheeting, shoring, and bracing where required to safely complete the Work, to prevent excavation from extending beyond limits indicated on the Plans, and to protect the Work and adjacent structures or improvements.
- B. The sides of all excavations shall be sufficiently sheeted, shored, and braced whenever necessary to prevent slides, cave-ins, settlements, or movement of the banks and to maintain the excavation clear of obstructions that would in any way endanger the workers or hinder or delay the progress of the Work.
- C. When wood or steel sheet piling, shoring, and bracing are used, it shall be of ample design and type to have sufficient strength and rigidity to withstand the pressures exerted and to maintain the walls of the excavation properly in place and protect all persons and property from injury or damage. Where required sheet piling, shoring, or bracing shall be designed by a Professional Engineer registered in the State of Alabama.
- D. The Contractor shall prevent voids from forming outside of sheeting. The Contractor shall immediately fill voids with material approved by the Engineer.
- E. The Contractor shall immediately fill and compact voids left or caused by removal of sheeting with crushed stone conforming to the requirements of Section 31 23 10 – Crushed Stone Aggregate or material approved by the Engineer.
- F. After completion of work in the area, the Contractor shall remove sheeting, shoring, and bracing unless the Engineer has approved in writing that such temporary structures may remain. The Contractor shall remove sheeting, shoring, and bracing in such a manner to maintain safety during backfilling operations and to prevent damage to the Work and adjacent structures or improvements. Trench sheeting and bracing shall not be removed until the trench has been backfilled one (1) foot above the top of the pipe.

### 3.7 EXCAVATION FOR STRUCTURES

- A. The Contractor shall perform excavation work so that the underground structure can be installed to depths and alignments as indicated on the Plans. The Contractor shall use caution during excavation work to avoid disturbing surrounding ground and existing facilities and improvements. The Contractor shall keep excavation to the absolute minimum necessary.

- B. Excavation for manholes and other structures shall not be greater in horizontal area than that required to allow two (2) feet in the clear between the outer surface of the structure and the walls of the adjacent excavation or of the sheeting used to protect it. The bottom of the excavation shall be true to the required shape and elevations shown on the Plans. Should the Contractor excavate below the elevations shown or specified, the Contractor shall fill the void made with special stone aggregate backfill at his own expense. No earth backfilling will be permitted under structures unless specifically shown on the Plans.
- C. When muck, quicksand, soft clay, swampy, or other material unsuitable for foundations or subgrade are encountered which extend below the limits of the excavation, such material shall be removed and replaced with Foundation Backfill as specified in this Section. Foundation Backfill shall be used only at the direction of the Engineer and only on a case-by-case basis.

### 3.8 TRENCH EXCAVATION

- A. Trench excavation or excavation for pipe lines shall consist of the excavation necessary for the construction of sewers and other pipe lines and all appurtenant facilities, including manholes, inlets, outlets, concrete saddles, pipe cushion, and pipe protection as called for in the Contract Documents. It shall include clearing and grubbing, where necessary, backfilling and tamping of pipe trenches and around structures, and the disposal of waste materials, all of which shall conform to the applicable provisions set forth in these Specifications. All excavation shall be unclassified regardless of the materials encountered, whether they be earth, rock, muck, quicksand, or any other materials.
- B. Trench excavation shall be true to the lines and grades shown on the Plans or established by the Engineer.
- C. The controlling elevation for measuring depths described in these Specifications shall be the pipe invert (flow line) elevation as shown on the Plans.
- D. The banks of trenches shall be cut in vertical parallel planes equidistant from the pipe center line from a horizontal plane one foot above the top of the pipe to the bottom of the trench, with shoring, sheeting, and/or bracing as necessary to provide safe working conditions for installation of the pipe. When shoring, sheeting, and/or bracing are used, the distance between vertical planes shall be measured from the inside faces of the sheeting.
- E. The bottom of the trench shall be level in cross section and shall be cut to the depth necessary to properly place the bedding material and lay down the pipe to grade as shown in the Plans.
- F. Where concrete cradles, encasements, or pipe foundations are indicated on the Plans or required by the Engineer, the excavation shall extend to the bottom of the cradle or foundation. All overshot rock must be removed and replaced with acceptable material before placing the bedding.
- G. Bell holes for bell-and-spigot pipe shall be excavated at proper intervals so that the barrel of the pipe will rest for its entire length upon the bedding material. Bell holes shall be large enough to permit proper installation of joints in the pipe.

- H. If the Contractor excavates below the required trench bottom, the excess space shall be filled with acceptable backfill material approved by the Engineer at no additional expense to the Owner.
- I. When muck, quicksand, soft clay, swampy, or other material unsuitable for foundations or subgrade are encountered which extend below the limits of the excavation, such material shall be removed and replaced with Foundation Backfill as specified in this section. Foundation Backfill shall be used only at the direction of the Engineer and only on a case-by-case basis.
- J. Pipe trenches shall not be excavated more than 100 feet in advance of pipe laying. Temporary bridges or crosswalks shall be constructed where required to maintain vehicular or pedestrian traffic. Plans for all such temporary bridges shall be prepared by a professional engineer registered in the State of Alabama and submitted to the Engineer for approval prior to any construction.
- K. In all cases where materials are deposited along open trenches, they shall be placed so that in the event of rain, no damage shall result to the Work and/or adjacent property.
- L. Where pipe trenches are cut across or along improved streets or roadways, the Contractor shall construct a temporary surface over the cut as specified in Section 31 57 50 - Pavement Repair. The temporary surface shall not disintegrate under traffic, and shall be maintained in good condition under traffic until the temporary or permanent pavement has been constructed, or for unpaved streets until the Work has been approved by the Engineer. This pavement shall be spread and rolled to accurately conform to the grade of the existing surface.
- M. Rock encountered in trench excavations for sewers shall be removed for the overall width of trench and to a depth 8 inches below the bottom of the barrel of the pipe as shown on the Plans. The space excavated below the barrel and bell of the pipe shall be backfilled with pipe bedding, as specified in this section. All overshot rock must be removed by the Contractor before placing the bedding. If the Contractor excavates below the required trench bottom, the excess space must be filled with acceptable backfill material at no additional expense to the Owner. All of the applicable provisions of the above specifications for excavation and sheeting, shoring, and bracing shall apply to rock excavation.

### 3.9 FOUNDATION BACKFILL

- A. Foundation backfill meeting the requirements of this section shall be installed as directed by the Engineer to stabilize an unsuitable subgrade below the pipe bedding.

### 3.10 PIPE BEDDING

- A. A cushion of stone aggregate shall be provided under all sanitary sewers unless other types of construction are shown on the Plans or directed by the Engineer. Pipe bedding material shall meet the requirements of this section. The Contractor shall place the bedding specified by the Engineer with no extra payment being allowed for changes in gradation throughout the course of the Work.
- B. Pipe bedding shall be placed below the barrel of the pipe, across the full width of the

trench, to the minimum depth indicated on the Plans. Bedding shall be compacted to the exact grade for the full length of the pipe barrel and for the full width of the trench before each pipe is laid. Backfill material shall be thoroughly compacted by use of pneumatic or mechanical tamping equipment or by other approved methods. Where appropriate, sling or cable grooves shall be excavated at proper intervals to facilitate installation of pipe.

### 3.11 PIPE INITIAL BACKFILL

- A. Pipe initial backfill meeting the requirements of this section shall be placed from the top of pipe bedding to one (1) foot above the top of the pipe.
- B. Backfilling of sewer or other pipe line trenches shall be started immediately after the Work has been inspected and approved by the Engineer. Backfill material as specified in the Plans, shall be carefully deposited in 6-inch layers (before compaction) on each side of the pipe and then thoroughly and carefully tamped or rammed around the pipe with approved vibratory compactors or other power tools approved by the Engineer to a minimum compaction of 95% of Standard Proctor Density (ASTM D-698) where applicable, until enough material has been placed and compacted to provide a cover of not less than one (1) foot over the top of the pipe. Care shall be taken to ensure that material under haunches of pipe is consistently placed, leaving no voids.

### 3.12 GENERAL BACKFILL

- A. The Contractor shall backfill areas to contours and elevations with unfrozen materials. The Contractor shall not backfill over porous, wet, frozen, or soft subgrade surfaces.
- B. Backfilling of sanitary sewer pipe shall be accomplished using the specific backfill material specified in this section, the Proposal, the Supplementary Conditions, in the Plans, or as approved by the Engineer. Alternate materials for backfill may be used if approved by the Engineer. The Contractor shall not backfill trenches until tests and inspections have been made and backfilling authorized by the Engineer.
- C. All backfilling shall be done in such a manner as will not disturb or injure the pipe or structure over or against which it is being placed. Any pipe or structure injured, damaged, or moved from its proper line or grade during backfilling operations shall be replaced or repaired and then re-backfilled as specified herein, at the expense of the Contractor.
- D. If the trench extends along or across paved streets, roadways, alleys, or sidewalks, the remainder of the trench shall be backfilled with special stone aggregate backfill to its full depth in the manner specified above.
- E. For trenches that do not extend along or across paved streets, roadways, alleys, or sidewalks, backfill material from a height of one (1) foot above the top of the pipe upward, will not require tamping unless otherwise specified. Backfill material not specified to be tamped shall be as specified in this section, except that a broken stone content of not more than fifty (50) percent by volume of stones not exceeding twelve (12) inches maximum dimension, will be allowed, if thoroughly mixed with the earth.
- F. Where the excavation has been within the limits of easements across private property, the top one (1) foot of backfill materials shall consist of fine, loose earth free from large clods, vegetable matter, debris, stones, and/or other objectionable materials.

- G. Where tamping is not required for the full depth, the backfill shall be neatly rounded over the trench to a sufficient height to allow for settlement to grade after consolidation. Any deficiency in the quantity of materials for backfilling the trenches, or for filling depressions caused by settlement, shall be supplied by the Contractor at no additional cost to the Owner.
- H. The Contractor shall remove surplus backfill materials from the site.
- I. The Contractor shall leave fill material stockpile areas completely free of excess fill materials.
- J. An impervious clay ditch check shall be required on the downstream side of all stream crossings. This ditch check shall be constructed for a length of fifteen (15) feet as measured along the centerline of the pipe and for the full width and depth of the trench excavation. There will be no special compensation for this work; the cost should be included in the cost of pipe in place.

### 3.13 BACKFILL FOR STRUCTURES

- A. The Contractor shall employ placement and compaction methods that do not disturb or damage existing structures.
- B. The Contractor shall provide methods to maintain adequate moisture content of backfill materials to attain required compaction density. Moisture content of soil fill materials shall be placed at  $\pm 2$  percent of the material's optimum moisture content.
- C. The Contractor shall backfill against supported foundation walls. The Contractor shall not backfill against unsupported foundation walls.
- D. The Contractor shall backfill simultaneously on each side of unsupported foundation walls until supports are in place.
- E. The Contractor shall slope grade away from building minimum two (2) inches in ten (10) feet, unless noted otherwise.
- F. The Contractor shall make grade changes gradual and blend slope into level areas.
- G. Backfilling around structures located in paved streets shall be done in the manner specified above for pipe trenches by tamping for the full depth of cut from the bottom to the finished grade.
- H. The Contractor shall replace all surface material and shall restore paving, curbing, sidewalks, gutters, and other surfaces disturbed to a condition equal to that before the Work began, furnishing all labor and material incident thereto, as described in Section 31 57 50 - Pavement Repair.
- I. Backfill for structures shall be placed and compacted according to the following schedule:
  - 1. Pavement Sub-Base: The Contractor shall, prior to placement of aggregate base

course material at paved areas, compact subsoil to 95% of the material's standard Proctor maximum dry density as determined by ASTM D-698.

2. Structure Foundation Bedding: Fill placed in eight (8) inch loose lifts compacted to 95% of the material's modified Proctor maximum dry density as determined by ASTM D-1557.
3. Structural Foundation Backfill: Fill placed in eight (8) inch loose lifts compacted to 95% of the material's standard Proctor maximum dry density.
4. Interior Slab-on-Grade: Granular material in six (6) inch thick layer compacted to 95% of the material's standard Proctor maximum dry density. Cover with sand fill, two (2) inches thick, compacted to 95% of the material's standard Proctor maximum dry density.
5. Exterior Side of Foundation Walls, Retaining Walls, and Structure Walls: Fill placed in eight (8) inch loose lifts compacted to 95% of the material's standard Proctor maximum dry density.
6. Structural Fill under Grassed Areas: Fill placed in twelve (12) inch loose lifts compacted to 90% of the material's standard Proctor maximum dry density as determined by ASTM D-698.

### 3.14 TOLERANCES

- A. Top Surface of Backfilling: Plus or minus one inch.

### 3.15 CLEANUP

- A. After completing each section of the sewer line, the Contractor shall remove all debris and construction materials and equipment from the site of the Work; grade and smooth over the surface on both sides of the line; and leave the entire construction area in a clean, neat, and serviceable condition. The Contractor shall restore the site to the original or better condition in accordance with requirements of Section 31 92 40 - Site Restoration.

END OF SECTION 31 22 20



## SECTION 31 23 10 - CRUSHED STONE AGGREGATE

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Examination
- B. Aggregate Placement
- C. Tolerances
- D. Field Quality Control

#### 1.2 RELATED SECTIONS

- A. Section 31 22 20 - Excavation and Backfill
- B. Section 31 92 40 - Site Restoration

#### 1.3 REFERENCES

- A. AASHTO M-147: Materials for Aggregate and Soil-Aggregate
- B. ASTM C-136: Method for Sieve Analysis of Fine and Coarse Aggregates
- C. ASTM D-4318: Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- D. ASTM D-1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- E. ASTM D-4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- F. Alabama Department of Transportation Standard Specifications for Highway Construction, latest edition.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Coarse Aggregate: ALDOT #57 Angular, crushed stone, free of shale, clay, friable materials and debris, graded in accordance with ASTM C-136.
- B. Fine Aggregate: ALDOT #8910 Natural stone, free of shale, clay, friable material, sand, debris, graded in accordance with ASTM C-136.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. The Contractor shall verify that subgrade has been inspected and that gradients and elevations are correct and dry.

### 3.2 AGGREGATE PLACEMENT

- A. The Contractor shall place coarse aggregates in areas shown on the plans or directed by the Engineer.
- B. The Contractor shall place and compact coarse aggregate in accordance with Section 31 22 20 - Excavation and Backfill.
- C. The Contractor shall level and contour surfaces to elevations and gradients indicated.
- D. The Contractor shall add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. The Contractor shall compact placed aggregate materials in accordance with Section 31 22 20 - Excavation and Backfill.
- F. The Contractor shall add water to assist compaction. If excess water is apparent, the Contractor shall remove aggregate and aerate to reduce moisture content.
- G. The Contractor shall use mechanical vibrating tamping in areas inaccessible to compaction equipment.

### 3.3 TOLERANCES

- A. Flatness: Maximum variation of ¼ inch measured with ten (10) foot straight edge.
- B. Scheduled Compacted Thickness: Within ¼ inch.
- C. Variation from True Elevation: Within ½ inch.
- D. Base: Compacted to 95 percent modified proctor density as determined by ASTM D-1557.

### 3.4 FIELD QUALITY CONTROL

- A. Gradation of Aggregate: In accordance with ASTM C-136.
- B. Compaction testing will be performed in accordance with Section 31 22 20 - Excavation and Backfill.
- C. If tests indicate that Work does not meet specified requirements, the Contractor shall remove Work, replace, and retest at no additional cost to the Owner.

END OF SECTION 31 23 10

## SECTION 31 25 00 – EROSION AND SEDIMENTATION CONTROLS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Work described in this section includes providing, establishing, and maintaining temporary erosion and sediment control work items which consist of measures indicated on drawings and as necessary during the life of the contract to control erosion and sedimentation on or beyond project limits.
- B. Related Work:
  - 1. Section 31 22 20 Excavation and Backfill.

#### 1.2 QUALITY ASSURANCE

- A. Reference Standards:
  - 1. General:
    - a. Current Federal, State, and City Standards apply to this Project.
    - b. Listings: Issues listed by reference, including revisions of issuing authority, form part of this Section to extent indicated. Issues listed are identified by number, edition, date, title, or other designation established by issuing authority. Issues subsequently referred to are by an issuing authority abbreviation and a basic designation.
    - c. Modifications: Modifications by Engineer to reference Standards, if any are noted with Standard.
  - 2. Alabama Department of Transportation (ALDOT), Standard Specifications for Highway Construction, Latest Edition.
  - 3. "Alabama Nonpoint Source Management Program" published by the Alabama Department of Environmental Management, April 1989.
  - 4. Local Codes, Ordinances, Regulations.
- B. Pre-Construction Meeting: Before proceeding with site clearing operations, review site features to remain and be protected at the site with Owner and Engineer.

### PART 2 – PRODUCTS

#### 2.1 HAY BALES

- A. Bales may be either hay or straw containing five cubic feet of material and weighing not less than 35 lbs.

#### 2.2 SILT FENCE

- A. Silt fences approved by governing authorities, consist of a polymeric filter fabric mounted on posts with wire backing as shown on the drawings.

### PART 3 - EXECUTION

#### 3.1 EROSION AND SEDIMENTATION CONTROL

- A. General: The Contractor is responsible for obtaining all required permits for construction activity. The Contractor will be responsible for application and maintenance of all conditions

required by the permits. The Contractor will be responsible for all requirements of the permits until acceptance of all work under this Contract.

1. Control and abate water pollution, erosion and sedimentation at its potential source; employ downstream sediment entrapment measures as a backup to primary control at the source.
2. Take all reasonable precautions to prevent and suppress fires and other detrimental occurrence which may be caused by construction operations.
3. Protect streams and drainage systems from contamination by siltation or other harmful materials.
4. The Contractor, his employees and subcontractors must use conservation practices during the work:
  - a. Comply with all State and local laws, rules and regulations for prevention and suppressive action for forest fires and for the prevention of pollution of streams and drainage ways.
  - b. Protect and preserve soil and vegetation cover on the property and on adjacent lands. Any disturbance of soil and vegetation cover outside the project area will not be permitted under any circumstances. Special consideration will be given to the protection of adjacent areas.
  - c. Prevent and control soil erosion and gulleying within the property covered by the Contract and the lands immediately adjacent as a result of construction.
  - d. Do not deposit waste, loose soil or other materials in live streams, swales or drainage ways.
  - e. Do not allow fuels, oils, bitumen or other greasy or chemical substances originating from construction operations to enter or be placed where they may enter a live stream or drainage way. Service and repair equipment in selected areas as far as possible from streams and drainage ways.
  - f. Coordinate erosion and sedimentation control measures with the clearing and grubbing operation so both activities occur in the correct relation to one another.
  - g. Install and maintain erosion and sedimentation control measures (both temporary and permanent) as a continuing program until the site work is complete. This includes repairs, damage from storms, regular maintenance, removal and disposal of accumulated silt.
  - h. Protect downstream properties.
- B. Hay bales shall be anchored by use of stakes.
- C. Once installed, maintain silt fence until its capacity has been reached or erosion activity in the areas has been stabilized. When a silt fence has reached its capacity to function and need for a backup fence becomes evident, provide an additional line of silt fence. Repair of a damaged silt fence shall be accomplished by utilizing same type of materials used in original construction.
- D. Install and maintain erosion and sedimentation control measures as a continuing program until the site work is complete. This includes, repairs, damage from storms, regular maintenance and removal and disposal of accumulated silt.

### 3.2 MAINTENANCE

- A. Maintain erosion and sediment control features that have been installed. Maintenance of erosion and sediment control features will be considered as an incidental part of the work and no specific payment for this will be made.

END OF SECTION 31 25 00

## SECTION 31 27 00 - SLOPE PROTECTION AND EROSION CONTROL

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. General
- B. Methods of Construction
- C. Erosion Checks
- D. Maintenance of Erosion Control Features
- E. Special Slope Protection
- F. Construction Runoff Permitting

#### 1.2 RELATED SECTIONS

- A. Section 31 11 00 - Site Preparation
- B. Section 31 22 20 - Excavation and Backfill
- C. Section 31 92 40 - Site Restoration

#### 1.3 MEASUREMENT AND PAYMENT

- A. Temporary Berms: No separate measurement or payment will be made for temporary berms, same being considered incidental to the Work.
- B. Temporary Slope Drains: No separate measurement or payment will be made for temporary drains, same being considered incidental to the Work, unless a separate pay item is included in the Proposal.
- C. Sediment Structure: No separate measurement or payment will be made for sediment structure, same being considered incidental to the Work.
- D. Check Dams: No separate measurement or payment will be made for check dams, same being considered incidental to the Work.
- E. Temporary seeding and mulching: Payment for temporary seeding and mulching of right-of-way will be on a square yard basis.
- F. Brush Barriers: No separate measurement or payment will be made for brush barriers, same being considered incidental to the Work.
- G. Baled Hay or Straw Checks: Payment for baled hay or straw checks will be per bale.
- H. Temporary Silt Fences: Payment for temporary silt fences will be on a Linear Foot basis.

## PART 2 - PRODUCTS

### 2.1 TEMPORARY BERMS

- A. A temporary berm is constructed of compacted soil, with or without a shallow ditch, at the top of fill slopes or transverse to centerline on fills. These berms are used temporarily at the top of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes stabilized.

### 2.2 TEMPORARY SLOPE DRAINS

- A. A temporary slope drain is a facility consisting of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half-round pipe, metal pipe, plastic pipe, sod or other material acceptable to the Engineer that may be used to carry water down slopes to reduce erosion.

### 2.3 SEDIMENT STRUCTURES

- A. Sediment basins, ponds, and traps, are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation.

### 2.4 CHECK DAMS

- A. Check dams are barriers composed of logs and poles, large stones, or other materials placed across a natural or constructed drain way.

### 2.5 TEMPORARY SEEDING AND MULCHING

- A. Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes, including waste sites and borrow pits, shall be seeded when and where necessary to control erosion.

### 2.6 BRUSH BARRIERS

- A. Brush barriers shall consist of brush, tree trimmings, shrubs, plants, and other approved refuse from the clearing and grubbing operation.
- B. Brush barriers are placed on natural ground at the bottom of fill slopes, where the most likely erodible areas are located, to restrain sedimentation particles.

### 2.7 BALED HAY OR STRAW CHECKS

- A. Baled hay or straw erosion checks are temporary measures to control erosion and prevent siltation. Bales shall be either hay or straw, containing five (5) cubic feet or more of material.
- B. Baled hay or straw checks shall be used where the existing ground slopes toward or away from the embankment along the toe of slopes, in ditches, or other areas where siltation erosion or water run-off is a problem.

## 2.8 TEMPORARY SILT FENCES

- A. Silt fences are temporary measures utilizing woven wire or other approved material attached to posts with filter cloth composed of burlap, plastic filter fabric, etc., attached to the upstream side of the fence to retain the suspended silt particles in the run-off water.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. The Contractor shall obtain an NPDES permit in accordance with requirements of this section and in compliance with regulations established by the EPA and the ADEM.
- B. It is a condition of this Contract that the Contractor exercise planning and forethought in coordinating the Work of protecting the project and adjoining properties from soil erosion by effective and continuous erosion control methods of either a temporary or a permanent nature.
- C. Prior to construction, the Contractor shall meet with the Engineer and go over in detail the expected problem areas in regard to the erosion control work. Different solutions shall be discussed so that the best method might be determined. It is the basic responsibility of the Contractor to develop an erosion control plan acceptable to the Engineer.
- D. Before beginning work on the site, the Contractor shall submit to the Engineer, for his review and approval, a plan for control of soil erosion.
- E. The Contractor shall plan his clearing work and his entire construction operations in such a manner as to effectively control soil erosion and prevent pollution of streams, ponds, and/or drains as would result from silt or soil runoff or as would result from any materials used in the construction operations such as oil, grease, paints, chemicals, or any construction debris.
- F. The Contractor shall intercept and block drainage from the construction site by means of silt fences, silt barriers, and sedimentation pools as required.
- G. Silt fences, wherever used on the site, shall consist of hay bales securely fastened in place or of approved permeable-barrier fabric designed to filter water and retain silt. Fabric shall be set securely in the ground and firmly held in place.
- H. The erosion control work shall cover all disturbed areas within the sewer right-of-way and/or easement along which the sewer has been installed. Erosion control work shall not be limited to the easement but shall include all disturbed areas as necessary.
- I. Areas to receive riprap, or special slope protection materials, shall be graded to the lines and slopes shown on the Plans, or as directed by the Engineer. Any loose material shall be compacted by the use of hand or mechanical tampers.

