



ADDENDUM NO. 02

To: Prospective Bidders & Plan Holders

From: Craig A. Johnson, P.E.
Crist Engineers, Inc.

Date: May 20, 2021

Project: Jim Hinkle Spring River
State Fish Hatchery Renovations
Mammoth Spring, Arkansas

Original Bid Date: May 25, 2021

REVISED BID DATE: MAY 27, 2021

Bid Time: 2:00 PM

Location: Crist Engineers, Inc.
205 Executive Court
Little Rock, Arkansas 72205

The BIDDER shall properly acknowledge Addendum No. 02 as required on the Proposal Form as confirmation that the BIDDER has examined the following Addenda and the related changes to the Contract Documents. Lack of proper acknowledgement on the Proposal Form may deem a bid non-responsive.

The Contract Documents dated April 23, 2021, are hereby amended as follows:





Prospective Bidders & Plan Holders

Addendum No. 02

Jim Hinkle Spring River State Fish Hatchery Renovations

Page 2 of 4

The bid opening for this project has changed from the Bid Set documents.

The Bid Date per this Addendum (Addendum No. 02) is **MAY 27, 2021** at 2:00 PM.

Please reference Section 002113 - Instructions to Bidders, provided in the contract documents for information required for the bid submission.

BID DOCUMENTS:

1. Table of Contents:

- a. Delete the Table of Contents and add Table of Contents Addendum No. 02 attached hereto.

2. Bond:

- a. In lieu of the Bond from provided in the Contract Documents, the prospective bidder may provide AIA 310 or EJCDC C 435 Bid Bond in the amount of 5% of the amount bid.

3. Instructions to Bidders:

- a. Delete the last sentence in Paragraph III.F. and add the following:
 - i. "Documents required for the submission of the Bid will be identified on the Proposal Form."
- b. Delete the last three sentences in Paragraph XI.

4. Special Provisions:

- a. Add the following paragraph to the Special Provision – Employment of Labor
 - i. "The Special Provision provided in the Employment of Labor section of this section shall govern the contract regardless of reference in other Bid Documents or Specifications".

GENERAL CONDITIONS:

1. Section 010000 – General Requirements:

- a. Delete the first and second sentence of Paragraph 1.5.A as follows:
 - i. "Working hours shall be defined in the Contract."



Prospective Bidders & Plan Holders

Addendum No. 02

Jim Hinkle Spring River State Fish Hatchery Renovations

Page 3 of 4

SPECIFICATIONS:

1. Add the following specifications to the project documents attached hereto:
 - a. Section 015713 – Temporary Erosion and Sediment Control – Addendum No. 02
 - b. Section 017329 – Cutting, Coring, and Patching - – Addendum No. 02
 - c. Section 026600 – Dewatering and Drainage - – Addendum No. 02
 - d. Section 331401 – Watertightness for Hydraulic Structures - – Addendum No. 02
2. Section 221100 – DIP and PVC Pipe and Fittings:
 - a. Delete in its entirety and replace with DIP and PVC Pipe and Fittings – Addendum No. 02
3. Section 444300 – Mechanically Cleaned Bar Screens:
 - a. Delete in its entirety and replace with Section 444300 – Mechanically Cleaned Bar Screens – Addendum No. 02 attached hereto.
4. Section 444350 – Belt Conveyor
 - a. Delete in its entirety and replace with Section 444350 – Belt Conveyor – Addendum No. 02 attached hereto.
5. Section 444473 Ultraviolet Disinfection Equipment
 - a. Modify Paragraph 2.1A. as follows:
 - i. “The UV systems shall be Ultraaqua Models MR3-220-SS, **Trojan UVLogic 03AS20** for the 40 gpm unit, and MR6-350-SS, **Trojan UVLogic 06AL30** for the 260 gpm unit, or equivalent units from Glasco, Aquioncs, or equal.