### 3.2 METHODS OF CONSTRUCTION

- A. The Contractor shall use any of the acceptable methods necessary to control soil erosion and prevent the flow of sediment to the maximum extent possible. These methods shall



include, but not be limited to, the use of water diversion structures, diversion ditches, and settling basins.

- B. Construction operations shall be restricted to the areas of work indicated on the Plans and to the area which must be entered for the construction of temporary or permanent facilities. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of the wetlands and adjacent watercourses. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.
- C. Excavated soil material shall not be placed adjacent to wetlands or watercourses in a manner that will cause it to be washed away by high water or runoff. Earth berms or diversions shall be constructed to intercept and divert runoff water away from critical areas. Diversion outlets shall be stable or shall be stabilized by means acceptable to the Engineer. If for any reason construction materials are washed away during the course of construction, the Contractor shall remove those materials from the fouled areas as directed by the Engineer at no cost to the Owner.
- D. For work within easements, all materials used in construction such as excavation, backfill, roadway, and pipe bedding and equipment shall be kept within the limits of the easements.
- E. The Contractor shall not pump silt-laden water from trenches or other excavations into wetlands or adjacent watercourses. Instead, silt-laden water from excavations shall be discharged within areas surrounded by baled hay or into sediment traps to ensure that only sediment-free water is returned to the watercourses. Damage to vegetation by excessive watering or silt accumulation in the discharge area shall be avoided.
- F. Prohibited construction procedures include, but are not limited to, the following:
  - 1. Dumping of spoil material into any streams, wetlands, surface waters, or unspecified locations.
  - 2. Indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface waters.
  - 3. Pumping of silt-laden water from trenches or excavations into surface waters or wetlands.
  - 4. Damaging vegetation adjacent to or outside of the construction area limits.
  - 5. Disposal of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in wetlands, surface waters, or unspecified locations.
  - 6. Permanent or unauthorized alteration of the flow line of any stream.
  - 7. Open burning of debris at the construction work unless permitted by the Shelby County Health Department. When allowed by the Shelby County Health Department, open burning shall be performed in accordance with the requirements of Section 31 11 00 - Site Preparation.
- G. Any temporary working roadways required shall be clean fill approved by the Engineer. In the event fill is used, the Contractor shall take every precaution to prevent the fill from

mixing with native materials of the site. All such foreign fill materials shall be removed from the site following construction.

### 3.3 EROSION CHECKS

- A. The Contractor shall furnish and install baled hay or straw erosion checks in all locations as indicated on the Plans, surrounding the base of all deposits of stored excavated materials outside of the disturbed area, and where indicated by the Engineer. Checks, where indicated on the Plans, shall be installed immediately after the site is cleared and before trench excavation is begun at the locations indicated. Checks around stored material shall be located approximately six (6) feet from the material. Bales shall be held in place with two (2) inches by two (2) inches by three (3) foot wooden stakes. Each bale shall be butted tightly against the adjoining bale to preclude short circuiting of the erosion check.

### 3.4 MAINTENANCE OF EROSION CONTROL FEATURES

- A. The temporary erosion control features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the Contractor.
- B. In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of Work as scheduled, and are ordered by the Engineer, such work shall be performed by the Contractor at his own expense.
- C. Where the Work to be performed is not attributed to the Contractor's negligence, carelessness, or failure to install permanent controls and falls within the specifications for a work item that has a contract price, the units of work shall be paid for at the applicable contract prices.

### 3.5 SPECIAL SLOPE PROTECTION

- A. The Work covered by this section consists of furnishing all materials, equipment, and labor and performing all necessary operations in connection with the installation of riprap, or other special slope protection, as called for on the Plans, or as directed by the Engineer.
- B. Areas to receive riprap, or special slope protection materials, shall be graded to the lines and slopes shown on the Plans, or as directed by the Engineer. Any loose material shall be compacted by the use of hand or mechanical tampers.
- C. Just prior to placing riprap, or other slope protection material, the Contractor shall install a non-woven, plastic filter cloth as described in the Standard Drawings. The filter cloth shall be approved by the Engineer for installation, and shall then be installed in strict accordance with the manufacturer's specifications for installation and use. Only then, and with the approval of the Engineer, shall the slope protection material be installed on the filter cloth.

### 3.6 CONSTRUCTION RUNOFF PERMITTING

- A. It shall be the responsibility of the Contractor to determine if a State NPDES General Permit ALG610000 for construction site runoff is required as part of this project. Application for coverage is made by submittal of a Notice of Intent (NOI) and a permit fee to:

ADEM - Water Division  
Industrial Branch  
1400 Coliseum Blvd.  
Montgomery, Alabama 36110  
Telephone (334) 271- 7700

- B. The construction general permit requires the Contractor to use Best Management Practices (BMPs) to control storm water runoff. The general permit requires inspections on monthly basis to ensure compliance with State water quality standards. On site precipitation must also be recorded.
- C. Payment for the construction general permit and monitoring shall be considered incidental to the Work and no separate payment shall be made except for the erosion control items listed in the Bid Proposal Form.

END OF SECTION 31 27 00

## SECTION 31 92 40 - SITE RESTORATION

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Disposition of Materials and Structures Encountered in the Work
- B. Right of Way Grassing
- C. Fence Reset
- D. Cleanup
- E. Inspection and Acceptance

#### 1.2 RELATED SECTIONS

- A. Section 31 22 20 - Excavation and Backfill

#### 1.3 QUALITY ASSURANCE

- A. The Contractor shall ship site restoration materials with certificates of inspection required by authorities having jurisdiction. The Contractor shall comply with regulations applicable to site restoration materials.
- B. If specified site restoration materials are not obtainable, the Contractor shall submit proof of non-availability to the Engineer together with proposal for use of equivalent material.
- C. The Contractor shall package standard products with manufacturers' certified analysis. For other material, the Contractor shall provide analysis by recognized laboratory, in accordance with methods established by the Association of Official Agricultural Chemists, as applicable.

#### 1.4 SAFETY REQUIREMENTS

- A. Hazards Control:
  - 1. Store volatile wastes in covered metal containers, and remove from premises daily.
  - 2. Prevent accumulation of wastes that create hazardous conditions.
  - 3. Provide adequate ventilation during use of volatile or noxious substances.
- B. Conduct cleaning and disposal operations in compliance with local ordinances and environmental laws and regulations.
  - 1. Do not burn or bury rubbish and waste materials on project site without written permission from the Engineer. Burning when permitted, shall conform with requirements of Section 31 11 00 - Site Preparation.
  - 2. Do not dispose of volatile wastes such as mineral spirits, oil, or fuel in open drainage ditch or storm or sanitary drains.

#### 1.5 SUBMITTALS

- A. The Contractor shall submit certificates of inspection as required by government authorities. Submit manufacturers' or vendors' certified analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements.
- B. The Contractor shall submit typewritten instructions recommending procedures to be established by Owner for maintenance of site restoration work for one full year. Submit prior to expiration of required maintenance period(s).
- C. The Contractor shall submit seed vendors certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed for each grass seed species.
- D. The Contractor shall submit proposed planting schedules, indicating dates for each type of planting work during normal seasons for such work in area of site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.

#### 1.6 DELIVERY

- A. The Contractor shall deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

#### 1.7 JOB CONDITIONS

- A. On a continuous basis, the Contractor shall maintain premises free from accumulations of waste, debris, and rubbish caused by operations.
- B. At completion of Work, the Contractor shall remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave Project clean and ready for occupancy.
- C. The Contractor shall proceed with the complete site restoration work as rapidly as portions of site become available, working within seasonal limitations for each kind of site restoration work required. The Contractor will not be allowed to postpone cleanup and seeding until the end of the project.
- D. The Contractor shall determine location of underground utilities and perform Work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
- E. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, the Contractor shall notify Engineer before planting.
- F. The Contractor shall install materials during normal planting seasons for each type of site restoration work.
- G. The Contractor shall plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to the Engineer. If planting of trees and

shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

- H. The Contractor may, at his option, employ additional measures (other than those specified) to prevent loss of, or damage to the Work resulting from the effects of wind and/or water. No additional compensation will be made for the employment of such additional measures.

## 1.8 MEASUREMENT AND PAYMENT

- A. Top Soil: Payment will be made only for topsoil imported to the site. Payment shall be considered to include the excavation hauling, placement and finish grading of all topsoil furnished. Topsoil will only be paid for when unavailable or in insufficient quantity at the construction site as determined by the Engineer.
- B. No payment shall be made for topsoil stripped from the site.
- C. No claim for additional compensation by the Contractor will be allowed for disposition of material and structures encountered in the work.
- D. Payment for cleanup, seeding, and fertilization of the site shall be considered incidental to the Work and no separate payment shall be made.

## PART 2 - PRODUCTS

### 2.1 TOPSOIL

- A. Topsoil for site restoration may not be available at site in sufficient quantity and must be furnished as specified.
- B. New topsoil shall be fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay, lumps, brush, weeds, and other litter, and free of roots, stumps, stones, and other extraneous or toxic matter harmful to plant growth.
- C. Obtain from local sources or from areas having similar soil characteristics to that found at project site. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4". Do not obtain topsoil from bogs or marshes.

### 2.2 FERTILIZER

- A. Utilize 13,13,13 commercial grade fertilizer

### 2.3 SEED

- A. Kentucky Blue Grass
- B. Pensacola Bahia
- C. Reseeding White Clover
- D. Kentucky 31 Fescue

E. Common Lespedeza (Var. Tenn.)

F. Bermuda Grass

#### 2.4 HAY AND STRAW

A. Hay or straw material which contains an excessive quantity of matured seeds, noxious weeds, or a species which would constitute a menace to the planted species and to surrounding farm land, will not be acceptable. Mulch which is too fresh, excessively brittle, or so decomposed as to retard growth of grass will not be acceptable.

### PART 3 - EXECUTION

#### 3.1 DISPOSITION OF MATERIALS AND STRUCTURES ENCOUNTERED IN THE WORK

A. Existing materials or structures that may be encountered (within the lines, grades, or trenching sections established for completion of the Work), if unsuitable or unacceptable to the Engineer for use in the Work, and for which the disposition is not otherwise specified, shall either be disposed of by the Contractor or shall remain the property of the Owner as further provided in this section.

B. At the option of the Owner, any existing materials or structures of "value" encountered in the Work, shall remain the property of the Owner. The term "value" shall be defined by the Owner.

C. Any existing materials or structures encountered in the Work, and determined not to be of "value" by the Owner, shall be disposed of by the Contractor, in an approved manner, except as otherwise specified in Section 31 11 00 - Site Preparation.

#### 3.2 GRASSING OF DISTURBED AREAS (OUTSIDE OF ACCESS DRIVE AND FENCED AREA)

A. After the sewer is installed and backfilled and a sufficient amount of time has elapsed for backfill to settle, the disturbed area shall be machined to a smooth surface matching the adjacent or adjoining ground surfaces and the ground profile on the Plans.

B. The ground preparation before seeding shall consist of cultivation to a loose depth of approximately four (4) inches minimum and the application of lime to the soil at the rate of two (2) tons per acre. The plowing, harrowing, cultivating and all other operations shall be performed with proper equipment and in such a manner as to breakup all clods, lumps, or earth balls, and remove all boulders, stumps, large roots, or other particles which would interfere with the Work and which will result in a smooth uniform, loose well broken, and fine grained soil; thus providing a suitable bed for seed grass. The ground shall be plowed to the required depth then cultivated with a rotary tiller and or disc harrow, in both directions if feasible, until approved. In small or inaccessible areas the use of hand tools will be permitted. The Contractor shall add sufficient water to wet the soil in order to prepare the ground to be seeded. Nine hundred twenty (920) pounds of 13,13,13 commercial grade fertilizer per acre of ground shall be spread uniformly into the areas to be planted. The fertilizer shall be well pulverized and free of lumps when applied. In no case shall full strength fertilizer be permitted in direct contact with the seeds. When fertilizers are applied hydraulically they must be diluted sufficiently as directed so that no damage is done to either seed or established grasses and legumes.



C. Work area seeding mixtures shall be as follows:

<u>September through March</u>	<u>Winter</u>
Kentucky Blue Grass	6 lbs/acre
Pensacola Bahia	20 lbs/acre
Reseeding White Clover	30 lbs/acre
Kentucky 31 Fescue	20 lbs/acre

<u>April through June</u>	<u>Spring</u>
Pensacola Bahia	20 lbs/acre
Kentucky 31 Fescue	20 lbs/acre
Common Lespedeza (Var. Tenn.)	10 lbs/acre
Bermuda Grass	12 lbs/acre

<u>July and August</u>	<u>Summer</u>
Bermuda Grass	5 lbs/acre
Pensacola Bahia	20 lbs/acre
Reseeding White Clover	30 lbs/acre
Kentucky 31 Fescue	20 lbs/acre

- D. Sowing of seed shall, in general, follow promptly after incorporation of fertilizer in a uniform manner at the rates specified for each seed specie. Sowing shall be done by approved mechanical seeders. No sowing shall be done during windy weather; when the prepared surface is crusted; or when the ground is frozen, wet, or otherwise in a non-tillable condition. Unless otherwise directed, after the seed has been sown, the seed bed shall be compacted immediately by means of a cultipacker, light roller, or approved drag. Rolling or covering of seed may be omitted when seeding is done hydraulically and mulched. Straw mulch shall be applied at the rate of two and one-half (2.5) tons per acre within 48 hours after seeding has been first applied. Water necessary to satisfactorily prepare, establish, and maintain mulching placed under this section shall be classified as a part of the mulching item involved. The amount of water and when it shall be applied shall be the Contractors' responsibility until acceptance of the Project.
- E. Straw and hay mulch shall be applied with mechanical mulchspreader designed to breakup balls or clusters of mulch and apply it evenly over the surface so as to provide adequate shading from sunlight. If an asphalt adhesive is used on the mulch the mulch spreader shall be equipped and so designed to apply effectively the asphalt adhesive to the mulch and form a uniform porous and stable mulch blanket held in place by the adhesive over the designated area.
- F. The acceptance of designated seed area will be based on verification of a satisfactory stand of grass in the season for each specie required by the mix designated for use. If a satisfactory stand of grass is not established the area shall be re-seeded without additional cost to the Owner.
- G. The Contractor shall be responsible for securing a satisfactory stand of grass and legumes in accordance with these specifications.
- H. Solid sod may be used if directed by the Engineer or as specified in the Proposal. The preparation of the ground will be the same as for seeding. The sod will be placed so as to give a smooth and uniform surface that is being sodded.

- I. Fescue may be substituted for Bahia in work areas adjacent to residential lawns, as directed by the Engineer.
- J. The Contractor shall remove all stumps, fallen trees, uprooted trees, dead trees, and debris from the edge of the R.O.W.

### 3.3 FENCE RESET

- A. Should the construction of the sewer require or result in removal or damage to an existing fence, the Contractor shall replace the fence in kind to the satisfaction of the fence owner.

### 3.4 CLEANUP

- A. During site restoration work, keep pavements clean and work area in an orderly condition.
- B. Protect site restoration work and materials from damage due to site restoration operations, operations by other contractors, and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged site restoration work as directed.
- C. Throughout the progress of the Work, the Contractor shall keep the construction area, including storage areas used by him, free from accumulations of waste material or rubbish, and shall keep his materials and equipment in a neat and orderly manner. Immediately upon completion of any section of Work and before payment therefore has been made, he shall remove from the site all construction equipment, temporary structures, and debris, and shall restore the site to a neat, workmanlike condition; he shall not remove barricades and warning and direction signs until directed by the Engineer. The Contractor will not be allowed to postpone cleanup and seeding until the end of the project. Waste materials shall be disposed of at locations satisfactory to the Owner or affected regulatory agency.
- D. After completion of all work contemplated under the Contract and before final payment has been made, the Contractor shall make a final cleanup of the site of each separate part of the work; shall restore all surfaces to a neat and orderly condition; and shall remove all construction equipment, tools, and supplies.

### 3.5 INSPECTION AND ACCEPTANCE

- A. When site restoration work is completed, including maintenance, the Engineer will, upon request, make an inspection to determine acceptability.
- B. Where inspected site restoration work does not comply with the requirements, replace rejected work and continue specified maintenance until reinspected by the Engineer and found to be acceptable. Remove rejected plants and materials promptly from the project site.

END OF SECTION 31 92 40

## SECTION 33 05 13 – MANHOLES AND STRUCTURES

### PART 1 - GENERAL

#### 1.1 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Society for Testing and Materials (ASTM):
    - a. ASTM A48 - Standard Specification for Gray Iron Castings.
    - b. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
    - c. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
    - d. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
    - e. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
    - f. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Section Precast Concrete Water and Wastewater Structures.
    - g. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures.
    - h. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
    - i. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
    - j. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

#### 1.2 SECTION REQUIREMENTS

- A. Submittals:
1. Product Data: For each type of product indicated.
  2. Shop Drawings:
    - a. Precast Manholes: Details of construction.
    - b. Precast Base, Cones, and Top Slab Sections: Details of construction.
    - c. Manholes Over Existing Piping: Plans and schedule for diverting flow.
    - d. Watertight Riser Connection Brackets: Details of construction.
  3. Quality Control Submittals:
    - a. Precast Manhole Sections: Manufacturer's results of tests performed on representative sections to be furnished.
    - b. Certified load test data for precast manhole steps.
    - c. Contractor's plan for diversion of flow during installation of manhole over existing piping.

#### 1.3 FIELD CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Notify Owner no fewer than seven days in advance of proposed interruption of water service. Do not proceed with interruption of water service without Owner's written permission.

## PART 2 - PRODUCTS

### 2.1 UTILITY STRUCTURES

- A. Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, with provision for sealant joints.
1. Diameter: 48 inches minimum unless otherwise indicated.
  2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
  3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
  4. Riser Sections: 4-inch minimum thickness, and of length to provide depth indicated.
  5. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
  6. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
  7. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
    - a. "Kor-N-Seal" flexible rubber boot with stainless steel accessories as manufactured by Kor-N-Seal Co. (NPC Systems, Inc.), Milford, New Hampshire 03055.
    - b. "Z-Lok XP" or "A-LOK" flexible connectors as manufactured by A-Lok Products, Inc., Tullytown, Pennsylvania 19007.
  8. Steps: Individual FRP steps wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals.
  9. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.
  10. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER", "SANITARY SEWER", or "PROCESS DRAIN" as required.
    - a. Material: ASTM A 536, Grade 60-40-18 ductile iron or ASTM A 48, Class 35 gray iron unless otherwise indicated.
- B. Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading, with provision for sealant joints.
1. Joint Sealants: ASTM C 990, bitumen or butyl rubber.
  2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
  3. Steps: Individual FRP steps wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals.
  4. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
    - a. "Kor-N-Seal" flexible rubber boot with stainless steel accessories as manufactured by Kor-N-Seal Co. (NPC Systems, Inc.), Milford, New Hampshire 03055.
    - b. "Z-Lok XP" or "A-LOK" flexible connectors as manufactured by A-Lok Products, Inc., Tullytown, Pennsylvania 19007.

5. Include 24-by-24-inch- minimum flat grate with small square or short-slotted drainage openings. ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading.
- C. Cast-Iron Area Drains:
1. Description: ASME A112.6.3 gray-iron round body with anchor flange and round grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
  2. Top-Loading Classification(s): Medium Duty
- D. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Remove and keep all water clear from the excavation during construction and testing operations.
- B. Place imported pipe base material on undisturbed earth; thoroughly compact with a mechanical vibrating or power tamper.

### 3.2 INSTALLATION OF PRECAST MANHOLES

- A. Concrete Base:
1. Place on compacted imported base material.
  2. Properly locate, ensure firm bearing throughout, and plumb first section.
- B. Sections:
1. Thoroughly clean ends of sections to be joined.
  2. Thoroughly wet joint with water prior to placing mortar.
  3. Locate precast steps in line with each other to provide a continuous vertical ladder.
- C. Preformed Plastic Gaskets (In lieu of mortar joints):
1. Carefully inspect precast manhole sections to be joined.
  2. Do not use sections with chips or cracks in the tongue.
  3. Use only pipe primer furnished by gasket manufacturer.
  4. Install gasket material in accordance with manufacturer's instructions.
  5. Completed Manholes shall be rigid and watertight.
- D. Rubber Gasketed Joints: Install in accordance with manufacturer's instructions.
- E. Extensions:
1. Provide on manholes in streets or other locations where a subsequent change in existing grade may be likely.
  2. Install to height not exceeding 12 inches.
  3. Lay grade rings in mortar with sides plumb and tops level.
  4. Seal joints with mortar as specified for sections, and make watertight.

### 3.3 MANHOLE INVERT

- A. Construct with smooth transitions to ensure an unobstructed flow through manhole. Remove sharp edges or rough sections which tend to obstruct flow.
- B. Where full section of pipe is laid through manhole, break out top section as shown and cover exposed edge of pipe completely with mortar. Trowel mortar surfaces smooth.

### 3.4 MANHOLE FRAMES AND COVERS

- A. Set frames in bed of mortar with mortar carried over flange.
- B. Set tops of covers flush with surface of adjoining pavement or ground surface, unless otherwise shown or directed.

### 3.5 WATERTIGHT MANHOLES

- A. Install frame fasteners and riser connection brackets at locations shown on the Drawings. Submit design details of brackets to Engineer for approval.

### 3.6 MANHOLE PIPING

- A. Flexible Joints:
  - 1. Provide in all pipe not more than 1-1/2 feet from manhole walls.
  - 2. Where the last joint of pipe is between 1 1/2 and 6 feet from manhole wall, provide a flexible joint in the manhole wall.

### 3.7 MANHOLES OVER EXISTING PIPING

- A. Maintain flow through existing pipe lines at all times.
- B. Concrete Pipe: Apply a bonding agent on all surfaces to be in contact with concrete.
- C. Construct base under existing piping.
- D. Construct manhole as specified.
- E. Break out existing pipe within new manhole, cover edges with mortar, and trowel smooth.
- F. Protect new concrete and mortar work for 7 days after placing concrete.

### 3.8 CONNECTIONS TO EXISTING MANHOLES

- A. Core drill neat hole in manhole.
- B. Clean all surfaces and apply a bonding agent.
- C. Re-grout to provide smooth flow into and through manholes.
- D. Provide diversion facilities and perform work necessary to maintain flow during connection.

### 3.9 FIELD QUALITY CONTROL

#### A. Hydrostatic Testing:

1. When, in Engineer's opinion, the groundwater table is too low to permit visual detection of infiltration leaks, hydrostatically test all project manholes.
2. Procedure: Plug inlets and outlets and fill manhole with water to height determined by Engineer.
3. A manhole may be filled 24 hours prior to time of testing, if desired, to permit normal absorption into the pipe walls to take place.
4. Leakage in each sanitary sewer manhole shall not exceed 0.1 gallon per hour per foot of head above the invert.
5. Leakage is not permitted in primary sludge manhole.
6. Repair manholes that do not meet the leakage test, or do not meet specified requirements from visual inspection.

#### B. Testing Cast-In-Place Manhole Steps:

1. Test each step for a horizontal pullout load of 400 pounds with the load applied over a width of 3-1/2 inches and centered on the rung.
2. Apply the load at a uniform rate until the required test load is reached.
3. Provide suitable hydraulic jacks and gauges to perform the test.
4. Steps will be considered acceptable if they remain solidly embedded after application of the test load and if no cracking or fracture of the step nor spalling of the concrete, masonry, or mortar is evident.
5. Replace, or reset and retest, steps failing to withstand required load.

END OF SECTION 33 05 13

## SECTION 40 05 13 - COMMON WORK RESULTS FOR PROCESS PIPING

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Hangers and supports
  - 3. Process valves and operators.
  - 4. Processing piping specialties.
  - 5. Sanitary waste and vent piping.
  - 6. Mechanical identification.

#### 1.02 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
  - 1. PE: Polyethylene plastic.
  - 2. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 2. NBR: Acrylonitrile-butadiene rubber.

#### 1.03 SUBMITTALS

- A. Product Data: For all equipment and materials per the General and Special Conditions and Division 1, Section 01 33 00 SUBMITTAL PROCEDURES.
- B. Welding certificates.

#### 1.04 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."



- B. Electrical Characteristics for mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. All per Division 1, Section 01 60 00 PRODUCT REQUIREMENTS.
- B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

#### 1.06 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

#### 2.02 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 40 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

#### 2.03 JOINING MATERIALS

- A. Refer to individual Division 40 piping Sections. For all other for special joining materials shall be as listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

#### 2.04 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
  - 1. Manufacturers:
    - a. PSI – Thunderline / Link-Seal®
    - b. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Provide silicone (ASTM D 2000 MI GE505) for fire seal applications. Include type and number required for pipe material and size of pipe.
    - c. Pressure Plates: Reinforced nylon polymer. Include two for each sealing element.
    - d. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

#### 2.05 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
  - 1. Underdeck Clamp: Clamping ring with set screws.

#### 2.06 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

### PART 3 - EXECUTION

#### 3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
  - 1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations: One-piece, cast-brass type with polished chrome-plated finish.
    - e. Bare Piping at Wall and Floor Penetrations: One-piece, stamped-steel type.
    - f. Bare Piping at Ceiling Penetrations: One-piece cast-brass type with polished chrome-plated finish.
    - g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    - h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
- M. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
    - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to

extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal" for flashing.

- 1) Seal space outside of sleeve fittings with grout.
4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and weatherproof sealant. Select sleeve size to allow proper clear space between pipe and sleeve for.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Verify final equipment locations for roughing-in.
- Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.02 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 40 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

### 3.03 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.04 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

### 3.05 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 7. Use 3000-psi 28-day compressive-strength concrete and reinforcement as specified in Division 3.

### 3.06 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.

- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 40 05 13

## SECTION 40 23 50 - DUCTILE IRON PIPE AND ACCESSORIES

### PART 1 - GENERAL

#### 1.01 REQUIREMENTS

- A. It shall be the responsibility of the Contractor to furnish and install all ductile iron piping systems specified herein and as shown on the contract drawings. Each system shall be installed complete with all applicable fittings, hangers, supports, anchors, expansion joints, flexible connections, valves, wall castings, sleeves, and accessories to provide a functional system as specified.
- B. The Contractor shall be responsible for all insulation, lining and coating, piping identification, testing, cleaning, disinfecting, excavation, backfill and/or encasement specified herein or as shown on the contract drawings.
- C. The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor necessary to complete installation of ductile iron pipe as shown on the contract drawings and specified herein.

#### 1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Comply with the reference specifications of the GENERAL REQUIREMENTS.
- B. Commercial Standards

#### 1.03 CONTRACTOR SUBMITTALS

- A. The Contractor shall submit complete shop drawings for approval in accordance with Submittals of the General Requirements and as specified herein.
- B. Shop drawings shall include all ductile iron pipe, fittings, gaskets, couplers, hangers, supports, wall castings, sleeves, and all required appurtenances indicated on the contract drawings or as specified herein necessary to provide a complete, operable piping system as specified.
- C. The Contractor shall submit for review and approval complete piping lay-out drawings showing piping, fittings, couplers, hangers, supports, wall castings, sleeves, and all required appurtenances indicated on the contract drawings or as specified herein necessary to provide a complete, operable piping system as specified. Lay-out drawings shall indicate any and all interfaces with other systems being installed which may cause interference with the piping system being installed.
- D. It is the responsibility of the Contractor to coordinate all work being performed and review all shop drawings to ensure that no unnecessary interferences exist.

#### 1.04 QUALITY ASSURANCE

- A. The Contractor shall comply with Sampling, Testing, and Fabrication Inspection of the General Requirements, as required by the Resident Project Representative.
- B. All wall castings shall be shop inspected.

- C. Manufacturer shall perform Notched Charpy impact tests on at least one sample machined from the pipe wall during each hour to assure the desired toughness of the pipe.
- D. Manufacturer shall perform Hydrostatic testing on pipe in conformance with AWWA C151.
- E. Each pipe shall have clearly marked on each piece the words "DUCTILE IRON", the weight, class (nominal thickness) and the casting date.
- F. Each piece of grooved end pipe shall have the groove type (flexible or rigid) clearly marked on each end of the pipe.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturers:
  - 1. American
  - 2. US Pipe

### 2.02 GENERAL REQUIREMENTS

- A. All pipe and fittings shall be carefully examined for cracks and other defects prior to shipment. All defective pipe and fittings shall be rejected and replaced.
- B. All pipes and equipment shall be supported in accordance with the details in the Plans and requirements of these specifications.

### 2.03 DUCTILE IRON PIPE AND FITTINGS

- A. General: Ductile iron pipe shall meet AWWA and ANSI Specifications C-150, C-151 and A 21.50, A 21.51, respectively. In general, ductile iron pipe shall be furnished with push-on joints for buried applications and flanged joints for exposed, above-grade applications, unless shown otherwise on the Drawings. Restrained joint pipe shall generally be required in critical buried applications such as highway crossings, creek crossings, railroad crossings, and in other locations as identified on the Drawings. Unless indicated in the Plans to be restrained joint, buried fittings shall be mechanical joint.
- B. Thickness: Class of ductile iron pipe shall be as noted in the Plans. If not indicated minimum class shall be as follows:
  - 1. Gravity (Sewer or Stormwater) Class 350
  - 2. Pressure (Water or Sewer) Class 350 (4"-12"), Class 250 (> 12")
  - 3. Thickness shall comply with ANSI/AWWA A21.50/C150 for minimum pipe wall thickness for threaded flanges.
- C. Fittings: Cast or ductile iron fittings shall meet AWWA Specifications C-110/A21.10. Fittings, unless indicated otherwise, shall be Class 250. Coating and lining shall match piping requirements as outlined above. Flanges shall be 125 pounds, or equal to those required for connections to equipment unless specified otherwise. Ductile iron pipe with mechanical or push-on joints shall conform to the requirements of ANSI A21.11 (AWWA C111). Ductile iron pipe with flanged joints shall conform to the requirements of ANSI A21.15. Flanges



shall be ductile iron and shall conform to the properties specified for ductile iron fittings in ANSI A21.10.

- D. Bolting: Bolting shall conform to Table 10.14 of ANSI A21.10/AWWA C110 or ANSI A21.15/AWWA C115 as applicable. Bolts for use with flat ring type gaskets between gray iron flanges shall conform to the requirements of ASTM A307-84, Grade B, hex head; and nuts shall be hex type of same grade and finish as the bolts. Bolts for use with flat full face type gaskets between either gray iron flanges or ductile iron flanges shall conform to the requirements of ASTM A449-84a, Type 1 hex head; and nuts shall be hex type of same grade and finish as the bolts. Bolts shall conform to the requirements of ANSI B18.2.1, and nuts shall conform to the requirements of ANSI B18.2.2.
- E. Gaskets: Gaskets for flanged, mechanical joint restrained joint, and push-on ductile iron pipe shall meet the requirements of ANSI/AWWA Specification ANSI A21.11/AWWA C111, latest revision. Unless indicated otherwise, gasket materials for various service conditions shall be as follows:
  - 1. Water Service (up to 120 deg F) – SBR (Synthetic Rubber)
  - 2. Air and Water Service (above 120 deg F) - Neoprene
  - 3. Wastewater Service – SBR (Synthetic Rubber)
  - 4. Air Piping for Blowers - EPDM
- F. Lining: All ductile iron pipe and fittings shall be furnished with interior lining. The types of lining required for the various conditions of service are listed herein below.
  - 1. Water service (up to 140°F) - Cement lining in accordance with ANSI A21.4/AWWA C104, latest revision, standard thickness, with an asphaltic seal coat.
  - 2. Wastewater service – Ceramic epoxy (Protecto 401, or approved equal).
  - 3. Stormwater Service – Cement lining per above.
- G. Coating: All buried ductile iron pipe shall, unless indicated otherwise, be tar coated outside. Pipe and fittings to be installed in buildings, galleries, basins, other locations where such pipe and fittings will be permanently "exposed" shall have an exterior coat of rust inhibitive primer. Wall pipes, sleeves, fittings, etc., to be installed through concrete walls shall be furnished bare or with the approved primer coat applied. All ductile iron pipe provided above grade with the tar coating shall be rejected and shall be replaced at the Contractor's cost.
- H. Couplings for use with grooved end joints, only where specifically called for in the Plans, shall be ductile iron in accordance with ASTM 536, Grade 65-45-12. Gaskets shall be the center leg design manufactured of a nitrile compound. Bolts shall be track head design and manufactured in accordance with ASTM A-183, minimum tensile 110,000 psi. Couplings shall be Victaulic or equivalent.

#### 2.04 RESTRAINED JOINT DUCTILE IRON PIPE AND FITTINGS

- A. General: Where required by the Plans, restrained joint pipe and fittings shall meet specifications in the Ductile Iron Pipe and Fittings sections and shall be a boltless restrained connection to protect against separation due to thrust. Restrained joint pipe shall be flexible restrained push-on type, unless otherwise indicated.
- B. Joints shall incorporate ductile iron locking segments, inserted through slots in the bell face, providing a positive axial lock between the bell interior surface and a retainer weldment on the

spigot end of the pipe. Restrained push-on joint to be equal to American “Flex-Ring”, U.S. Pipe “TR Flex”, or Clow Superlock.

- C. Restraining or “Gripper” gaskets to be used to restrain slip joint pipe shall only be allowed when specifically called for in the Plans. Restraining gaskets shall contain stainless steel locking segments vulcanized into the gasket which shall in all other respects meet the requirements of standard push-on gaskets in ANSI/AWWA C111/A21.11. Restraining gaskets shall be UL listed for a minimum working pressure of 250 psi. Gaskets shall be equal to American Fast-Grip or U.S. Pipe Field Lok Gasket.

## 2.05 RESTRAINT FOR MECHANICAL JOINT VALVES AND FITTINGS

- A. When required in the Plans, mechanical joint restraint shall be provided for valves and fittings. Joint restraint shall be incorporated in the design of the follower gland and shall be suitable for the type pipe being installed. Flexibility of the joint shall be maintained after burial.
- B. Glands shall be manufactured of ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53, latest revision. Restraining follower glands utilizing wedging action against the face of the pipe for restraint shall incorporate torque limiting twist-off nuts to ensure proper torques of the restraining devices.
- C. Restraint devices for cast iron and ductile iron shall consist of a follower gland, which when actuated, imparts multiple wedging action against the pipe wall, increasing its resistance as the pressure increases. Unless required otherwise by the manufacturer for large diameter pipe, a standard mechanical joint gasket shall be used with the restraining follower gland. The restraint devices for cast iron and ductile iron shall have a minimum working pressure of at least 250 psi with a minimum safety factor of 2:1 and be as manufactured by EBAA Iron, Inc.; Romac Industries, Inc.; The Ford Meter Box Co.; or equal.
- D. Restraint devices for use on PVC pipe shall consist of a follower gland which shall incorporate a series of serrations or an “elongated spike” design on the inside diameter surface to provide positive restraint, exact fit, 360 deg contact and support of the pipe wall. The restraint devices for PVC pipe shall work in conjunction with a standard mechanical joint gasket and follower gland. The installed restraining device shall have a water working pressure rating equivalent to the full rated pressure of the PVC pipe on which they are installed with a minimum 2:1 safety factor in any nominal pipe size. In addition, they shall meet or exceed the requirements of Uni-B-13-94, Recommended Performance Specification for Joint Restraint Devices for Use with PVC Pipe. Notarized certification from the manufacturer of the restraint device shall be provided with submittals. The mechanical joint restraint devices for use on PVC pipe shall be as manufactured by The Ford Meter Box Co.; Romac Industries, Inc.; Smith Blair, Inc.; or equal.

## 2.06 BOSSES ON DUCTILE IRON PIPE

- A. Bosses shall be ductile iron and welded to the pipe by the pipe company in the foundry.
- B. For pipe sizes 6 inch through 12 inch in diameter, a minimum of Class 350 pipe shall be used unless the pipe manufacturer recommends a higher class pipe.

- C. For pipe sizes 14 through 54 inch in diameter, Class 51 pipe shall be used unless a higher class pipe is recommended by the pipe manufacturer.
- D. Bosses shall be drilled and tapped for proper connection in accordance with the Standard Specifications.

2.07 MECHANICAL COUPLINGS

- A. Pipe couplings shall be threaded, push-on mechanical joint, or bolted as specified herein, required for the application, or as indicated on the Drawings. Unless indicated otherwise, mechanical coupling shall be Smith-Blair, or equal, as follows:
 

1. Type	Model
2. Straight	411
3. Transition	413
4. Reducing	415
5. Insulating	416
- B. Harness bolts, where required on lines under pressure where shown on the Drawings, shall be joint restraint system as manufactured by Star National Products, or may be equivalent systems of the manufacturers.
- C. Mechanical couplings shall be carefully installed in accordance with the manufacturer's recommendations. Depending upon sleeve length, a space of at least 1/4 inch and nor more than 1 inch shall be left between the pipe ends. Pipe and coupling surfaces which contact gaskets shall be clean and free from dirt and other foreign matter during assembly. All assembly bolts shall be uniformly tightened so that the coupling is free from leaks and all parts of the coupling are square and symmetrical with the pipe.
- D. Following installation of the couplings, damage areas of shop coatings on the pipe and coupling shall be repaired to the satisfaction of the Engineer. The interior surfaces of the middle rings shall be prepared for painting in accordance with instructions of the paint manufacturer and shall then be coated with liquid epoxy in accordance with AWWA C210. The remaining components shall be cleaned and shop primed with the manufacturer's standard rust-inhibitive primer.

2.08 FLEXIBLE COUPLINGS, REDUCERS, AND FITTINGS

- A. Flexible coupling, joint, increasers, etc. where indicated on the Drawings shall be constructed with high strength fabric and elastomer reinforced with metal rings.
- B. Flanges shall be integral with the body and utilize ductile iron retaining rings. Standard flange drilling mates with 125/150# flanges. Flanges are drilled to standard ANSI dimensions and provided with ductile iron retaining rings. Control rods, gussets and compression sleeves shall be provided for all pressure applications.
- C. Flexible fittings for sewage or sludge service shall be supplied with a soft rubber arch filler to prevent the collection of solid materials in the arch. Multiple arches shall be provided as required for pipe misalignment and expansion or contraction.
- D. Concentric and electric reducer connections shall connect unequal size pipes as indicated in the Plans and confirmed through the submittal process. Joints shall be provided with arches as described above and provide sound and vibration isolation.

- E. A high strength synthetic fabric shall be used to reinforce the body.
- F. Couplings shall be as manufactured by Metraflex, Chicago, IL; Mercer Rubber Co., Hauppauge, NY; or equal.

### PART 3 - EXECUTION

#### 3.01 HANDLING

- A. Pipe, fittings and accessories shall be handled in a manner that will insure installation in sound, undamaged condition.
- B. Pipe and fittings with cement mortar or glass lining shall be handled with rubber covered hooks or other type of equipment to prevent damage to the cement lining.
- C. Bare fork lift arms, hooks, or chains shall not be inserted into open ends.
- D. Pipe and fittings in which the lining has been damaged shall be immediately removed from the job site and replaced.

#### 3.02 STORAGE

- A. All pipe and fittings shall be stored off the ground.
- B. Pipe ends shall be covered to prevent foreign matter from entering the pipe during storage.
- C. Pipe shall be stacked using suitable lumber between rows to prevent damage to pipe.
- D. Any pipe that becomes damaged or unidentifiable due to improper storage shall be rejected and immediately removed from the job site.

#### 3.03 REPAIR OF CEMENT MORTAR LINING

- A. When approved and witnessed by the Resident Project Representative, small and readily accessible damaged areas of cement mortar lining may be repaired in conformance with ANSI/AWWA C104/A21.4 and the following:
  - 1. Cut out the damaged lining to the metal, with square edges.
  - 2. Thoroughly wet the cut out area and adjoining lining.
  - 3. With the damaged area cleaned and the adjoining lining wet, spread the mortar evenly over the area to be patched.
  - 4. After the lining patch has become firm and adheres well to the surface, finish it with a wet 3" or 4" paint brush or similar soft bristle brush.
  - 5. The repaired lining shall be kept moist by tying canvas wet burlap over the ends of the pipe or fitting for 24 hours
  - 6. After the lining patch is dry and hard, the asphaltic coating shall be replaced using approved coating material.
- B. Repair mortar shall be in conformance with ANSI/AWWA C104/A21.4 and the following formula:
  - 1. Cement Mortar mix by volume:
    - a. 3 parts Portland Cement
    - b. 2 parts clean sand
    - c. Necessary clean water for 5" to 8" slump

2. Sand shall be clean, free of clay, and screened through a No. 20 screen.

### 3.04 CUTTING PIPE

- A. Cutting of pipe shall be done in a neat manner, without damage to the pipe or the lining.
- B. Cuts shall be smooth, straight, and at right angles to the pipe axis.
- C. Pipe shall be cut using a portable guillotine saw, abrasive wheel "cut-off" saw, or milling cutter only. Use of gas torches for cutting pipe will not be permitted.
- D. Field cut holes for saddles shall be with mechanical cutters. Gas torch cutting will not be permitted.
- E. After cutting, the end of the pipe shall be dressed with a file or power grinder to remove all roughness and sharp edges.
- F. All damaged or removed cement mortar lining shall be repaired in accordance with Section 3.03 of these specifications.

### 3.05 CLEANING

- A. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter prior to installation, and shall be kept clean until the work has been accepted.
- B. Before jointing, all joint contact surfaces shall be wire brushed, wiped clean, and kept clean until jointing is completed.
- C. Flange faces shall be wire brushed and cleaned to remove all oil, grease, loose primer, mill scale or any other foreign matter which could affect the proper seating of the gasket.
- D. When pipe installation is stopped, precautions shall be taken to prevent foreign material from entering the pipe.
- E. Prior to testing, the entire pipeline shall be flushed until the flushing water runs clear and clean.

### 3.06 ALIGNMENT

- A. Piping shall be installed to the lines and grades indicated on the contract drawings.
- B. Pipelines intended to be straight shall be laid straight Deflections from a straight line or grade shall not exceed the values stipulated in Table 5 of ANSI/AWWA C600, unless specially designed approved bells and spigots are provided.
- C. Batter boards, laser beam equipment, or survey shall be used in all pipe installations to maintain alignment and grade.
- D. Batter boards, if used, shall be erected at intervals not to exceed 25 feet.
- E. All pipe subgrades shall be determined and checked by survey.

- F. If laser equipment is used, periodic elevation measurements shall be made with survey equipment to verify accuracy of grade or elevation. If such measurements indicate thermal deflection of the laser due to differences between ground temperature and the air temperature within the pipe, steps shall be taken to prevent further thermal deflections.

### 3.07 LAYING PIPE

- A. Buried pipe shall be protected from lateral displacement by use of the specified pipe embedment and/or encasement.
- B. Under no circumstance shall pipe be laid in water.
- C. All pipe will be laid on native material unless otherwise indicated on the contract drawings.
- D. All pipe subgrade shall be compacted to 95% of maximum density per ASTM D698, unless otherwise indicated on the contract drawings.
- E. When pipe laying is interrupted, or stopped at the end of the work shift, the open ends of pipe shall be sealed with a watertight plug to prevent water from entering the pipe.

### 3.08 FIELD JOINTS

- A. All joints in buried locations shall be grooved-end type "flexible" joints unless otherwise indicated in these specifications or on the contract drawings.
- B. All buried ductile iron pipe joints shall be field coated with a minimum 12 mils of an approved thixotropic coal tar coating. The coating shall cover the entire joint, including fasteners.
- C. When specified or indicated on the contract drawings, bells on flush mounted wall castings and wall sleeves shall be mechanical joint type with tapped holes for tie rods or stud bolts.
- D. When specified or indicated on the contract drawings, all wall castings other than flush mounted castings and wall sleeves shall be standard mechanical joint flanged joints as indicated.

### 3.09 GROOVED END JOINTS

- A. Only where specified or indicated specifically on the contract drawings. Grooved end couplings shall be installed in accordance with AWWA C606 and the manufacturer's recommendations and instructions.
- B. Completed joints in piping above grade or within tunnels, galleries or buildings shall be rigid and shall not allow angular deflection or longitudinal movement.
- C. Completed joints in buried piping shall be flexible and shall allow limited angular deflection and longitudinal movement, in accordance with the coupling manufacturer's recommended tolerances.
- D. The outside surface of the pipe between the groove and the pipe end shall be smooth and free from deep pits or swells.
- E. All rust, loose scale, oil, grease, and dirt shall be removed prior to installation of the coupler.

- F. Following installation and before backfill or encasement, all joints in buried piping shall be thoroughly coated with a minimum of 12 mils of approved coal tar coating.
  - 1. Joints may be wrapped with a minimum of 40 mils of approved pipe tape wrap.

### 3.10 MECHANICAL JOINTS

- A. When specified or indicated on the contract drawings, mechanical joints shall be carefully assembled in accordance with ANSI/AWWA C110/A21.10 and ANSI/AWWA C111/A21.11 and the manufacturer's recommendations.
- B. If effective seating is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled.
- C. Bolts shall be uniformly tightened to the torque values listed in Appendix A of ANSI/AWWA C111/A21.11.
- D. Holes in mechanical joints with tie rods shall be carefully aligned to permit installation of the tie rods.
- E. In flange and mechanical joint pieces, holes in the mechanical joint bells and the flanges shall straddle the top (or side for vertical piping) centerline. The top centerline shall be marked on each flange and mechanical joint piece at the foundry.

### 3.11 PUSH-ON JOINTS

- A. When specified or indicated on the contract drawings, joints shall be installed in conformance with ANSI/AWWA C111.A21.11 and the pipe manufacturer's instructions and recommendations for proper jointing operations.
- B. All joint surfaces shall be properly lubricated with approved heavy vegetable soap solution immediately before the joint is completed.
- C. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean at all times.
- D. Each spigot end of the pipe shall be suitably beveled to facilitate assembly.

### 3.12 FLANGED JOINTS

- A. When specified or indicated on the contract drawings, flanges shall conform to ANSI B16.1, B16.2, and B21.10.
- B. Bolts shall be tightened gradually and at a uniform rate to facilitate uniform gasket compression.
- C. Care shall be taken when connecting to pumping equipment to insure that pipe stresses are not transmitted to the pump flanges.
- D. All flanged piping connecting to pumping equipment shall be permanently supported so that accurate matching of bolt holes and uniform contact over the entire surface of abutting pump and piping flanges are obtained before the installation of any bolts in these flanges.
- E. Pump connection piping shall be free to move parallel to its longitudinal centerline while the bolts are being tightened.

- F. Each pump shall be leveled, aligned, and placed into position, but shall not be grouted until the initial fit-up and alignment of the pipe is completed.
- G. Each pump shall be grouted before final bolting of the connecting piping.

### 3.13 FLANGED COUPLING ADAPTERS

- A. When specified or indicated on the contract drawings, flanged coupling adapters shall be installed in strict accordance with manufacturer's recommendations and instructions.

### 3.14 MECHANICAL COUPLINGS

- A. When specified or indicated on the contract drawings, mechanical couplings shall be installed in accordance with the manufacturer's recommendations and instructions.
- B. A space of at least 1/4", and not more than 1", shall be left between the pipe ends.
- C. All assembly bolts shall be uniformly tightened so that the coupling is free from leaks and all parts of the coupling are square and symmetrical with the pipe.
- D. Following installation of the coupling, damaged areas of shop coatings of the pipe and coupling shall be repaired.

### 3.15 WALL CASTINGS

- A. Unless otherwise specified or indicated on the contract drawings, wall castings shall be provided where ductile iron pipe passes through concrete walls.
- B. Where a flange and mechanical joint piece is to connect to a mechanical joint wall casting, the bolt holes in the bell of the wall casting shall straddle the top (or side for vertical piping) center line of the casting and shall align with the bolt holes in the flange and mechanical joint piece. The top center line shall be marked on the wall casting at the foundry.

### 3.16 WALL SLEEVES

- A. Wall sleeves are to be provided where ductile iron pipe passes through concrete floors and where otherwise specified or indicated on the contract drawings.
- B. Wall sleeves are to be sealed using modular casing seals ("link seals") and approved caulking on both sides of the floor penetration.

### 3.17 REDUCERS

- A. Reducers, adjacent to flowmeters and pumps or in other locations as specified or indicated on the contract drawings, shall be eccentric pattern, installed with the straight side on top so that air traps are not formed. All other reducers shall be concentric pattern.

### 3.18 OUTLETS

- A. Where a 12" or smaller branch outlet is specified or indicated on the contract drawings, and the diameter of the line pipe is at least twice the diameter of the branch, either a tee or factory welded-on boss shall be used.



- B. Connections of gauges to 6" and smaller pipe shall be made using a tee complete with blind flange drilled and tapped to accept the gauge piping specified.
- C. Connections of gauges to 8" and larger piping shall be made by means of a factory welded-on boss.
- D. Tapping saddles shall be used for "hot taps" in specified instances or as shown on the contract drawings. Use of tapping saddles must be approved in writing by the Engineer prior to use in every instance.

### 3.19 CONNECTIONS TO EXISTING PIPING

- A. Connections between new work and existing piping shall be made using fittings submitted and approved by the ENGINEER for each separate condition encountered.
- B. Each connection to existing pipe shall be made at a time and under conditions which will least impact normal plant operations, and as authorized in writing by the ENGINEER.
- C. The Contractor is responsible for making provisions for cutting of existing pipe when necessary, using approved mechanical means. Flame cutting of pipe will not be allowed.
- D. The Contractor is responsible for making provisions for dewatering existing lines and for disposal of water from the dewatering operation.
- E. Prior to construction, the Contractor shall submit for review and approval detailed procedures for pressure testing and the making of final connections to existing lines.
- F. The Contractor is responsible for disinfection and chlorination of all fresh and potable water lines after connections are made in conformance with these specifications.

### 3.20 CONCRETE ENCASEMENT

- A. Concrete pipe encasement shall be installed where indicated on the contract drawings, per the detail in the contract drawings.
- B. Concrete and reinforcement for encasement shall be Class "B" concrete.
- C. All pipe to be encased shall be suitably supported and blocked in proper position.
- D. All pipe to be encased shall be anchored to prevent floating.
- E. All pipe to be encased shall be tested as specified and the Resident Project Representative will approve the pipe installation prior to encasement.

### 3.21 REACTION ANCHORAGE

- A. All buried piping shall have thrust blocks placed at all changes of direction, tees, y-branches, valves, and at ends of pipe runs.
- B. All piping with mechanical couplings or mechanical joints subject to internal pressure shall be anchored to prevent separation of joints.

- C. When placing thrust blocks, the concrete shall extend from the pipe to solid, undisturbed earth, and all joints shall remain accessible for repair.
- D. The minimum dimensions of all concrete blocking shall be as generally indicated on the contract drawings, or as required to accommodate field conditions.
- E. If adequate support against undisturbed earth cannot be obtained, metal harness anchorages shall be provided.
  - 1. Metal harness anchorages shall consist of steel rods extending across the joint and securely anchored to the pipe.
- F. All reaction anchorage shall be installed prior to pressure testing of any pipe.
- G. Piping installed above ground in buildings, galleries, tunnels, piping trenches, and chases shall be supported and braced as indicated on the Drawings and specified herein. Where pipes are braced or supported above ground piping by means of concrete piers or thrust blocks, the concrete used by construction of such piers or thrust blocks shall be Class "B" concrete as specified in these Specifications; reinforced; and anchored to slabs and/or walls by dowels. Such concrete supports or blocks shall be finished to match adjacent concrete surfaces or finished surfaces of adjacent walls or floors, whichever is applicable.

END OF SECTION 40 23 50

## SECTION 40 23 51 - PVC PRESSURE AND GRAVITY SEWER PIPE

### PART 1 - GENERAL

#### 1.01 REQUIREMENT

- A. The CONTRACTOR shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.
- B. This Section covers furnishing and installing 4-inch to 36-inch polyvinyl chloride (PVC) pressure pipeline, complete, in place, in accordance with the requirements of the Contract Documents.

#### 1.02 RELATED SECTIONS

- A. Piping, General.
- B. Protective Coating.
- C. Earthwork.

#### 1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Comply with the reference specifications of the GENERAL REQUIREMENTS.
- B. Comply with the current provisions of the following Codes and Standards.
  - 1. Commercial Standards:
    - a. ANSI/AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe 4-in Through 12-in for Water
    - b. ASTM D2584 Test Method for Ignition Loss of Cured Reinforced Resins
    - c. PPI Technical Report TR 3/4 Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials
    - d. AWWA Manual M23 PVC Pipe - Design and Installation

#### 1.04 CONTRACTOR SUBMITTALS

- A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.
- B. Shop Drawings: The Contractor shall submit shop drawings of pipe, fittings, and appurtenances.
- C. Certifications: The Contractor shall furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section of the Specifications, as specified in the referenced standards and the following supplemental requirements:
  - 1. Hydrostatic proof test reports.
  - 2. Sustained pressure test reports.
  - 3. Burst strength test reports.
- D. All expenses incurred in making samples for certification of tests shall be borne by the Contractor.

## 1.05 QUALITY ASSURANCE

- A. Tests: Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of this Section of the Specifications, as specified in the referenced standards, as applicable.
- B. The Contractor shall perform all tests in accordance with the requirements of the Contract Documents. The Engineer shall have the right to witness all testing conducted by the Contractor.
- C. In addition to those tests specifically required, the Engineer may request additional samples of any material for testing by the Engineer. The additional samples shall be furnished at no additional cost to the Owner.

## PART 2 - PRODUCTS

### 2.01 PVC C900 AND C905 (WATER)

- A. PVC pressure pipe 4-inch through 12-inch shall conform to the applicable requirements of ANSI/AWWA C900; 14-inch through 36-inch pipe shall conform to the applicable requirements of AWWA C905; and all sizes are subject to the additional requirements specified herein. The pipe shall be of the diameter and pressure class specified or shown, shall be furnished complete with elastomeric gaskets, and all specials and fittings shall be provided as required in the Contract Documents
- B. PVC pressure pipe shall be designed in accordance with the requirements of Appendix A of ANSI/AWWA C900 and of AWWA C905, as applicable, and the supplemental requirements specified in this Section.
- C. Joints: All joints for buried PVC pipe shall be either an integral bell manufactured on the pipe or a separate coupling, both employing an elastomeric gasket. The bell and coupling shall be the same thickness as the pipe barrel, or greater thickness. The sealing ring groove in the coupling shall be of the same design as the groove in ductile iron fittings and valves.
- D. Joint Deflection: Deflection at the joint shall not exceed 1.5 degrees or the maximum deflection recommended by the manufacturer. No deflection of the joint shall be allowed for joints which are over-belled or not belled to the stop mark.
- E. Unless indicated otherwise in the plans, fittings for use with C900 and C905 PVC pipe shall be ductile iron and shall conform to the requirements of AWWA C110, Class 250. PVC pipe fittings shall be mechanical joint. All fittings shall be lined and coated in accordance with the requirements specification for Ductile Iron Pipe and Protective Coatings. Each fitting shall be clearly labeled to identify its size and pressure class.
- F. Marking requirements for every joint include:
  - 1. Nominal size and outside diameter dimension base (C.I.)
  - 2. PVC
  - 3. Dimension ratio
  - 4. AWWA pressure class
  - 5. AWWA (900) designation number
  - 6. Manufacturer's name and production code
  - 7. Date of manufacturer and production shift time
  - 8. Type of service

## 2.02 PVC SDR CLASS (PRESSURE WATER OR SEWER)

- A. The pipe shall be made from Polyvinyl Chloride plastic (PVC) as defined in ASTM Specification D-1784. The pipe shall conform to ASTM Specification D-2241 and be approved by the National Sanitation Foundation. Pipe lengths shall not exceed 40 feet. The pipe will be stored away from direct sunlight.
- B. The pipe shall have water working pressure rating of 160 psi (SDR26), 200 psi (SDR21), or 250 psi (SDR17) at 23°C per the Plans. If not indicated in the Plans, pipe shall be 200 psi (SDR21) minimum.
- C. Fittings shall be ductile iron, mechanical joint with transition gaskets suitable for use with SDR type PVC pipe.
- D. The joints shall be "push-on" or "twin gasketed coupling", meeting ASTM Standards D-3139
- E. Lubricant shall be nontoxic and have no effects on the gasket or pipe material.
- F. Gaskets shall meet ASTM F477 requirements. The gasket manufacturer's mark and year of manufacture shall be molded in the rubber. Gaskets shall be vulcanized natural or synthetic rubber. No reclaimed rubber shall be used.
- G. Pipe for pressure sewer force mains shall be provided with pigments added to the PVC for green coloring.
- H. As a minimum, the pipe shall have the following data applied to each piece every two feet:
  - 1. Nominal Size
  - 2. Type of Material
  - 3. ASTM Standards
  - 4. Manufacturer
  - 5. National Sanitation Foundation Seal of Approval
  - 6. Quality Control Code
  - 7. Working Pressure Rating
  - 8. Type of Service (Water or Sewer)
  - 9. Spigot ends shall be marked to indicate distance spigot should be extended into bell.

## 2.03 SCH 80 PVC (GENERAL SERVICE)

- A. PVC pipe and fittings shall be rigid, polyvinyl chloride pipe and fittings meeting the requirements of ASTM Specification Designations D-1784 and D-1785, Type I, Schedule 80, and Commercial Standard Specification CS 207-60, Type I, Schedule 80.
- B. Fittings shall meet the requirements of ANSI/ASTM D2464.
- C. Pipe shall be furnished with threaded joints or glue joints for connection to fittings, companion flanges, and flanged valves.
- D. Joints: Solvent socket-weld except where connection to valves and equipment may require future disassembly. Threaded joints shall not be used unless specifically called for in the plans and/or approved by ENGINEER.

- E. Flanges: One piece, molded hub type PVC flat face flange in accordance with Fittings above, 125-pound ANSI B16.1-89 drilling.
- F. Bolting: Flat Face Mating Flange or In Corrosive Areas: ASTM A193/A193M Rev A-94 Type 316 stainless steel Grade B8M hex head bolts and ASTM A194/A194M-94 Grade 8M hex head nuts. With Raised Face Mating Flange: Carbon steel ASTM A307-94 Grade B square head bolts and ASTM A563-93 Grade A heavy hex head nuts.
- G. Gaskets: Flat Face Mating Flange: Full faced 1/8" thick. Raised Face Mating Flange: Flat ring 1/8" thick, with filler gasket between OD of raised face and flange OD to protect the flange from bolting moment. Gasket material shall be suitable for each service. Submit recommended gasket material for each service to ENGINEER.
- H. Solvent Cement: As recommended by the pipe and fitting manufacturer conforming to ASTM F493 Rev A. Solvent cement shall be rated for use with each service. Provide manufacturer's certification that the solvent is appropriate for respective service.
- I. Thread Tape: Teflon

#### 2.04 CHLORINATED PVC (CPVC)

- A. Pipe: Schedule 80 CPVC: Type IV, Grade I or Class 23447-B conforming to ASTM D1784 and ASTM DF441.
- B. Threaded Nipples: Schedule 80 CPVC.
- C. Fittings: Schedule 80 CPVC as specified above: Conforming to the requirements of ASTM F439 Rev A for socket-weld type and ASTM F437 for threaded type.
- D. Joints, Flanges, Bolting, Gaskets, Cement, Tape: Per 2.2 above.

#### 2.05 PVC SDR CLASS (GRAVITY SEWER)

- A. All pipe and fittings shall be slip joint and made from polyvinyl chloride (PVC) components as described in ASTM D-1784. The sewer pipe and fittings shall meet or exceed the requirements of ASTM D-3034 (15 inch) or ASTM F679 (18 inch through 36 inch), Type PSM (15 inch) Polyvinyl Chloride Sewer Pipe and Fittings. Unless indicated otherwise in the Plans, pipe shall be minimum SDR35. Standard laying lengths shall be 13 feet.
- B. The bell shall consist of an integral wall section with joints conforming to ASTM D-3212. Gaskets shall be vulcanized and comply with ASTM F-477 for Elastomeric Seals for Joining Plastic Pipe.
- C. Each pipe shall be marked as prescribed by ASTM Standard D-3034 as follows:
  1. Pipe size
  2. Manufacturer's name and code
  3. Cell classification
  4. Standard dimension ratio (SDR)
  5. Use (sewer)
  6. ASTM standard
- D. Representative samples, when required by the Engineer, will be tested with acetone in accordance with ASTM 2152.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. All laying, jointing, testing for defects and for leakage shall be performed in the presence of the Engineer's Representative, and shall be subject to his approval before acceptance. All material found during the progress to have defects will be rejected and the Contractor shall promptly remove such defective materials from the site of the work.
- B. Installation shall conform to the requirements of AWWA M23, the Handbook of PVC Pipe Design and Construction manual, instructions furnished by the pipe manufacturer, and to the supplementary requirements or modifications in the Plans or as specified herein. Wherever the provisions of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.

### 3.02 HANDLING AND STORAGE

- A. Handling: Pipe, fittings and accessories shall be carefully inspected before and after installation and those found defective shall be rejected. Pipe and fittings shall be free from fins and burrs. Before being placed in position, pipe, fittings, and accessories shall be cleaned, and shall be maintained in a clean condition. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe, fittings or any other material be dropped or dumped into trenches.
- B. Storage: Pipe should be stored, if possible, at the job site in unit packages provided by the manufacturer. Caution should be exercised to avoid compression damage or deformation to bell ends of the pipe. Pipe should be stored in such a way as to prevent sagging or bending and protected from exposure to direct sunlight by covering with an opaque material while permitting adequate air circulation above and around the pipe. Gaskets should be stored in a cool, dark place out of the direct rays of the sun, preferably in original cartons.

### 3.03 TRENCHING AND BACKFILL

- A. Trench excavation and backfill shall conform to the requirements of the details in the Plans, the specifications for "Earthwork", and as specified herein. The minimum backfill compaction in the pipe zone shall be 90 percent of maximum density per ASTM D698.

### 3.04 INSTALLATION

- A. Bell-and-spigot pipe shall be laid with the bell end pointing in the direction of laying. Pipe shall be graded in straight lines, taking care to avoid the formation of any dips or low points. Pipe shall not be laid when the conditions of trench or weather are unsuitable. At the end of each days work, open ends of pipe shall be closed temporarily with wood blocks or bulkheads.
- B. Pipe shall be supported at its proper elevation and grade, care being taken to secure firm and uniform support. Wood support blocking will not be permitted. The full length of each section of pipe and fittings shall rest solidly on the pipe bed, with recessed excavation to accommodate bells, joints and couplings. Anchors and supports shall be provided where necessary and where indicated on the drawings for fastening work into place. Fittings shall be independently supported.

- C. Short lengths of pipe shall be used in and out of each rigid joint or rigid structure. Piping that does not allow sufficient space for proper installation of jointing material shall be replaced by one of proper dimensions. Blocking or wedging between bells and spigots will not be permitted.
- D. Joints shall be installed according to manufacturer's recommendations. Trenches shall be kept free of water until joints have been properly made. The maximum combined deflection at any coupling shall be in accordance with the manufacturer's recommendations.
- E. Pipe shall be cut by means of saws, power driven abrasive wheels or pipe cutters, which will produce a square cut. No wedge-type roller cutters will be permitted. After cutting, the end of the pipe shall be beveled using a beveling tool, portable type sander or abrasive disc.

### 3.05 INSTALLATION OF COPPER WIRE

- A. All PVC pipelines shall be provided with toner copper wire laid along the top of the pipe and held in place with ties or hitches of the same kind of wire spaced not more than 13 feet apart, or metallic locating tape laid along the centerline of the pipe trench at a depth of 18 inches below finish grade. In such case, the CONTRACTOR shall furnish manufacturer's literature, completely describing the tape proposed to be furnished.

### 3.06 WATER LINE SERVICE CONNECTIONS

- A. Service Connections: Direct tapping will not be permitted. Double strap bronze service clamps shall be used for all service connections. Service clamps shall have a bearing area of sufficient width along the axis of the pipe, so that the pipe will not be distorted when the saddle is made tight. An internal shell cutter shall be used to drill through the corporation stop to minimize PVC shavings, retain the coupon, and reduce stress. Single fluted shell cutters or twist drills are not acceptable. Lubricate the cutting and tapping edges of the tool with cutting lubricant. Make the cuts slowly and use the follower very lightly - do not force cutter through pipe wall. Shell cutter shall have sufficient throat depth to handle the heavy wall PVC pipe. Maximum outlet size permitted with service clamps or saddle is 2 inches.
- B. Tapping sleeves and valves shall be used for all outlet sizes greater than 2 inches in diameter. Tapping sleeves shall be assembled and installed in accordance with the manufacturer's recommendations.

### 3.07 CONNECTIONS TO EXISTING PIPELINES

- A. The CONTRACTOR shall locate all underground improvements and install the pipelines to the depths shown on the drawings. Where the new work is to be connected to existing pipelines, the CONTRACTOR shall make its arrangements with the serving utility well in advance of the connections, to allow adequate time for dewatering of the existing line, if necessary, and shall expedite the work to minimize water outages to the users.

### 3.08 FIELD TESTING AND DISINFECTION

- A. Field testing and disinfection of water mains shall conform to the requirements of Section "Installation, Testing, and Disinfection of Pressure Mains."

END OF SECTION 40 23 51



## SECTION 40 23 60 - PROCESS VALVES

### PART 1 - GENERAL

#### 1.01 REQUIREMENT

- A. The Contractor shall provide all tools, supplies, materials, equipment, and labor necessary for furnishing, epoxy coating, installing, adjusting, and testing of all valves and appurtenant work, complete and operable, in accordance with the requirements of the Contract Documents. Where buried valves are shown, the Contractor shall furnish and install valve boxes to grade, with covers, extensions, and position indicators.
- B. The provisions of this Section shall apply to all valves and valve operators specified in the various Sections of Division 40 of these Specifications except where otherwise specified in the Contract Documents. Valves and operators in particular locations may require a combination of units, sensors, limit switches, and controls specified in other sections of these Specifications.

#### 1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Comply with the reference specifications of the GENERAL REQUIREMENTS.
- B. Comply with the current provisions of the following Codes and Standards.
  - 1. ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
  - 2. ANSI B16.5 Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
  - 3. ANSI/ASME B1.20.1 General Purpose Pipe Threads (inch).
  - 4. ANSI/ASME B31.1 Power Piping.
  - 5. ASTM A 36 Specification for Structural Steel.
  - 6. ASTM A 48 Specification for Gray Iron Castings.
  - 7. ASTM A 126 Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  - 8. ASTM A 536 Specification for Ductile Iron Castings
  - 9. ASTM B 61 Specification for Steam or Valve Bronze Castings.
  - 10. ASTM B 62 Specification for Composition Bronze or Ounce Metal Castings.
  - 11. ASTM B 148 Specification for Aluminum-Bronze Castings.
  - 12. ASTM B 584 Specification for Copper Alloy Sand Castings or General Applications.
  - 13. ANSI/AWWA C500 Gate Valves for Water and Sewerage Systems.
  - 14. ANSI/AWWA C504 Rubber-Seated Butterfly Valves.
  - 15. ANSI/AWWA C506 Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valves Types.
  - 16. ANSI/AWWA C507 Ball Valves 6 inches through 48 inches.
  - 17. AWWA C508 Swing-Check Valves for Waterworks Service, 2 inches Through 24 inches NPS.
  - 18. ANSI/AWWA C509 Resilient-Seated Gate Valves for Water and Sewage Systems.
  - 19. AWWA C550 Protective Interior Coatings for Valves and Hydrants.
  - 20. SSPC-SP-5 White Metal Blast Cleaning.
  - 21. MSS-SP-70 Manufacturers Standardization Society of the Valve and Fitting Industry; Cast Iron Gate Valves. Flanged and Threaded Ends.

### 1.03 CONTRACTOR SUBMITTALS

- A. Submittals shall be made in accordance with GENERAL REQUIREMENTS. In addition to product information, the Contractor shall submit for approval lay-out drawings showing valve locations within the piping system, supports, and identification numbers.
- B. The following submittals and specific information shall be provided.
  - 1. Shop Drawings: Shop drawings of all valves and operators including associated wiring diagrams and electrical data, shall be furnished as specified in the General Conditions and Division 01 requirements.
  - 2. Valve Labeling: The Contractor shall submit a schedule of valves to be labeled indicating in each case the valve location and the proposed wording for the label.

### 1.04 QUALITY ASSURANCE

- A. Valve Testing: Valves shall be shop tested per manufacturer's recommendations and applicable AWWA/ANSI specifications prior to shipment. Manufacturer's certification that valves have been shop tested shall be submitted for approval 30 days prior to scheduled shipment.
- B. Bronze Parts: Unless otherwise specified, all interior bronze parts of valves shall conform to the requirements of ASTM B 62, or, where not subject to dezincification, to ASTM B 584.
- C. Shop Inspection: Shop inspection of valve construction, testing and coating shall be witnessed and approved by the Resident Project Representative. All valves will be shop inspected unless otherwise waived in writing by the Resident Project Representative.
- D. The CONTRACTOR shall demonstrate that each valve installed as a part of a piping system will operate under field conditions in a manner consistent with the design of the system. All testing of valves shall be witnessed and approved by the Resident Project Representative.

## PART 2 - PRODUCTS

### 2.01 VALVES - GENERAL

- A. General: The Contractor shall furnish all valves, operators, actuators, valve-operating units, stem extensions, and other accessories as shown or specified. All valves shall have the name of the manufacturer and the site of the valve cast on the body or bonnet or shown on a permanently attached plate in raised letters. All valves and gates shall be new and of current manufacture. All shut-off valves, 6-inch and larger, shall have operators with position indicators. Where buried, these valves shall be provided with valve boxes and covers containing position indicators, and valve extensions. Shut-off valves mounted higher than 5 feet 6 inches above working level shall be provided with chain operators.
- B. Valve Flanges: The flanges of valves shall be in accordance with Section 40 23 50 Ductile Iron Pipe.
- C. Valve Stems: Valves with motorized operators shall have stems conforming to ASTM A276 Type 316 stainless steel with minimum tensile strength of 95,000 psi, and a minimum yield point of 75,000 psi, and elongation of 25% in 2 inches. Manually operated valves shall have silicon-bronze stems conforming to ASTM B 584-875, having minimum tensile strength of

60,000 psi, a minimum yield point of 24,000 psi, and elongation of 16% in 2 inches. Where subject to dezincification, manually operated valve stems shall be of bronze conforming to ASTM B62, containing no more than 5% zinc, nor more than 2% aluminum.

- D. Protective Coating: Except where otherwise specified, ferrous surfaces, exclusive of stainless steel surfaces, in the water passages of all valves 4-inch and larger, as well as the exterior surfaces of all submerged valves, shall be coated as specified in the Painting Section of these specifications. Buried valves shall be coated per manufacturer's standard. Exposed valves shall be shop primed for finished coating in the field. Flange faces of valves shall not be coated. The valve manufacturer shall certify in the submittals that the coatings applied in the manufacturing plant prior to shipment are in accordance with these Specifications.
- E. Valve Operators: Where shown, certain valves and gates shall be furnished with electric operators, provided by the valve or gate manufacturer. All operators of a given type shall be furnished by the same manufacturer. Where these operators are supplied by different manufacturers, the Contractor shall coordinate their selection to provide uniformity of each type of electric operator. All valve operators, regardless of type, shall be installed, adjusted, and tested by the valve manufacturer at the manufacturing plant.
- F. Valve Labeling: Except for buried valves and when such requirement is waived by the ENGINEER in writing, a label shall be provided on all valves. The label shall be of stainless steel, as detailed on the Plans, as specified in the "Piping Identification Systems" section, and shall be permanently attached to the valve or on the wall adjacent to the valve.
- G. Nuts and Bolts: All nuts and bolts on valve flanges and supports shall be Type 316 stainless steel.

## 2.02 RESILIENT SEAT GATE VALVES

- A. Gate valves shall be resilient wedge type rated for 250 psi cold water, working pressure. All ferrous components shall be ductile iron. The words DI or Ductile Iron shall be cast on the valve or stamped on a permanently attached corrosion resistant metal tag.
- B. The wedge shall be ductile iron encapsulated with nitrile rubber (2"-12" sizes) or SBR rubber (14"-30"). Valves through 16 inches shall be in accordance with AWWA C-550 and C-509, latest revision. The wedge shall be symmetrical and seal equally well with flow in either direction. Valves shall have a clear, unobstructed water way when fully opened. Opening shall be at least as large as the inside diameter of the pipe on which the valve is installed. The sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction. Obtaining the compression-set of the rubber shall not require sliding on the seating surfaces and shall not be affected by pressure applied to either side of the wedge.
- C. Bolting shall develop the physical strength requirements of ASTM A307 and have regular square or hexagonal heads per ANSI B18.2.1. Use of metric size, socket head cap screws or Allen screws shall not be allowed.
- D. All gaskets shall be pressure energized O-rings. Stem shall be sealed by three O-rings. The top two O-rings shall be replaceable with the valve fully open while subject to the full rated working pressure. O-rings set in a cartridge shall not be allowed. Thrust washers shall be provided above and below the thrust collar.

- E. For buried valves, all internal and external surfaces of the valve body and bonnet shall be coated with a fusion bonded epoxy to a minimum thickness of eight mils. Coating shall be nontoxic and impart no taste or odor to the water. Coating shall comply with ANSI/AWWA C550 applied electrostatically prior to assembly. Internal surfaces of exposed gate valves shall be fusion bonded epoxy, as outlined above. External surfaces of exposed gate valves shall be primed in accordance with the painting specifications or shop primed for “brush blasting”, priming and finish coating in the field. It shall be the Contractor and valve manufacturer’s responsibility to coordinate external valve coating with the painting systems proposed and field coating operations.
- F. Unless indicated otherwise, valves 14 inches and smaller shall be installed in the vertical position. Valves 16 inches and larger shall be provided with geared operators. Unless indicated otherwise, bevel gear operators shall be provided for buried service (valve installed horizontally) and spur gearing (valve installed vertically) shall be provided in exposed locations. The Contractor shall be responsible for filling of the gear case with lubricants as recommended by the manufacturer. Operating nuts shall be constructed of ductile iron and shall have four flats at stem connection to assure even torque to the stem.
- G. Manufacturers, or Equal:
  - 1. Mueller
  - 2. American Flow Control
  - 3. Kennedy Valve

2.03 GATE VALVES (BRONZE)

- A. Gate valves less than three inches in diameter shall be bronze body, union bonnet type, with solid wedge gate and rising stem. Unless indicated otherwise, valves shall be rated for not less than 200 psi WOG with the valve shell hydrostatically tested to no less than 350 psi.
- B. Valves shall be all-bronze construction excluding the handwheel and handwheel nut. Handwheel shall be malleable iron. Handwheel nut shall be brass or bronze. All valves shall be provided with backseating to permit repacking the valve under full pressure.
- C. Unless indicated otherwise, bronze body gate valves (3" and smaller) shall be installed in copper, PVC, galvanized or alloy steel piping in exposed and buried locations. Valves shall have ends as required for threaded or flanged connections.

2.04 BUTTERFLY VALVES (AWWA)

- A. General: Butterfly valves shall conform to ANSI/AWWA C504 subject to the following requirements. Valves shall be of the size and class shown. Flanged valves shall have 125-lb American Standard flanges unless indicated to be 250-lb flanges in the Plans. Unless otherwise shown, valve may be either short-bodied or long-bodied. Wafer valves shall only be provided where indicated specifically in the plans.
- B. Valve discs shall be made from cast iron ASTM A-126 Class B for 3" through 20" sizes or ASTM A-48 Class 40 for 24" size. Sizes 30" and larger shall be ductile iron ASTM A-536 Grade 65-45-12. Ductile iron of adequate strength may be substituted for cast iron.

- C. Valve shafts shall be stainless steel conforming to ASTM A-276 Type 304. Shaft seals shall be designed for use with standard split-V type packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft.
- D. The interior passage of butterfly valves shall not deviate from the nominal diameter by more than one-inch nor shall it have any obstructions or stops.
- E. Coating: All corrosive ferrous surfaces of valves, 4-inch and larger, which will be in contact with water, exclusive of flange faces shall be epoxy-coated as specified in Section 09 90 00, "Painting and Coating."
- F. Manual Operators: Operators shall conform to ANSI/AWWA C504, subject to the following requirements. Unless otherwise shown, all manually-operated butterfly valves shall be equipped with a handwheel and 2-inch square operating nut and position indicator. Screw-type operators will not be permitted for valves 30 inches in diameter and larger.
- G. Valves, 30 inches and larger, as well as all submerged and buried valves, shall be equipped with worm-gear operators, lubricated and sealed to prevent entry of dirt or water into the operator.
- H. All valves shall be hydrostatic and leak tested. The leak test shall be performed at a differential pressure of 150 psig with the disc in a closed position. In a slightly open position, internal hydrostatic pressure equal to 300 psig shall be applied to the inside of the valve body for five minutes. Certified test results shall be made available to the Engineer.
- I. Valves rated for 250 psig service shall comply with the following details. Valves discs shall be constructed of cast iron ASTM A-40 Class 40 for 10" through 20" sizes or ductile iron ASTM A-536 Grade 65-14-12 for 6", 8", 24" through 48" sizes. Ductile iron of adequate strength may be substituted for cast iron. Valve shafts shall be stainless steel ASTM A-564 Type 630 Condition H-1150.
- J. All valves rated for 250 psig shall be hydrostatic and leak tested. The leak test shall be performed at a differential pressure of 250 psig with the disc in a closed position. In a slightly open position, internal hydrostatic pressure equal to 500 psig shall be applied to the inside of the valve body for five minutes. Certified test results shall be made available to the Engineer
- K. Manufacturers, or Equal:
  - 1. Crispin
  - 2. DeZurik
  - 3. Mueller
  - 4. Pratt
  - 5. Kennedy Valve

## 2.05 BUTTERFLY VALVES (AIR AND GAS SERVICE)

- A. General: Butterfly valves for air and gas systems shall be specifically designed for this service and meet or exceed the design, strength, performance, and testing standards of ANSI/AWWA C 504. They shall be suitable for pressures from vacuum to 125 psi, and temperatures from minus 40 degrees F to 250 degrees F.

- B. Body: The valve body shall be of cast iron conforming to ASTM A126, class B, with either wafer, lug, or flanged design, as shown in the Plans, drilled to ANSI B 16.1, class 125.
- C. Disc: The disc shall be of ductile iron to conforming ASTM A536 with an edge of monel, Type 316 stainless steel, or nickel; it shall be designed with the air-profile or other suitable shape. Sprayed or plated disc edges are not acceptable.
- D. Seat: The elastomer seat shall be in the body. It shall be field-replaceable without special tools. Except for use with petroleum-base fluids, the seat material shall be Ethylene-Propylene-Diene Monomer (EPDM), or other suitable material, to provide a tight shut-off at the above-mentioned temperatures. The elastomer thickness shall be minimum 2-inch, exclusive of backing rings, or stiffeners.
- E. Shaft: The valve shaft shall be of stainless steel, with sufficient strength to allow for the increased torque for air service.
- F. Bearings: All shaft bearings shall be of the self-lubricating corrosion resistant sleeve type.
- G. Packing: The packing shall be of the adjustable or self-adjustable type, suitable for the temperature and service conditions.
- H. Actuators: All valve actuators shall be in accordance with Section 40 23 61 "Valve Operators and Actuators." They shall be sized for air service applications with the torque condition after 3 years of service. Manual actuators shall allow for positive throttling and locking in any position from open to closed.
- I. Testing: All valves shall be factory leak tested in accordance with ANSI/AWWA C 504.
- J. Manufacturers, or Equal:
  - 1. DeZurik
  - 2. Keystone Valve - USA

## 2.06 PLUG VALVES

- A. Plug valves for sludge water and wastewater service shall be eccentric type, either non-lubricated or permanently lubricated.
- B. Valves shall have bodies of semi-steel, or of cast iron ASTM A126D, Class B or of ductile iron ANSI/ASTM A536, Grade 65-45-12. Discs or plugs shall be semi-steel or ductile iron ANSI/ASTM A536, Grade 65-45-12 and all bushings, bearings and journals shall be corrosion resistant. All wetted surfaces shall be made corrosion resistant by application of nylon or epoxy coatings, fusion bonded.
- C. Valves shall be rated at not less than 150 psi working pressure, bi-directional. Valves shall operate from fully closed position to fully open position with 90 degree turn, shall have full port openings of not less than 82 percent of connecting pipe area, and shall be equipped with position-indicating quadrants, pointers, adjustable stops and locks.
- D. Valve ends shall be flanged ANSI B16.1 Class 125, except when installed underground. Valves for underground service shall be equipped with mechanical joint ends. Valves shall be similar and equal to manufacture.

- E. Manufacturers, or Equal:
  - 1. DeZurik
  - 2. Dresser
  - 3. Kennedy Valve

## 2.07 SWING CHECK VALVE

- A. Swing style check valve shall be fully opening (100% of pipe diameter), test rated for 250 psi and shall comply with all applicable parts of ANSI / AWWA C508.
- B. Flange fitting shall comply with ANSI B16.1 Class 125.
- C. Swing check valve shall be lever and weight operated with adjustable position weight and lever arm attached to the disc assembly for variable closure force.
- D. All materials of construction shall conform to ASTM specifications as follows:
  - 1. Body – Cast Iron ASTM A126 Gr. B
  - 2. Disc – Cast Iron ASTM A126 Gr. B
  - 3. Hinge Plug – Brass ANSI B21
  - 4. Body Seat Ring – Bronze ANSI B62
  - 5. Interior and Exterior paint – See Section 09 99 00
- E. Manufacturers, or approved equal:
  - 1. Mueller
  - 2. American
  - 3. Dezurik
  - 4. Kennedy Valve

## 2.08 KNIFE GATE VALVES

- A. Knife Gate Valves shall be bonnetless, wafer type gate valves made with a cast iron body in sizes 3" through 24" or a fabricated steel body in sizes 30" and up. Port areas shall be 100% of the full pipe area throughout the entire length
- B. Flange fitting shall comply with ANSI B16.1 Class 125.
- C. The gate will be of sufficient thickness to provide against permanent deformation at 1.2 times the rated working pressure. The gate shall be ASTM A240 T-316 Stainless Steel. The stem shall be ASTM A276 T-304 Stainless Steel and shall have single pitch acme threads.
- D. Manufacturers, or approved equal:
  - 1. Red Valve Co. Flexgate FG
  - 2. DeZURIK KGN-RSB

## PART 3 - EXECUTION

### 3.01 VALVE INSTALLATION

- A. General: All valves, gates, operating units, stem extensions, valve boxes, and accessories shall be provided and installed in accordance with the specifications for "Valve Operators and

Actuators” and the manufacturer's written instructions as approved through the submittal process. Valves shall be firmly supported to avoid undue stresses on the pipe.

- B. Access: All valves shall be installed to provide easy access for operation, removal, and maintenance and to avoid conflicts between valve operators and structural members or handrails.
- C. Valve Accessories: Where combinations of valves, sensors, switches, and controls are specified, it shall be the responsibility of the CONTRACTOR to properly assemble and install these various items so that all systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on shop drawing submittals.
- D. All valves shall be field tested following installation to demonstrate that the valve operates under field conditions in a manner consistent with the design of the system.
- E. All testing of valves shall be witnessed and approved by the Field Representative.
- F. It shall be the Contractor’s responsibility to make such variations in depths of cut as necessary to secure proper bury of the valves. Proper bury shall ensure nut operators, with extensions when necessary, are between 18 inches and 48 inches from finished grade. The Contractor will not be permitted to make sudden or local grade changes to accomplish proper bury.
- G. Valves installed underground shall be equipped with geared operator of traveling-nut type, sealed, gasketed and lubricated. The encased operators shall be designed for satisfactory operation under hydrostatic head of 10 psi. High-head extension boxes and extension stems for valves shall be provided for all underground valve installations. Tops of extension stems shall be equipped with operating nuts, and bottom sockets of extension stems shall be pinned and tack welded to operating nuts of valves.
- H. Valves located in piping trenches shall be provided with extension socket wrenches of proper length so that the handle is 30 inches above the grating or floor. Openings in gratings shall be framed with 1/8 inch bar stock of same material as grating and of same depth as grating, and circular stem collars (split type) shall frame the openings. Collars shall have flanged bases for attachment (bolted) to grating and collar height shall be not less than two inches so as to maintain the extension stem in vertical position.
- I. All valves installed at heights greater than 6 feet-6 inches above finished floor, without regard to size of valve, shall be equipped with worm-and-gear operators and chain wheels complete with chains of proper lengths. All worm-and-gear operators shall be enclosed in oil-tight and dust-proof cases.

END OF SECTION 40 23 60



## SECTION 40 23 61 - VALVE OPERATORS AND ACTUATORS

### PART 1 - GENERAL

#### 1.01 REQUIREMENT

- A. Unless otherwise shown, all shut off and throttling valves shall be provided with manual or power operators. The Contractor shall furnish and install the following valve operators, complete and operable, including all controls, motors, gears, etc., as shown and as specified herein, in accordance with the requirements of the Contract Documents.

#### 1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Comply with the reference specifications of the GENERAL REQUIREMENTS.

#### 1.03 CONTRACTOR SUBMITTALS

- A. Submittals shall be made in accordance with the GENERAL REQUIREMENTS.

#### 1.04 QUALITY ASSURANCE

- A. For all pneumatic, hydraulic, and electric motor operators, it shall be the responsibility of the CONTRACTOR to provide a qualified representative of the valve manufacturer to perform all field adjustments to set operator limit switches for the required functions. The cost of providing a qualified representative of the valve manufacturer for field adjustments shall be included in the CONTRACTOR'S bid. All wiring of motor operators shall be identified with a unique number unlike any other wiring identification. It is the responsibility of the Contractor to coordinate the requirements of this section with those involving both electrical and instrumentation specifications.
- B. All adjustments, calibration, and/or testing shall be done in the presence of the Engineer's representative.

### PART 2 - PRODUCTS

#### 2.01 ELECTRIC MOTOR OPERATORS (AC REVERSING CONTROL TYPE)

- A. Equipment Requirements: Where electric motor operators are shown, an electric motor-operated valve control unit shall be attached to the valve operating mechanism housing by means of a flanged motor adaptor piece.
- B. Gearing: The motor operator shall include the motor, reduction gearing, reversing starter, torque switches, and limit switches in a weatherproof NEMA IV assembly. The operator shall be a double reduction unit consisting of spur or helical gears and worm gearing. The spur or helical gears shall be of hardened alloy steel and the worm gear shall be alloy bronze. All gearing shall be accurately cut with hobbing machines. All power gearing shall be grease or oil lubricated, in a sealed housing. Ball or roller bearings shall be used throughout. Operator output speed changes shall be mechanically possible by simply removing the motor and changing the exposed or helical gearset ratio without further disassembly of the electric operator.

- C. Starting Device: The unit shall be so designed that a hammer blow is imparted to the stem nut when opening a closed valve or closing an open valve. The device should allow free movement at the stem nut before imparting the hammer blow. The operator motor must attain full speed before stem load is encountered.
- D. Switches and Wiring: Travel in the opening and closing directions shall be governed by a switch responsive to mechanical torque developed in seating the valve, or by an obstruction met in opening or closing the valve. The torque switch shall be adjustable and shall function without auxiliary relays or devices. The geared limit switches shall be of the open type and shall be actuated by a rotor cam with 4 contacts to each cam or gear train. The operator shall have a number of gear trains as required to produce the operation shown. The operator shall be wired in accordance with the schematic diagram and all wiring for external connections shall be connected to marked terminals. One 1-inch and one 1-1/4-inch conduit connection shall be provided in the enclosing case.
- E. Handwheel Operation: A permanently-attached handwheel shall be provided for emergency manual operation. The handwheel shall not rotate during electrical operation. A calibration tag shall be mounted near each switch correlating the dial setting to the unit output torque. Microswitch elements or devices relying on coil springs shall not be used in the torque switches. Position limit switches and associated gearing shall be an integral part of the valve operator. To provide the best possible accuracy and repeatability, limit switch gearing shall be of the "counting" intermittent type, made of stainless steel, grease lubricated, and enclosed in its own gearcase to prevent dirt and foreign matter from entering the gear train. Switches shall not be subject to breakage or slippage due to over travel. Traveling nuts, cams, or microswitch tripping mechanisms shall not be used. Limit switches shall be of the heavy duty open contact type with rotary wiping action. The maximum torque required on the handwheel under the most adverse conditions specified herein shall not exceed 60 ft-lb, and the maximum force required on the rim of the handwheel shall not exceed 60 lb. An arrow and either the word "open" or "close" shall be cast on the handwheel to indicate the direction to turn said handwheel.
- F. Motor: The motor shall be of the totally-enclosed, non-ventilated, high-starting torque, low-starting current type for full voltage starting. It shall be suitable for operation on 480-volt, 3-phase, 60-Hz current, and have Class B insulation, and a motor frame with all dimensions in accordance with the latest revised NEMA Standards. The observed temperature rise by thermometer shall not exceed 55 degrees C above an ambient temperature of 40 degrees C when operating continuously for 15 minutes under full rated load. With a line voltage of not more than 10 percent above or 10 percent below the rated voltage, the motor shall develop full rated torque continuously for 15 minutes without causing the thermal contact protective devices, imbedded in the motor windings to trip or the starter overloads to drop out. All bearings shall be of the ball type and thrust bearings shall be provided where necessary. All bearings shall be provided with suitable seals to confine the lubricant and prevent the entrance of dirt and dust. Motor conduit connections shall be watertight. Motor construction shall incorporate the use of stator and rotor as independent components from the valve operation such that the failure of either item shall not require operator disassembly or gearing replacement. The motor shall be furnished with a space heater suitable for operation on 120-volt single-phase circuit.
- G. Starter: There shall be furnished and installed in the integral weatherproof housing on the valve, unless otherwise shown, a suitably sized amperage rated reversing starter with its coils rated for operation on 120-volt, 1-phase, 60-Hz current. A control power transformer shall be

included to provide a 120-volt source. The starter shall be equipped with 3 overload relays of the automatic reset type. Its control circuit shall be wired as shown. The controls compartment shall contain a suitably sized 120-volt ac single-phased space heater to prevent moisture condensation on electrical components.

- H. Operator Appurtenances: The operator for each valve shall be supplied with a 3/2 light push button station with mechanical or electrical lockout device. The pushbutton station is intended to be integral to the actuator enclosure unless directed otherwise. Where the pushbutton station enclosure is separate, it shall also be rated for NEMA IV environments, and the contractor shall provide all interconnection circuitry (using material types required by Electrical Specifications) as required between the actuator and the pushbutton station.
- I. The actuator shall be furnished with dry contacts to indicate the following parameters:
  - 1. Fully Open Status
  - 2. Fully Closed Status
  - 3. HOA (or LOR) Switch Position Status
  - 4. Alarm Status
- J. The actuator shall be furnished with provisions to monitor the following separate remote dry contacts for control of the actuator when the actuator's HOA (or LOR) switch is in the "Auto" (or "Remote") position:
  - 1. Control Open
  - 2. Control Close
- K. Manufacturers, or Equal:
  - 1. Limitorque Corp.
  - 2. Auma, Corp.
  - 3. Rotork Corp.

## 2.02 ELECTRIC MOTOR OPERATORS (AC MODULATING CONTROL TYPE)

- A. General: Where shown, modulating electric motor operators shall be the ac modulating type complete with a local control station with open/close/auto/hold functions.
- B. Control Module: Control module shall be of the electronic solid state type ac with proportional pulse output to control the speed of an ac valve operator motor.
- C. Starter: The operator shall control a solid state reversing starter designed for minimum susceptibility to power line surges and spikes. The solid state starter and control module shall be rated for continuous modulating applications. Power supply shall be 480-volt, 3-phase, 60-Hz.
- D. Construction: Control unit shall be microprocessor based and shall contain analog/digital converter, separate input-output switches, non-volatile random access memory for storage of calibration parameters and push button calibration elements for field setup. Control unit shall be configured to adjust the actuator position based on 4-20mA signal input (when the actuator's HOA (or LOR) switch is in the "Auto" (or "Remote") position). Potentiometer adjustments shall contain a PID control function internally. In addition the controller shall contain as standard feature a loss of command signal protection selectable to lock in last or lock in preset valve position and a valve position output signal in 4-20 mA.

- E. The actuator shall be furnished with dry contacts to indicate the following parameters:
  - 1. Fully Open Status
  - 2. Fully Closed Status
  - 3. HOA (or LOR) Switch Position Status
  - 4. Alarm Status
  
- F. Manufacturers, or Equal:
  - 1. Limitorque Corp.
  - 2. Auma, Corp.
  - 3. Rotork Corp.

### 2.03 MANUAL OPERATORS

- A. All manual operators shall have levers or handwheels, unless otherwise shown. Where buried, the valves shall have extensions with square nuts or floor stands. Manual valves mounted higher than 5 feet-6 inches above floor or operating level shall have chain operators. Unless otherwise shown in the Plans or specified elsewhere, valves of sizes 14-inch and larger shall have gear-assisted operators.
  
- B. Unless otherwise required by the Owner, the direction of rotation of the wheel or wrench nut to open each valve shall be to the left (counterclockwise). Each valve body or actuator shall have cast thereon the work "Open" and an arrow indicating the direction to open.
  
- C. The housing of traveling-nut type actuators shall be fitted with a removable cover which shall permit inspection and maintenance of the operating mechanism without removing the actuator from the valve.
  
- D. Travel limiting devices shall be provided inside the actuator for the open and closed positions. Travel limiting stop nuts or collars installed on the reach rod of traveling-nut type operating mechanisms shall be field adjustable and shall be locked in position by means of a removable roll pin, cotter pin, or other positive locking device. The use of stop nuts or adjustable shaft collars which rely on clamping force or set screws to prevent rotation of the nut or collar on the reach rod will not be acceptable.
  
- E. The valve and actuator shall be designed so that shaft seal leakage cannot enter the actuator housing.
  
- F. Handwheel diameters shall be at least 8 inches but not more than 24 inches for 30 inch or smaller valves and not more than 30 inches for 36 inch and larger valves.
  
- G. Each chainwheel operated valve shall be equipped with a chain guide which will permit rapid handling of the operating chain without "gagging" of the wheel and will also permit reasonable side pull on the chain. Suitable actuator extensions shall be provided, if necessary, to prevent interference of the chain with adjacent piping or equipment. Operating chains shall be hot-dip galvanized carbon steel and shall be looped to extend to within 3 feet of the floor below the valve.
  
- H. Floor stand valve operators shall be provided where indicated in the Plans. Stands shall be of high strength cast iron with extension stems as specified elsewhere. Stands shall be handwheel operated with brass name plates for indicating valve service. Stands shall be the non-rising

stem type with a special yoke attachment and indicator for valve position. Stands shall be Clow Model F5505 NRS or equal.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Valve operators are to be installed where specified and designated on the contract drawings. The Contractor is responsible for installation of the correct valve operator as specified to provide a complete piping system as specified.
- B. Performance Testing: The contractor shall demonstrate that each valve operator installed as a part of a piping system will operate under field conditions as designed and in the manner for which the operator was specified. All testing will be witnessed and approved by the Engineer.

END OF SECTION 40 23 61

## SECTION 40 23 65 - PIPING SUPPORTS

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. This Section includes the following hangers and supports for mechanical system piping and equipment:
  - 1. Steel pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Metal framing systems.
  - 4. Thermal-hanger shield inserts.
  - 5. Fastener systems.
  - 6. Pipe positioning systems.
  - 7. Equipment supports.

#### 1.02 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

#### 1.03 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes, capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Design seismic-restraint hangers and supports for piping and equipment.

#### 1.04 SUBMITTALS

- A. Product Data: For the following:
  - 1. Steel pipe hangers and supports.
  - 2. Thermal-hanger shield inserts.
  - 3. Pipe positioning systems.
- B. Shop Drawings:
  - 1. Show fabrication and installation details and include calculations for the following:
    - a. Trapeze pipe hangers. Include Product Data for components.
    - b. Metal framing systems. Include Product Data for components.
    - c. Equipment supports.
  - 2. Drawings of piping support system, locating each support, brace, hanger, guide, component and anchor. Identify support, hanger, guide, and anchor type by catalog number and Shop Drawing detail number.
  - 3. Revisions to support systems resulting from changes in related piping system layout or addition of flexible joints.

- C. Welding certificates.
- D. Contract Closeout Submittals: Maintenance information on piping support system.

1.05 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel and ASME Boiler and Pressure Vessel Code: Section IX.
- B. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel."
  - 2. AWS D1.2, "Structural Welding Code--Aluminum."
  - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
  - 4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
  - 5. ASME Boiler and Pressure Vessel Code: Section IX.

1.06 DESIGN REQUIREMENTS

- A. General:
  - 1. Contractor shall be responsible for the design, size, and location of process piping support systems in accordance with the requirements specified herein and in general conformance with the Drawings and the Design Details. The design shall be provided by a company specifically specializing in the design of support systems. The pipe support system design company shall demonstrate that they have at least five years of experience in pipe support design and have successfully completed at least three designs in the previous year. The Contractor shall provide Certification of Compliance with these requirements.
  - 2. Piping smaller than 30": Supports are shown only where specific types and locations are required; additional pipe supports may be required.
  - 3. Piping 30" and larger: Support systems have been designed for piping shown.
  - 4. Meet requirements of MSS SP 58, MSS SP 69, and MSS SP 89.

- B. Pipe Support Systems:
  - 1. Support Load: Dead loads imposed by weight of pipes filled with water, except air and gas pipes, plus insulation and capable of supporting combined weight of supported systems, system contents, and test water.
  - 2. Safety Factor: Minimum of 5.
  - 3. Maximum Support Spacing and Minimum Rod Size:

a. Steel or Ductile Iron Piping:		
Pipe Size	Maximum Support/ Hanger Spacing	Minimum Rod Size Single Rod Hangers
1-inch & smaller	6 feet	1/4-inch
1.5-inch – 2.5-inch	8 feet	1/4-inch
3-inch & 4-inch	10 feet	3/8-inch
6-inch	12 feet	3/8-inch
8-inch	12 feet	1/2-inch
10-inch & 12-inch	14 feet	5/8-inch
14-inch	16 feet	3/4-inch
16-inch & 18-inch	16 feet	7/8-inch

- b. Copper Piping:

- 1) Maximum Support Spacing: 2 feet less per size than listed for steel pipe, with 1" and smaller pipe supported every 5 feet.
- 2) Minimum Hanger Rod Sizing: Same as listed for steel pipe.
- c. Plastic and Fiberglass Piping:
  - 1) Maximum support spacing: As recommended by manufacturer for flow temperature in pipe and to prevent visible sagging.
  - 2) Minimum Hanger Rod Sizing: Same as listed for steel pipe.

d. Stainless Steel Piping:

SST Pipe Size	Maximum Support/ Hanger Spacing	Minimum Rod Size Single Rod Hangers
1-inch – 4-inch	8 feet	1/4-inch
6-inch	8 feet	3/8-inch
8-inch & 10-inch	10 feet	1/2-inch
12-inch	10 feet	1/2-inch
14-inch & 16-inch	12 feet	5/8-inch
18-inch & 20-inch	14 feet	3/4-inch
24-inch	14 feet	7/8-inch

- C. Framing Support System:
  - 1. Beams: Size such that beam stress does not exceed 25,000 psi and maximum deflection does not exceed 1/240 of span.
  - 2. Column Members: Size in accordance with Manufacturer's recommended method.
  - 3. Support Loads: Calculate using weight of pipes filled with water.
  - 4. Maximum Spans:
    - a. Steel and Ductile Iron Pipe, 3" Diameter and Larger: 10-foot centers, unless otherwise shown.
    - b. Other Pipelines and Special Situations: May require supplementary hangers and supports.
  - 5. Electrical Conduit Support: Include in design of framing support system.
- D. Anchoring Devices: Design, size, and space support anchoring devices, including anchor bolts, inserts, and other devices used to anchor support, to withstand shear and pullout loads imposed by loading and spacing on each particular support.
- E. Vertical Sway Bracing: 10-foot maximum centers, or as shown.
- F. Existing Support Systems: Use existing supports systems to support new piping only if Contractor can show that they are adequate for additional load, or if they are strengthened to support the additional load.

PART 2 - PRODUCTS

2.01 GENERAL

- A. When specified items are not available, fabricate pipe supports of correct material and to general configuration indicated by catalogs.
- B. Special support and hanger details are shown for cases where standard catalog supports are inapplicable.
- C. Materials:



1. Wetted and Submerged: Stainless steel.
2. Atmospheric Exposed: Galvanized or painted steel in accordance with Section 09 90 00, PAINTING AND COATING.
3. Corrosive Areas: Stainless steel (includes all wet well valve vaults)

## 2.02 MANUFACTURERS

- A. The following requirements apply to product selection:
  1. Available Manufacturers: Subject to compliance with requirements, Manufacturers offering products that may be incorporated into the Work include, but are not limited to, Manufacturers specified.

## 2.03 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
  1. B-Line Systems, Inc.; a division of Cooper Industries.
  2. Empire Industries, Inc.
  3. ERICO/Michigan Hanger Co.
  4. Globe Pipe Hanger Products, Inc.
  5. Grinnell Corp.
  6. GS Metals Corp.
  7. National Pipe Hanger Corporation.
- C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

## 2.04 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

## 2.05 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
  1. B-Line Systems, Inc.; a division of Cooper Industries.
  2. Power-Strut Div.; Tyco International, Ltd.
  3. Thomas & Betts Corporation.
  4. Tolco Inc.
  5. Unistrut Corp.; Tyco International, Ltd.
- C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

## 2.06 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
  - 1. Carpenter & Paterson, Inc.
  - 2. ERICO/Michigan Hanger Co.
  - 3. PHS Industries, Inc.
  - 4. Pipe Shields, Inc.
  - 5. Rilco Manufacturing Company, Inc.
  - 6. Value Engineered Products, Inc.
- C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.
- E. Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. Clevis or Band Hangers: Insert and shield shall cover lower 180° of pipe.
- G. Insert Length: Extend 2” beyond sheet metal shield for piping operating below ambient air temperature.

## 2.07 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Manufacturers:
  - 1. Hilti, Inc.
  - 2. ITW Ramset/Red Head.
  - 3. Masterset Fastening Systems, Inc.
  - 4. MKT Fastening, LLC.
  - 5. Powers Fasteners.
- C. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- D. Manufacturers:
  - 1. B-Line Systems, Inc.; a division of Cooper Industries.
  - 2. Empire Industries, Inc.
  - 3. Hilti, Inc.
  - 4. ITW Ramset/Red Head.

5. MKT Fastening, LLC.
6. Powers Fasteners.

## 2.08 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.
- B. Manufacturers:
  1. C & S Mfg. Corp.
  2. HOLDRITE Corp.; Hubbard Enterprises.
  3. Samco Stamping, Inc.

## 2.09 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

## 2.10 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
  1. Properties: Non-staining, noncorrosive, and nongaseous.
  2. Design Mix: 5000-psi, 28-day compressive strength.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Install support systems in accordance with MSS SP 69, Pipe Hangers and Supports-Selection and Application and MSS SP 89, Pipe Hangers and Supports-Fabrication and Installation, unless shown otherwise.
- B. Support piping connections to equipment by pipe support and not by the equipment.
- C. Support large or heavy valves, fittings, and appurtenances independently of connected piping. Support no pipe from the pipe above it.
- D. Support pipe at changes in direction or in elevation, adjacent to flexible joints and couplings, and where shown.
- E. Do not install pipe supports and hangers in equipment access areas or bridge crane runs.
- F. Brace hanging pipes against horizontal movement by both longitudinal and lateral sway bracing.
- G. Install lateral supports for seismic loads at all changes in direction.
- H. Install pipe anchors where required to withstand expansion thrust loads and to direct and control thermal expansion.
- I. Repair mounting surfaces to original condition after attachments are made.

### 3.02 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- G. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- H. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.
- I. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

### 3.03 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Fiberglass Pipe Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.
- D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- E. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- F. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4" thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool Manufacturer. Install fasteners according to powder-actuated tool Manufacturer's operating manual.
  2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to Manufacturer's written instructions.
- G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- K. Install lateral bracing with pipe hangers and supports to prevent swaying.
- L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- O. Insulated Piping: Comply with the following:
1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
  2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
  3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180°.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
  4. Shield Dimensions for Pipe: Not less than the following:
    - a. NPS 1/4 to NPS 3-1/2: 12" long and 0.048" thick.
    - b. NPS 4: 12" long and 0.06" thick.
    - c. NPS 5 and NPS 6: 18" long and 0.06" thick.

- d. NPS 8 to NPS 14: 24" long and 0.075" thick.
- e. NPS 16 to NPS 24: 24" long and 0.105" thick.
- 5. Pipes NPS 8 and Larger: Include wood inserts.
- 6. Insert Material: Length at least as long as protective shield.
- 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.04 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.05 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### 3.06 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2".

### 3.07 PAINTING

- A. Paint exposed surfaces immediately after erecting hangers and supports as specified in Section 09 90 00, PAINTING AND COATING.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 40 23 65

## SECTION 40 23 70 - INSTALLATION, TESTING, AND DISINFECTION OF PRESSURE MAINS

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Requirements for:
  - 1. Installing both water and sewer pressure mains.
  - 2. Procedures for hydrostatic testing for both water and sewer pressure mains.
  - 3. Procedures for flushing and disinfecting water mains.

### PART 2 - PRODUCTS (Not Applicable)

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. The excavation, preparation, and backfilling of the trench shall be in accordance with the General Specifications and those Specifications covering excavation and sitework.
- B. The Contractor shall be solely responsible for following the AMUCTD to determine the minimum type of traffic control devices to be used on, and along all streets, including but not limited to City Streets, County Roads, and State or Federal Highways.
- C. All water or sewer pressure mains are to follow accurately the grade, alignment, type, size and location shown on the Plans unless otherwise approved by the Engineer.
- D. All pipe shall be inspected after unloading from the carrier. Rejected pipe shall be marked with paint and removed from the job site.
- E. The Contractor shall be responsible for locating and marking with guard stakes all underground obstructions. Where these obstructions could interfere with the proposed line locations, the Contractor shall notify the Engineer and the obstruction will be exposed to determine elevations and alignment of proposed line(s) in relation to the obstruction. All damages to obstructions will be repaired at the Contractor's expense.
- F. The interior of all pipe, pipe fittings, and accessories shall be kept clean and free of dirt and other foreign material. The interior of all piping shall be swabbed for cleanliness immediately before lowering into trench and shall be protected during laying to prevent earth or other foreign matter from entering the pipe. During periods when pipe laying is not in progress, open ends of laid pipe shall be protected by means of watertight plug or other means as concurred with the Engineer. All joints of pipe in trench shall be made up tightly before stopping work at the end of each work day.
- G. The top of the pipe shall be a minimum of 30 inches below the surface unless shown deeper in the Plans, specified deeper by a permitting agency, or required to avoid existing facilities or achieve proper depth and burial for valves and fittings.
- H. The pipe shall have a uniform bearing. Bell holes shall be dug so that the bell will clear the ground.

- I. Rock and boulders shall be removed to a clearance of at least six inches from pipe, valves and fittings. If the bottom of the trench is found to be unsuitable, the Contractor will remove the material, backfill and compact with a suitable base. If unsuitable material cannot be removed, the Contractor shall construct a foundation for the pipe as directed by the Engineer. Additional compensation will be allowed for the foundation work if provided for in the Bid Documents.

3.02 TRENCH BACKFILL

- A. The excavation, preparation, and backfilling of the trench shall be in accordance with the General Specifications and those Specifications covering excavation and sitework.
- B. Backfill shall be compacted in layers not to exceed 8 inches and to a minimum density of 95 percent of Standard Proctor Compaction Test, unless indicated otherwise in the Drawings.
- C. Backfill will be selected earth-free of rocks and hard objects, to a point 12 inches above the pipe with the remainder of the trench to be kept free of large rocks

3.03 TESTING OF WATER AND SEWER PRESSURE MAINS

- A. The Contractor shall furnish approved equipment. Testing shall be done in the presence of the Engineer.
- B. Testing will be 1-1/2 times the normal operating pressure but not less than 150 pounds per square inch. The Engineer shall determine the test pressure and test sections which shall be limited to a maximum of one mile. Tests with joints uncovered shall be maintained for a period to inspect the section, but in no case for less than two hours. Where the pipeline is backfilled, the test will be maintained for no more than eight hours with hydrostatic test performed in accordance with AWWA C-600. Leakage shall not exceed the following:

1.	Maximum Leakage per 1,000 Feet of Pipe in Gallons per Hour			
	a. Pipe Diameter	at 150 psi	at 200 psi	at 250 psi
	b. 3 Inches	0.28 GPH	0.32 GPH	0.36 GPH
	c. 4 Inches	0.37 GPH	0.43 GPH	0.47 GPH
	d. 6 Inches	0.55 GPH	0.64 GPH	0.71 GPH
	e. 8 Inches	0.74 GPH	0.85 GPH	0.95 GPH
	f. 10 Inches	0.92 GPH	1.06 GPH	1.19 GPH
	g. 12 Inches	1.10 GPH	1.28 GPH	1.42 GPH
	h. 14 Inches	1.29 GPH	1.48 GPH	1.66 GPH
	i. 16 Inches	1.47 GPH	1.70 GPH	1.90 GPH
	j. 18 Inches	1.66 GPH	1.91 GPH	2.14 GPH
	k. 20 Inches	1.84 GPH	2.12 GPH	2.37 GPH
	l. 24 Inches	2.21 GPH	2.55 GPH	2.85 GPH
	m. 30 Inches	2.76 GPH	3.19 GPH	3.56 GPH

3.04 FLUSHING AND DISINFECTION OF WATER MAINS

- A. All water mains, pipe fittings, valves, and hydrants installed or affected by the project through which water passes must be properly flushed and sterilized as required by ADEM, the State Board of Health, or any other governing state/local health or environmental agency. In general, procedures for flushing and disinfecting shall be in accordance with AWWA C651,



latest revision, and as generally outlined in the Installation Guide for Ductile Iron Pipe published by the Ductile Iron Pipe Research Association.

- B. Flushing velocities shall be at least 2.5 fps. For large diameter pipe, where it is impractical or impossible to flush the pipe at specified velocity, the Contractor shall clean the pipeline in place from the inside by brushing and sweeping, then flushing the line.
- C. If required, the Contractor shall flush the pipe through flushing branches and remove branches after flushing is complete. Service connections and hydrants shall be flushed following pipeline flushing. Contractor shall provide temporary connections as required and operate all valves at least twice during flushing to ensure the complete piping system (including short runs and dead end runs) installed or affected during construction has been thoroughly flushed. Contractor shall provide hoses, temporary pipes, ditches, and other conduits as needed to dispose of flushing water without damage to adjacent properties.
- D. Chlorine shall be used for disinfection. If adequate disinfection is not achieved with dry chlorine additions, liquid chlorine solution methods shall be employed.
- E. The Contractor shall furnish all chlorine, chemical feed pumps, generator sets, temporary valves and connections, materials, labor, and equipment required for proper disinfection of the piping system. The Contractor shall operate valves, hydrants, and appurtenances during disinfection to ensure that disinfecting solution is dispersed into all parts of pipeline, including dead-ends and areas that otherwise may not be treated. In no case shall the Contractor allow disinfecting solution to enter piping systems which are in service.
- F. Samples will be taken to the State Health Department for analysis. If the samples do not meet the standards of the Health Department, the disinfection process shall be repeated until satisfactory test results are obtained. Approval of samples shall be secured before placing piping system in service.
- G. After disinfection, the Contractor shall flush water from pipeline and hydrants until water through the entire piping system is equal chemically and bacteriologically to the water supply. Contractor shall properly dispose of all disinfecting solution and flushing water in accordance with all applicable requirements and regulations. Contractor shall not allow flow into a waterway without adequate dilution or other satisfactory methods to prevent damage to adjacent properties and environment.

### 3.05 WATER SERVICE CONNECTIONS OR RECONNECTIONS

- A. Unless indicated otherwise in the Drawings, service connections or reconnections shall be 3/4 inch and shall consist of a mainline tap, using a hinged saddle, installing a corporation stop, 3/4 inch copper pipe and terminating with a curb stop and a swing check valve at the meter box (existing or relocated).
- B. Service pipe shall be laid with a minimum of 24 inches of cover with fittings to be equal to the Mueller Company. Service pipe depth under paving will be in accordance with existing local or State Highway Department regulations.

END OF SECTION 40 23 70

## SECTION 46 21 39 – ROTARY DRUM SCREEN

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. There will be furnished one (1) Model RSA2524UBCR Rotostrainer screen unit(s), manufactured by Parkson Corporation, Vernon Hills, IL OR one (1) Model IFM 3648 manufactured by IPEC. The rotary self-cleaning screen unit will consist of a headbox assembly, cylinder, solids discharge doctor blade assembly, cylinder drive system and solids discharge chute.
- B. The liquid/solids mixture to be screened will be introduced to the external surface of the wedgewire cylinder with the solids being retained on the surface of the cylinder until removed by the doctor blade. The fluid will pass down through the cylinder resulting in self-cleaning continuous backwash of the cylinder as it rotates.
- C. Specifications are based on the Model RSA2524UBCR by Parkson, and changes to this arrangement will be at the expense of the contractor. An alternate support platform has been provided in the Plans for the IPEC Model IFM 3648 which is pre-approved as a “base-bid” option. The screen manufacturer will have 10 years design and manufacturing experience with externally-fed wedgewire screens, with not less than 25 similar units installed as screening devices in similar applications.

#### 1.02 RELATED SECTIONS

- A. The following list of related sections is provided for the convenience of the Contractor and is for reference only to support commonly referenced sections that are in-general applicable to all equipment supplied. (For complete list of sections see specification index.)
  1. All sections of Division 1 including but not limited to Submittal Procedures, Shop Drawings, Product Data and Samples, Operating and maintenance information, Protection of Materials and Equipment, Installation, Testing, and Commissioning, Instruction of Operations and Maintenance Personnel, and Spare Parts Maintenance Manuals.
  2. Section 09 90 00 - Coating Systems
  3. Division 26 – Electrical

#### 1.03 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
- C. American Welding Society (AWS)
- D. American Institute of Steel Construction (AISC)
- E. American Bearing Manufacturers Association (ABMA)
- F. American Gear Manufacturers Association (AGMA)
- G. National Electrical Manufacturers Association (NEMA)

H. Underwriters Laboratory (UL)

1.04 SUBMITTALS

- A. The equipment manufacturer shall submit the following items:
1. See Section 01 33 00 Submittal Procedures
  2. Five (5) Sets of General Arrangement drawings that illustrate the layout of the equipment, equipment weight, principal dimensions with related verifications required for installation including anchorage locations. Other related data including descriptive literature, Electrical Control Drawings, Catalog Cut Sheets for individual components and Drive Motor Data.
  3. A list of recommended Spare Parts including any Special Tools required for routine maintenance of the equipment is provided in Section 2.05.
  4. Five (5) of O & M Manuals including As-Built Drawings of the Mechanically Cleaned Bar Screen Arrangement, Controls and Accessories shall be provided in digital format after equipment ship for inclusion in the Close-Out Submittal process.
    - a. See Section 01 78 23 – Operations and Maintenance Data

1.05 QUALITY ASSURANCE

- A. To assure quality and performance: All equipment furnished under this Section and related sections shall be of a single manufacturer who has been regularly engaged in the design and manufacture of the equipment and demonstrates, to the satisfaction of the Engineer, that the quality is equal to equipment made by those manufacturers specifically named herein. And the screen manufacturer shall have at least 25 installations of the specified model of mechanically cleaned bar screen equipment that has been in successful operation, at similar installations, for at least five (5) years. Upon request, the manufacturer shall provide a reference of such installation sites along with the relevant contact information.
- B. The equipment furnished shall be fabricated, assembled, installed and placed in proper operation condition in full conformity with approved drawings, specifications, engineering data, and/or recommendations furnished by the equipment manufacturer.

1.06 WARRANTY

- A. Manufacturer shall provide a written one year standard warranty from the date of use of the drum screen and associated screw compactor equipment to guarantee that there shall be no defects in material or workmanship in any item supplied.
- B. Manufacturer shall warrant for the period of 2 years all rotating parts of the rotary drum screen including the gear motor, bearing, drive head, trunnions, castings, pins and retaining rings. Manufacturer warrants that these components shall be replaced if damaged or defective in the normal use of the equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Screen shall be Model RSA2524UBCR Rotostrainer screen unit(s), manufactured by Parkson Corporation and as represented by The TDH Co. (404.213.6935) or Model IFM 3648 Drum Screen as manufactured by JWC (IPEC) as represented by Heyward Incorporated Atlanta.

## 2.02 BASIS OF DESIGN

- A. Each screen shall be capable of treating a sustained flow of 500 gallons per minute (gpm) with a maximum suspended solids of 350 mg/l, through the unit without bypassing unscreened flow.

## 2.03 DRUM SCREEN COMPONENTS

- A. HEADBOX ASSEMBLY: The headbox assembly including integral headbox will be ruggedly constructed of 12 gauge, type 304 stainless steel.
  - 1. INFLUENT PIPE. The headbox will be equipped with (a) 10 inch OD plain-end influent pipe stub of 12 gauge construction.
  - 2. WIPER BLADE. The influent will enter the headbox and flow over a wiper blade of UHMW polyethylene that makes direct contact with the rotating cylinder.
  - 3. CLEANOUT PORT. The headbox will be fitted with a 6 inch diameter cleanout port, having a polyurethane sealing ring and a removable polypropylene plug.
  - 4. INTERNAL BAFFLE. The headbox assembly will be equipped with a removable internal baffle for the purpose of flow dampening and distribution. The baffle will be vertical, and be top-mounted to the inside of the inlet headbox, so as to provide an underflow or U-path design. This baffle will be minimum 12 gauge type 304 stainless steel and run the full length of the headbox.
  - 5. EFFLUENT PIPE. The headbox will be equipped with a 12 inch OD plain-end effluent pipe stub of 12 gauge construction.
- B. HOOD: A hood will be supplied to enclose the front of the screen assembly. It will be bolted to the headbox and will include hinged access panels with interlock switches to provide maintenance access. The hood will be fabricated of minimum 12 gauge type 304 stainless steel.
  - 1. INTERLOCK SWITCH. An interlock switch will be fitted on the hood access panel. The switch will be wired to the control panel to cause the unit to completely stop rotating upon opening of the access panel. Proper wiring from the switch to the control panel will be the responsibility of others. Interlock switch is rated for [NEMA 4X, 120 volt and is provided with a 72 inch long 18/2 lead or NEMA 7, 120 volt and will have provision for 1/2 inch conduit]. [Add to end of 3.1 electrical devices]
- C. CYLINDER. The screen cylinder will be constructed of type 304 stainless steel and consist of a continually helical wound spiral peripheral wedge-shaped wire with a minimum face width of 0.060 inch and a minimum height of 0.100 inch with a 26 degree included taper angle. This will be resistance welded to each of the longitudinal supporting members placed on 1 inch (maximum) centers within the inside diameter of the cylinder. The longitudinal support members will be 0.210 inch high (minimum) and 0.122 inch wide (minimum at widest point). Chordal effect between supports will not exceed 0.004 inch. A minimum of 120 support rods will be provided. Cylinder construction methods using tie rods internal to the cylinder are specifically excluded and will not be used.

The opening between the wedge-shaped wire will be 0.06 inches at the face or exterior/screening surface of the wire.

- 1. CYLINDER SUPPORT SYSTEM. The cylindrical screen will be supported on both ends by a spider hub assembly bolted to rings which are welded to the interior ends of the cylinder. Each support rod will be welded to the end rings. Units that do not have all

support rods welded to the end ring will not be acceptable due to the possibility of early failure due to fatigue loading. Each spider hub assembly has a bolted-on support shaft which is supported by self-aligning, greaseable pillow block housed bearings. The bearings will be outside of the fluid flow.

2. CYLINDER RIM SEALS. Replaceable rim seals will be of UHMW 1900 polyethylene, retained in position by clips. The seals will continuously self-adjust up to the edge of the cylinder end plates, by means of two torsion springs per seal. Seals will not make contact with cylindrical screen surfaces.
3. INTERNAL CYLINDER BAFFLE. The cylinder will be equipped with an internal baffle of 18 gauge type 304 stainless steel. The baffle will be suspended within the cylinder, mounted in a stationary position to an internal support pipe. The baffle will be designed to eliminate splashing as water passes through the inside bottom of the wedgewire cylinder. The baffle will be the approximate full width and length (minus required clearance tolerances) of the inside of the cylinder, for maximum effect.

- D. SOLIDS DISCHARGE DOCTOR ASSEMBLY: The solids discharge doctor assembly will be constructed of type 304 stainless steel with the exception of a Phosphor Bronz doctor blade. The doctor blade will be designed to effectively remove solids from the cylindrical screen surface and will be easily removable. It will have sufficient travel so as to clear the cylinder and flanges for changing or inspection. Pressure of the doctor blade against the cylindrical screen surface will be controlled with a counterweight assembly. The doctor blade holder and assembly can pivot clear of the cylinder and flanges, allowing for doctor blade change or inspection.

The doctor blade holder will be a machined, slotted, open-jaw design, which allows the doctor blade to evenly contact the screen surface along its entire length. Designs incorporating doctor blades bolted to the holder will not be used.

- E. CYLINDER DRIVE SYSTEM: The cylinder drive system will consist of a single speed, dual voltage motor direct coupled to a Eurodrive FA type helical gear reducer. The electric motor will be 1/2 HP with 230/460 volt, 3 Phase, 60 Hz, power supply. The gear reducer will be shaft-mounted directly on the cylinder drive shaft and have an output speed of 11 RPM.
- F. SOLIDS DISCHARGE CHUTE: Screen manufacturer shall provide a discharge chute as depicted on the Plans to be constructed of 304 stainless steel or aluminum. Details of the chute shall be submitted with the screen for review and approval.

G. SURFACE FINISH

1. The Rotostrainer unit will be properly prepared and coated for the purposes intended. All stainless steel components will remain unpainted but adequately cleaned of all commercial and shop markings during fabrication.
2. The gearmotor and pillow block bearings will remain the manufacturer's standard finish for severe environment. All plastic parts will remain unfinished.

2.04 ELECTRICAL DEVICES In addition to the drive motor, the following electrical devices will be furnished with the unit:

- A. EMERGENCY STOP LOCAL PUSH BUTTON STATION. A NEMA 4X polycarbonate emergency stop push button station will be mounted to the headbox and will have provision for 1/2 inch conduit. Local E-Stop Push Button Stations

1. Provide NEMA 4/7 rated E-stop pushbutton station for each proposed screen and compactor as indicated on plans. Local push button station shall be local to the equipment at exact location as recommended by the equipment supplier.

## 2.05 SPECIALTY TOOLS, SPARE PARTS AND LUBRICATION

1. The following spare parts will be furnished for each screen:
  - a. 1 pair cylinder rim seals with clips and springs
  - b. 1 wiper seal
  - c. 2 doctor blades

## PART 3 - EXECUTION

### 3.01 SHIPMENT

- A. Shipment of all equipment shall be coordinated to allow the screen shipment as one complete integrated assembly unless otherwise specified by the customer, contractor, or engineer.

### 3.02 INSTALLATION

- A. Equipment shall be installed in strict conformance with the manufacturer's installation instructions, as submitted with Shop Drawings, Operation and Maintenance Manuals and/or any pre-installation checklists. Installation shall utilize standard torque values and be installed secure in position and neat in appearance. Installation shall include any site preparation tasks as required by the engineer or manufacturer; such as unloading, touch-up painting, etc. and any other installation tasks and materials such as wiring, conduit, controls stands as determined by the customer and/or specified by the manufacturer.
- B. Anchor Bolts: Anchor bolts and nuts shall be 316 stainless steel and furnished for each item of equipment by the Contractor.
  1. Anchor bolt template drawings shall be included in the submittal to permit verification of the location structural elements, new or existing in the concrete.
  2. Anchor bolt sizes, quantity and requirements will be indicated on the submittal drawings.

### 3.03 TESTING

- A. After completion of installation, CONTRACTOR shall provide for testing and shall be performed in strict conformance with the manufacturer's start up instructions. Testing of the bar screen shall demonstrate that the equipment is fully operational by picking up and depositing materials into specified containment.
- B. Field certification shall include inspection of the following:
  1. Verify equipment is properly aligned and anchored per the installation instruction and drawings. Assure the bar screen unit is square, flat and unobstructed with required clearances maintained.
  2. Assure controls and instrumentation work in all modes.
  3. Check equipment for proper operation of debris blade, scrapers, etc as well as completion of the Start-Up requirements in the installation guide.

### 3.04 ONSITE TECHNICAL ASSISTANCE

- A. Manufacturer shall provide services to include Installation Certification, and shall include (1) full day for Start-Up and Training. Manufacturer shall be given minimum 14 days notification prior to the need for such services.

END OF SECTION 46 21 39

**Electric Machine Control, Inc.**

7015 Haisten Drive  
Trussville, Alabama 35173

**Phone:** 205-661-3998

**Fax:** 205-661-3997

<http://www.emcinc.biz>



TOTAL PAGES IN THIS QUOTE: 2

**Proposal**

Company:	AWARDED CONTRACTOR	From:	JAMES DENTON
	ATTN: ACCOUNTS PAYABLE	email:	<a href="mailto:identon@emcinc.biz">identon@emcinc.biz</a>
	BILL TO: ADDRESS TBD	Phone #:	205-910-8348
	BILL TO: ADDRESS TBD	Date:	3/7/2023
Attention:	WYNN ECHOLS, JR. P.E.		
Phone #:	205-516-3307	EMC, Inc., Prop. #	EM230050 R0
email:	wynnechols@engineersofthesouth.com	Customer Ref. No.	SW-20026

Qty.	Description	Price Each	Total Net
	<b>BROOKWOOD SEU WWTP IMPROVEMENTS INTEGRATORS SCOPE</b>		
1	REMOTE PLC IO PANEL	\$ 18,563.74	\$ 18,563.74
	ADDITIONAL IO REQUIRES NEW REMOTE IO PLC PANEL. PRICE INCLUDES NEMA 3R ENCLOSURE, PROGRAMMABLE LOGIC CONTROLLER, AND AS REQUIRED SWITCHES, CIRCUIT PROTECTION, BATTERY BACKUP, ETC.		
1	PLC AND SCADA PROGRAMMING	\$ 12,240.00	\$ 12,240.00
	INCLUDES: PLC PROGRAMMING, SCADA PROGRAMMING, SUBMITTAL DRAWINGS, TESTING, AS BUILT DRAWINGS.		
1	IN FIELD STARTUP	\$ 11,347.50	\$ 11,347.50
	3 DAYS ON SITE FOR ENGINEER AND ENGINEERING TECH FOR START-UP AND CHECKOUT.		
	<b>TOTAL</b>		<b>\$ 42,151.24</b>

**COMMENTS:**

**FURNISHED BY SCADA INTEGRATOR INSTALLED BY CONTRACTOR**  
REMOTE TERMINAL UNIT

**FURNISHED BY SCADA INTEGRATOR**  
SIGNAL WIRE TERMINATION  
FAT TEST  
START-UP  
SCADA MODIFICATIONS AND TESTING

**FURNISHED BY OTHERS (CONTRACTOR)**  
15 AMP 120VAC CONTROL POWER  
PANEL MOUNTING  
REQUIRED INSTRUMENTS  
INSTRUMENT INSTALLATION  
ALL INTERCONNECTING WIRE AND CONDUIT

**PROGRESS PAYMENTS REQUIRED**  
RECEIPT OF APPROVAL TO PROCEED 20%  
ENGINEERING COMPLETION (FAT) 60 %  
SHIPMENT OF HARDWARE 20 %

ALLOW 4 - 6 WEEKS FOR SUBMITTALS.

**CLAUSES TERMS AND CONDITIONS**  
WHILE "BUSINESS AS USUAL" IS OUR GOAL, PLEASE BE ADVISED THAT POSSIBLE DISRUPTIONS BEYOND OUR CONTROL IN OUR SUPPLY CHAIN AND OUR PRODUCTION CAPABILITIES MAY ARISE DUE TO COVID-19. EVERY EFFORT WILL BE MADE TO MAINTAIN THE SCHEDULES PROVIDED AND IF DISRUPTIONS OCCUR, WE WILL NOTIFY YOU AS SOON AS POSSIBLE.

DUE TO COVID SUPPLY CHAIN ISSUES AND ASSOCIATED PRICE ESCALATIONS, ELECTRIC MACHINE CONTROL'S PRICING IS VALID FOR 60 DAYS FOR RECEIPT OF ELECTRIC MACHINE CONTROL DELIVERING SUBMITTALS. AFTER 60 DAYS FROM RECEIPT OF SUBMITTALS A REVIEW OF PRICING MAYBE REQUIRED AND ADDER FOR PRICE INCREASES MAY APPLY.



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	ATTN: ACCOUNTS PAYABLE	email:	<a href="mailto:identon@emcinc.biz">identon@emcinc.biz</a>
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Phone #:	205-516-3307	EMC, Inc., Prop. #	EM230050 R0
email:	wynnechols@engineersofthesouth.com	Customer Ref. No.	SW-20026

EMC SHALL NOT BE RESPONSIBLE FOR ANY FAILURE TO PERFORM, OR DELAY IN PERFORMANCE OF, ITS OBLIGATIONS RESULTING FROM THE COVID-19 PANDEMIC OR ANY FUTURE EPIDEMIC, AND BUYER SHALL NOT BE ENTITLED TO ANY DAMAGES RESULTING THEREOF.

ALL ORDERS MUST BE RELEASED FOR MANUFACTURE WITHIN 90 DAYS OF DATE OF ORDER ENTRY. IF APPROVAL DRAWINGS ARE REQUIRED, DRAWINGS MUST BE RETURNED APPROVED FOR RELEASE WITHIN 30 DAYS OF MAILING. IF DRAWINGS ARE NOT RETURNED ACCORDINGLY, AND/OR IF SHIPMENT IS DELAYED FOR ANY REASON, ELECTRIC MACHINE CONTROL RESERVES THE RIGHT TO ESCALATE THE PRICE OF THE ORDER BY 1.0% PER MONTH FROM DATE OF QUOTE OR FRACTION THEREOF FOR THE TIME THE SHIPMENT IS DELAYED.

	ESTIMATED LEADTIME -----	10-12 WEEKS ARO	
	TERMS -----	PPD & ADD	
	FOB -----	SHIPPING POINT	
	FREIGHT -----	NET 30 DAYS	

The "Conditions of Sale" and "Terms and Conditions" of  
Electric Machine Control, Inc. Apply to this Quotation.  
This Proposal is Valid for 90 Days.

**x**

# FLUIDYNE CORPORATION



## SCOPE OF SUPPLY

FLUIDYNE CORPORATION (HEREINAFTER CALLED THE COMPANY) AGREES TO SELL TO THE PURCHASER AND THE PURCHASER AGREES TO BUY AND ACCEPT FROM THE COMPANY, THE ITEM (S) DESCRIBED HEREIN.

PROJECT: **Weatherly, Alabama  
Wastewater Treatment Plant  
Sequencing Batch Reactor**

DATE WRITTEN: February 12, 2021

WRITTEN BY: Eric McGee

**FLUIDYNE CORPORATION**

**PROJECT: Weatherly, AL**  
**DATE: February 12, 2021**

Fluidyne Corporation is pleased to provide our preliminary proposal for a Fluidyne single tank SBR to treat wastewater at the Weatherly, Alabama Wastewater Treatment Plant.

We have evaluated a couple different design conditions as follows:

**Influent:**

Average Daily Flow:	0.200 MGD
Max Day Flow:	0.400 MGD
Influent BOD5:	250 mg/l
Influent TSS:	250 mg/l
Influent TKN:	50 mg/l

**Effluent: (monthly averages)**

Effluent BOD5:	10-15 mg/l or less
Effluent TSS:	10-30 mg/l or less
Effluent NH3-N:	1 mg/l or less

We have assumed the wastewater has been properly screened and is non-toxic and readily bio-degradable. Performance assumes proper operation and maintenance and is based on monthly averages.

Fluidyne proposes the following equipment:

**SBR:**

One (1) Fluidyne model# FID-24 304 Stainless Steel SBR Influent Diffuser Baffles.

One (1) Fluidyne model# BDM2JA12 Jet Aeration Headers including all in-basin liquid piping, submerged air piping and stainless-steel supports. Air piping to terminate with a 6" flange connection at approximately 12" above the jet aeration manifold to mate to the contractor supplied air distribution piping. The liquid piping will terminate with a 10" flange connection to mate to the tank wall spool flange.

One (1) 6" Hydro-pneumatic backflush assemblies including all in-basin piping, supports and 6" manually operated backflush plug valve.

Two (2) 20 HP Dry Pit Vertical Jet Mixing Pumps including suction elbow with foot. Pump to include 20 HP, TEFC premium efficiency motor (460/3/60). **One pump to be a bare spare pump only.**

One (1) Fluidyne model # FSED-12 Floating Decanters with swivel joint, all in-basin piping, supports and decant vent valve. The decanter is to terminate with a 10" flange connection to mate to the tank wall spool flange. The decanter includes the required in-basin flexible hose to allow air to enter and exit the decanter.

One (1) 1" Diameter Electric Operated Decant Vent Valve in NEMA 4 Weatherproof Enclosure with thermostatically controlled heater.

One (1) 10" Diameter Electric Operated Effluent Control Bray Butterfly Valve. Valve to have 120/1/60 AUMA electric actuator. Valves are to be powered from the Fluidyne SBR control panel.

One (1) 3 HP Dry Pit Vertical SBR Waste Sludge Pumps including suction elbow with foot. Pump to include 3 HP, TEFC premium efficiency motor (460/3/60).

One (1) Insite Dissolved Oxygen Sensors with 30' of cable.

One (1) DO Sensor with 30' of cable.

One (1) Dual Channel Analyzer.

One (1) Submersible Level Transducers with 30' of cable for the 4-20 mA signal.

One (1) High Water Level Float Level Sensors with 30' of cable.

### **BLOWERS:**

Two (2) 25 HP Positive Displacement Blower Packages including inlet silencer w/filter, blower block, oil drawings with ball valves, v-belt drive w/ automatic belt tensioner, TEFC drive motor, discharge silencer, pressure relieve valve, check valve, vibration isolators, discharge temperature gauge, discharge pressure gauge, filter differential pressure gauge, sound enclosure with vent valve and internal blower package flex connectors. Blowers are designed for outdoor installation. **One blower is a complete 100% in-place spare.**

### **POST SBR EQ TANK:**

One (1) Fluidyne model# FAS-10 Jet Aspirator/Mixer including all in-basin liquid piping, submerged air piping and stainless steel supports. The air piping will terminate with at just above the maximum water level to induce atmospheric air into the jet mixing/aspiration nozzle. The liquid piping will terminate with a 6" flange connection to mate to the tank wall spool flange.

One (1) 10 HP Dry Pit Vertical Jet Mixing Pump including suction elbow with foot. Pumps to include 10 HP, TEFC premium efficiency motor (460/3/60).

One (1) Submersible Level Transducer with 30' of cable for the 4-20 mA signal.

One (1) High Water Level Float Level Sensor with 30' of cable.

**CONTROLS:**

One (1) SBR Control Panel housed in NEMA 12 enclosure with Allen-Bradley PLC, digital input cards, digital output cards, analog card, indicating lights, switches, relays, modem, UPS and PanelView 1000+ operator interface to automatically control the SBR and Post-Equalization Tank Jet Aspirator/Mixer. Control panel is sized for future four (4) tank operation. Hardware and programming is only included for the first SBR and the Post Equalization Tank Equipment.

**SPARE PARTS:**

One (1) Set of replacement inlet filter media, v-belts and blower oil for each blower.

One (1) Set mechanical seal/bearing kit for each type of pump.

One (1) Spare float assembly.

One (1) Spare submersible level transducer.

**DOCUMENTATION:**

Five (5) Copies of Submittals and Operation and Maintenance Manuals are included along with a digital electronic copy.

Fluidyne will provide two (2) 3 HP Filter Feed pumps each capable of pumping at a rate of approximately 200 gpm at 22' TDH. Each pump to include suction elbow with foot. Pumps to include 3 HP, TEFC premium efficiency motor (460/3/60).

**Clarifications:**

Equipment will be fabricated according to Fluidyne's standard methods and procedures.

All out of basin pump suction and discharge piping, fittings and isolation valves are the responsibility of others.

We have assumed all blowers, pumps and valves in our scope will be installed outside of the class 1, division 2 area.

Wiring requirements between the Fluidyne control panel, the motor control center and the field equipment will be provided with our submittal and may differ slightly than what is currently shown on the plans.

**SERVICE:** Service has been provided in the amount of nine (9) days provided in three (3) trips for installation inspection, start-up and operator training. All travel and living expenses are included. Additional service can be provided at a rate of \$1200.00 / day plus travel and living expenses.

**EXCLUSIONS:** Not furnished by Fluidyne are the following; tanks; any pipe, supports, fittings or valves except those specifically included above; out of basin or interconnecting piping, valves or supports other than those referenced above; tank wall spools and interconnecting hardware and gaskets; parshall flume; grit removal equipment and accessories; screening equipment and accessories; standby generator; VFD's; motor starters; MCC; disinfection equipment; sludge disposal or handling equipment; effluent filtration equipment and accessories; sampler; auto dialer; access hatches; hoists; handrail; grating; explosion proof equipment; remote panels or controls or control stations; intrinsically safe barriers, Electrical Distribution labels, disconnects, junction boxes, conduit or wiring between mechanical equipment and the control panel; surge protection devices; instrument sun/rain shields; auto transfer switch; transformer; pump or blower shop performance tests; electrical and mechanical installation labor; off-loading of equipment; jobsite testing; lab testing; jobsite storage; taxes; duties; insurance and other items not specifically mentioned in the body of this proposal.

**SHIPMENT:** The price quoted is based on a target shipment date of 12 to 16 weeks after receipt of approved drawings.

**TAXES:** Any applicable duties, sales, use, excise or similar taxes are not included in the quoted price.

# UV DISINFECTION SCOPE OF SUPPLY

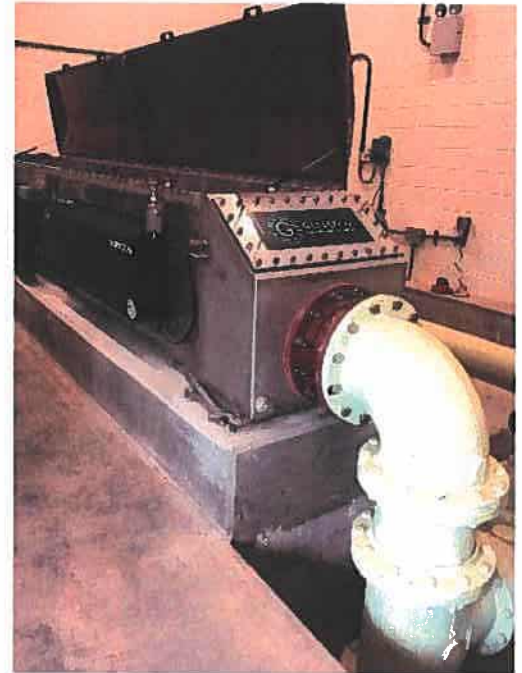


## NONCON SERIES

<b>Project Name:</b>	
<b>Date:</b>	January 20, 2021

<b>Prepared by:</b>	Eric McGee
<b>Email</b>	<a href="mailto:eric.mcgee@pumpandprocess.net">eric.mcgee@pumpandprocess.net</a>
<b>Mobile</b>	205-529-8432

<b>Project Type:</b>	<b>Wastewater</b>
<b>Type</b>	Fluoropolymer Tube
<b>Orientation</b>	Horizontal
<b>System Name</b>	NONCON-5000-3-5 x 6
<b>Lamp Technology</b>	Low pressure high output
<b>Flow rate range</b>	300 GPM peak



### BENEFITS OF NONCON 5000

- No quartz sleeves
- Teflon FEP tubes do not foul
- Low pressure high output lamps
- Economical lamp costs

### EQUIPMENT

- Stainless steel reactor with inlet and outlet box
- Remote NEMA 4x ballast control center with run time and lamp status
- UV monitoring

### By Others

- Inlet isolation gate
- Integration





## DESIGN OVERVIEW

Application	Wastewater
Peak flow	285 GPM
Max 30 day	
Average flow	
Minimum flow	0
Location	outdoors w/roof

Water Quality	
UV transmission %	65%
Influent counts	200,000 fc/100 ml
Water temp.	33-85° F
TSS	<30 mg/l
BOD	<30 mg/l
Discharge permit	<126/100 ml
Design UV dosage	>30,000 uWs/cm <sup>2</sup> @ end of lamp life

Dimensions	TBD
Channel length	10' 2"
Channel width	22"
Channel height	26" (4' with door open)
Connections	TBD by Project Eng.
Ballast Control Center	NEMA 4x stainless steel free standing

### Our Fluoropolymer

- Manufactured USA
- Use 100% virgin resins
- Inert to chemicals and solvents
- High UV transmission
- Resistant to fouling

### Scope of Engineering

The following documentation will be provided by Glasco UV at the time of submittal:

Installation Operation and Maintenance manual, layout drawings, P+ID drawings, ladder logic diagrams, terminal block diagrams, Warranty requirements, long term storage requirements, bills of materials, equipment descriptions, equipment brochures, head loss calculations, UV DIS calculations, equipment installation lists and other relevant documentation.

## EQUIPMENT OVERVIEW

Model Name	NONCON-5000-3-5 x 6
System type	Horizontal
Configuration	Closed Reactor
Lamp type	Low pressure high output 155 watts
Reactors	1
Banks per reactor	1
Modules per bank	3
Lamps per module	5
Lamps per unit	15
Lamps per project	15
Tubes	6
UV monitoring	0-100% - 4-20 ma
Lamp status	Green LEDs
Remote control	H/O/A
Voltage	220-240 Volt
kW/hr	<2.6 kW

Integration	
UV output	4-20 mA from UV
Flow signal	Not Required
Basic PLC	Not Required
Remote control	H/O/A

### Our System

- Manufactured in USA
- Uses low pressure high output UV lamps
- Uses proven ballast technologies
- UV sensor and UV monitor
- No quartz sleeves – tubes require less maintenance and do not foul





- operational tests is provided.
- i) Supply and installation of electrical conduit and wiring for power supply and controls of UV system.
  - j) Any civil and/or mechanical work required to support or install the UV system or its associated controls. This includes concrete pads.
  - k) Power surge protection and lightning strike protection devices to be provided by contractor.
  - l) All transformers, circuit breakers and disconnect devices prior to the UV system enclosures are to be provided by electrical contractor (in some cases the transformer is provided by Glasco).
  - m) Labor and installation of UV modules, electrical enclosures, compressor and PLC.
  - n) Contractor to supply stainless steel anchor bolts for component installation.
  - o) Sun shields for all electrical enclosures. This is to prevent thermal gain resulting from exposure to direct sunlight. (Not needed if installed indoors)
  - p) If supplied, remote signal communication to the SCADA system including language/protocol conversion software and hardware as required. Data retrieval of information from the PLCs is the responsibility of the SCADA system provider or integrator. This includes integration of flow signals.

## **Warranty**

The warranty period is 18 months from date of delivery and 12 months from date of the Certification of Substantial Completion whichever comes first. It covers all failures due to defects in material and/or workmanship excluding consumables (see separate lamp and ballast warranties below).

This warranty shall not apply to any failure or defect which results from the Equipment not being operated and maintained in strict accordance with instructions specified in Glasco UV's Instructions Manual or which results from mishandling, misuse, neglect, improper storage, improper operation of the Equipment with other equipment furnished by the Customer or by other third parties or from defects in designs or specifications furnished by or on behalf of the Customer by a person other than Glasco UV. In addition, this warranty shall not apply to Equipment that has been altered or repaired after start-up by any one except:

- Authorized representatives of Glasco UV, or
- Customer acting under specific instructions from Glasco UV.

Customer must notify Glasco UV in writing within 5 days of the date of any Equipment failure. This notification shall include a description of the problem, a copy of the operator's log, a copy of the Customer's maintenance record and any analytical results detailing the problem. If Customer has not maintained the operator's log and maintenance record in the manner directed in the Operation and Maintenance manual, or does not notify Glasco UV of the problem as specified above, this warranty may, in Glasco UV's discretion, be invalid.

Customer will fully cooperate with Glasco UV, in the manner requested by Glasco UV, in attempting to diagnose and resolve the problem by way of telephone support. If the problem can be diagnosed by telephone support and a replacement part is required, Glasco UV will either, at Glasco UV's expense, ship a repaired, reworked or new part to the Customer who will install such part as directed by Glasco UV or will direct Customer to acquire, at Glasco UV's expense, such part from a third party and then install such part as directed by Glasco UV.

This warranty is the exclusive remedy of the Customer for all claims based on a failure of or defect in the Equipment, whether the claim is based on contract (including fundamental breach), tort (including negligence), strict liability or otherwise. This warranty is lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or fitness for a particular purpose shall apply to the Equipment.

### **Lamp Warranty**

Each low pressure, high output lamp is guaranteed for 13,000 hours operating time under normal operating conditions. Normal operating conditions include:

- On/off cycles max. 4 per 24 operating hours,
- Voltage fluctuations according to DIN IEC 38.

In case of premature lamp failure, the client is requested to send the lamp back to Glasco UV together with the information of UV unit serial number, hours run and on/off cycles. Glasco UV then offers the following:

- Lamp failure before 9,000 h: Glasco UV will send a replacement lamp free of charge,
- Lamp failure after 9,000 h: Glasco UV will issue a credit proportional to the hours not used.

Upon return to our facilities in Mahwah, NJ, we will dispose/recycle all used and failed lamps at no charge to the client.

**Scope of Supply**

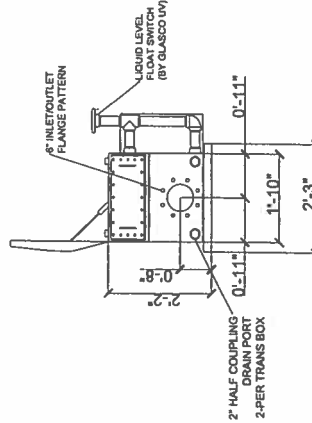
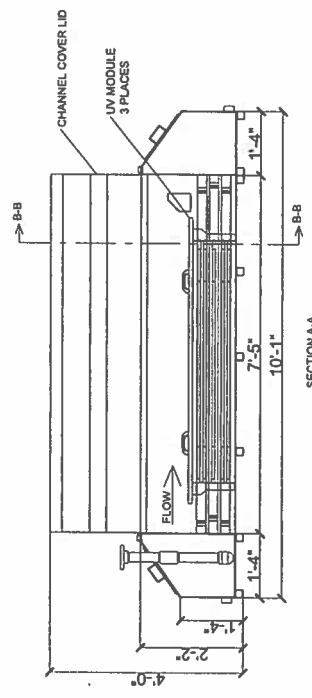
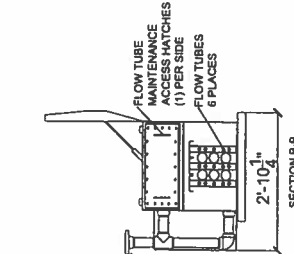
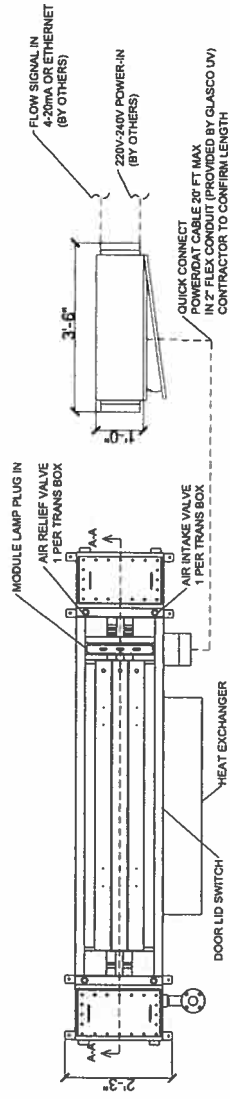
Qty	Description
One (1)	NONCON single bank reactor with internal heat management system. Outdoor gasketing kit
	System has three (3) UV modules – each holding five (5) lamps. Fifteen (15) lamps per channel. Six (6) tubes will extend through reactor.
One (1)	Remote: Ballast Control Center (BCC) NEMA 4X modified Type 304 SS wall mounted enclosure. Includes LEDs, Run Time and UV monitoring systems. System will have a HOA switch.
<b>Spares</b>	
	UV Lamps 2
	Operator safety kit 2
	Cleaning kit 1
	Operation Manuals 3

**NOTES**

1. GLASCO UV's proposes to furnish materials and/or equipment for the above project. Any items not shown above as detailed under 'SCOPE OF SUPPLY', or other attachments to this proposal, are EXCLUDED.
2. Any order resulting from this proposal is subject to the GLASCO UV's Standard Terms of Sale in addition to the following understandings:
  - a. Prices noted will be held valid for a period of 90 days from the date of the proposal.
  - b. Prices are in US Dollars.
  - c. Local or state taxes are not included in this proposal.
3. Please send all purchase orders to Glasco UV, 126 Christie Street, Mahwah, NJ 07430.

**Items not included in our scope**

- a) Ventilation/air conditioning of shelter for electrical cabinet(s) to maintain indoor temperature below 104 F (if applicable; see actual temperature limit for control cabinet).
- b) Structure above UV modules to protect from direct heat as well as from inclement weather.
- c) Mechanical installation labor for installing equipment, cabling and instrumentation.
- d) Lightning surge protection and electrical ground connection.
- e) Valves for isolation of individual systems for dose pacing and/or maintenance/cleaning purposes
- f) Unloading of components supplied by GLASCO UV.
- g) Placement in storage of all components supplied by GLASCO UV.
- h) All required equipment, labor, analysis, etc. for any on-site biological performance tests that may be required (regular support for



<b>Glasco UV LLC</b> 120 Christie Ave. Marlborough, NJ 07430 PH: 201-261-3348 FAX: 201-261-3308		<b>EQUIPMENT LAYOUT</b>	
PROJECT NO. 1202016	DRAWING NO. D	SCALE NONE	SHEET 1 OF 1
DESIGNED BY ES	CHECKED BY AD	DATE 1/20/16	TITLE NONCON-3-5X6

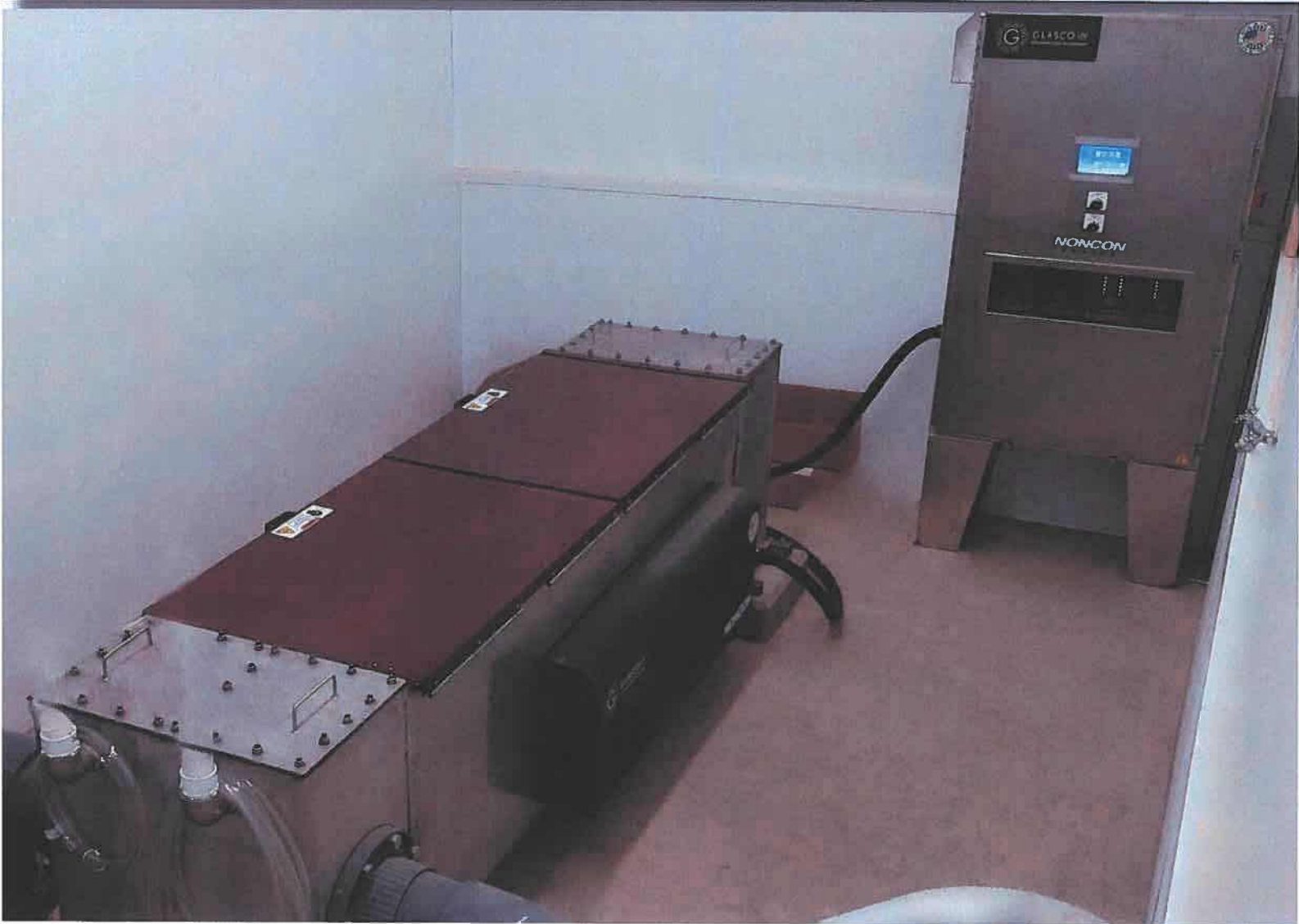
# NONCON

## S E R I E S

### FEP Tube Disinfection



GLASCO UV



## OVERVIEW

The “NONCON 5000” Series is a “flow through” fluoropolymer style of ultraviolet (UV) water and wastewater disinfection systems.

Unlike our other systems where the UV lamps are immersed in the water (using protective quartz sleeves), the “NONCON 5000” uses non conductive transparent fluoropolymer tubes (aka Teflon) to transport the water close to the UV lamps.

The UV lamps are positioned in the air and shine germicidal rays (@ 254 nm) through the fluoropolymer tubes directly at their intended targets, microorganisms. Lamps are not in the water.

## FEATURES

- Stainless steel disinfection reactor
- Low-pressure high-output UV lamps
- Fluoropolymer flow through tubes
- Multi-voltage power (120-277)
- UV monitoring
- Lamp status and run time indicators
- 45 psi pressure-rated
- Remote electronics
- Environmental temperature management
- Air release valves
- Drain ports





## OPERATIONAL OVERVIEW

Systems use special fluoropolymer (FEP) tubes to transport water, wastewater and other liquids in close proximity to the UV lamps. The fluoropolymer tubes are transparent and allow UV light in the 254 nm range to penetrate the tube's walls and disable microorganisms. Lamps are positioned around the tubes in a reflective reactor.

The tubes are manufactured in the United States from a high quality polymer resin. The tubes, which are highly transparent, are neutrally charged (the "non-conductive" in "NONCON") and thus, not susceptible to fouling and scaling from positively charged minerals. In traditional UV systems, the quartz sleeves need to be cleaned.

Over 100 years ago, scientists found that when pathogens were exposed to UV light, their reproduction was limited. The light resided in the UVC range of the spectrum. Specifically, they discovered that light in the 254 nanometer (nm) range was the most effective. When pathogens are exposed to UV light, their cells become damaged and this inhibits reproduction. UV light damages the cell's DNA and RNA and once damaged, they are unable to replicate and therefore, rendered harmless.

The amount of damage is a result of the intensity of the UV light multiplied by the time the water is exposed to the light (time x intensity). The dosage, referred to as microwatts, is often expressed as mJ/cm<sup>2</sup>. Doses > 30,000 microwatt dose (30 mJ) are accepted for wastewater disinfection.



### APPLICATIONS

- Wastewater
- Process waters
- Opaque liquids
- Juices, milks, beverages

### OPTIONS

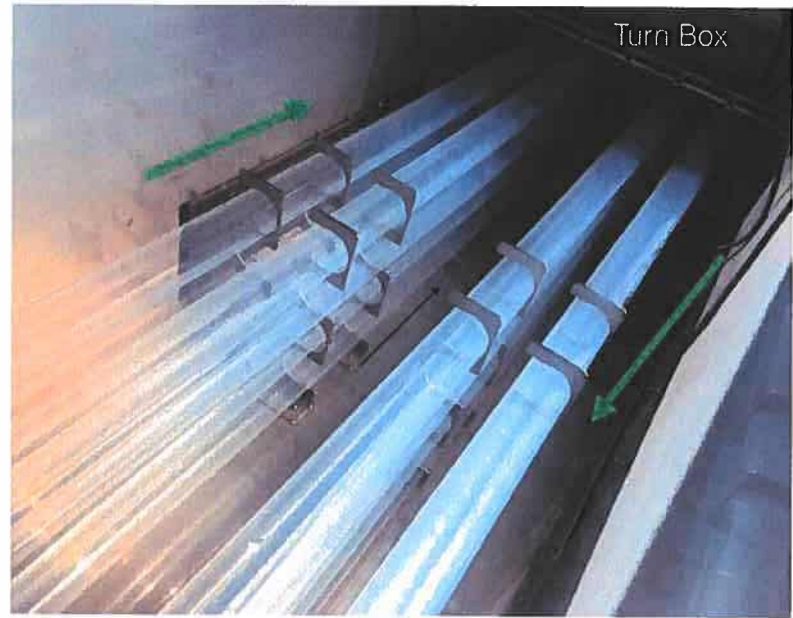
- 80 psi
- PLC controls
- Open channel
- Skid mounting

## CONFIGURATIONS

Piping connects to the "NONCON" reactor via flange or in the case of larger projects, directly into a poured concrete channel. Water or wastewater enters a pressurized transition box and then feeds into a bank of transparent tubes. Water and wastewater travels through the tubes and exits into the discharge pressure box. Tubes are rated at 45 psi.

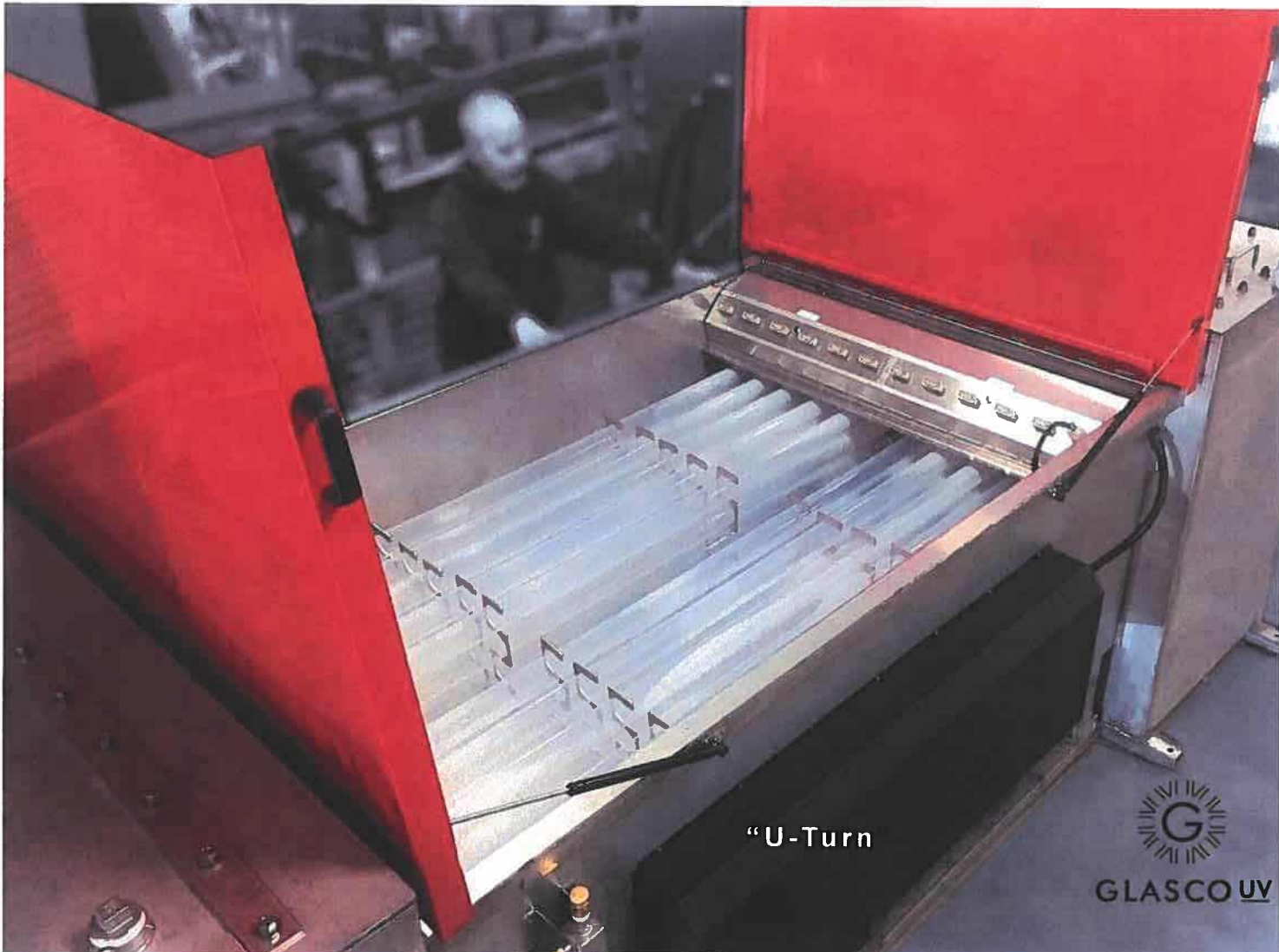
Systems can be provided with redundancy. This can be in the form of "in series", "U-turn" or parallel.

Systems are designed based on a peak flow rate, a UV transmission percentage (UVT%) and information related to the plant's discharge permit. The number of tubes and associated UV lamps are based on the biological testing (bioassay) testing and computational fluid dynamic (CFD) modeling can be supplied in various voltages.



In this "U-Turn" style set up, 2 banks are in the same channel

NONCON - FEP TUBE





# NONCON - FEP TUBE



“In Series”

## INSTALLATION DESIGN

The NONCON uses a remote Ballast Control Center (BCC). This stainless steel enclosure provides a single point of control for operators and removes sensitive components from reactor, which may be damaged in the event of moisture or flooding. The BCC houses ballasts, power controls, operating displays and UV monitor in a controlled environment. NONCON lamps (low-pressure high-output) are sensitive to temperature.

To maintain optimal lamp temperature, reactor will be provided with a heat exchanger.

System has flexibility when designing for redundancy. Standalone, banks “in-series”, “U-turn” box (shown above) or in parallel. Unlike traditional open channel UV systems, the FEP tube systems have very low maintenance costs due to the lack of quartz sleeve fouling.

glascouv.com - info@glascouv.com - phone: 201-934-3348 fax: 201-934-3388 -

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