DRAWINGS:

1. Sheet No. 01 – Demolition and Construction Plan:
 - a. Modify this sheet as shown on the Addendum No. 2 – Contractor Storage Area, attached hereto.
 - b. Add the following note:

“8. THE PROJECT IS AN ACTIVE FISH HATCHERY AND SHALL REMAIN IN SERVICE THROUGHOUT ALL CONSTRUCTION ACTIVITIES. AT NO TIME SHALL WATER FLOW BE DISRUPTED OTHER THAN NOTED ON THE PLANS FOR THE WATER SUPPLY DUCTS.”
2. Sheet No. 02 – Tank Layout and Details
 - a. Delete Note 1 and replace as follows:



Prospective Bidders & Plan Holders

Addendum No. 02

Jim Hinkle Spring River State Fish Hatchery Renovations

Page 4 of 4

- i. "1. PIPE SHALL BE DIP OR PVC AS SHOWN ON THE PLANS"
 - b. Delete Note 2 and replace as follows:
 - i. "2. ALL FILL PLACED FOR CONSTRUCTION OF THE PIPING AND TANKS SHALL BE SELECT FILL MEETING THE REQUIREMENTS OF SECTION 312316 – EXCAVATING, BACKFILLING, AND COMPACTING FOR STRUCTURES."
 - c. Add the following note:
 - i. "3. Spoil material removed for the demolition of the existing tanks and appurtenances can be utilized as backfill such that the material is compliance with Section 312316 – Excavating, Backfilling, and Compacting for Structures.
 - d. Add the following note:
 - i. "4. Where stainless steel is noted it shall be stainless steel grade 304.
- 3. Sheet No. 09 –Screens:
 - a. Modify this sheet as shown on the Addendum No. 02 – Section 1, Bar Screen – West attached hereto.
- 4. Sheet No. 09 –Screens:
 - a. Modify this sheet as shown on the Addendum No. 02 – Section 2, Bar Screen - East attached hereto.
- 5. Sheet No. 10 – Screen Electrical Plan
 - a. Modify this sheet as sown on the Addendum No. 02 – Screen Electrical attached hereto.
- 6. Sheet No. 18 – Misc Photos 2:
 - a. Modify this sheet as shown on Addendum No. 02 – Misc Photo 6, attached hereto.
- 7. Sheet No. 20 – Misc Photos 4:
 - a. Add Photograph 12 as shown on Addendum No. 02 – Misc Photo 12, attached hereto.
 - b. Add Photograph 13 as shown on Addendum No. 02 – Misc Photo 13, attached hereto.

END ADDENDUM NO. 02

TABLE OF CONTENTS

**JIM HINKLE SPRING RIVER
STATE FISH HATCHERY RENOVATIONS**

TITLE	NO. OF PAGES
ADVERTISEMENT FOR BIDS	1
BID SUBMISSION REQUIREMENT	1
PROPOSAL FORM	4
BOND	2
CONTRACT	20
INSTRUCTIONS TO BIDDERS	5
LIEN RELEASE REQUIREMENT	1
GENERAL SPECIFICATIONS	23
SPECIAL PROVISIONS	2
PERFORMANCE BOND	3
PAYMENT BOND	4

TECHNICAL SPECIFICATIONS.....NO. OF PAGES

DIVISION 01 - GENERAL REQUIREMENTS

010000	GENERAL REQUIREMENTS	4
013000	ADMINISTRATIVE REQUIREMENTS	3
013300	SUBMITTAL PROCEDURES	3
014000	QUALITY REQUIREMENTS.....	2
015000	TEMPORARY FACILITIES AND CONTROLS.....	3
015713	TEMPORARY EROSION AND SEDIMENT CONTROL	6
016000	MATERIAL AND EQUIPMENT	4
017329	CUTTING, CORING, AND PATCHING.....	6
017516	STARTING OF SYSTEMS.....	2
017700	CLOSEOUT PROCEDURES	4
017823	OPERATION AND MAINTENANCE DATA.....	4

DIVISION 02 - SITE WORK

026600	DEWATERING AND DRAINAGE	4
--------	-------------------------------	---

DIVISION 03 - CONCRETE

031513	WATERSTOPS.....	3
033100	STRUCTURAL CONCRETE.....	7
036000	GROUT	4

DIVISION 04 - MASONRY

042200	CONCRETE MASONRY UNITS.....	9
042201	WATER-REPELLENT FOR CMUs	2
042202	WATER-REPELLENT FOR MORTAR.....	2

DIVISION 05 - STEEL

055000	MISCELLANEOUS STEEL FABRICATIONS.....	7
--------	---------------------------------------	---

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

061000	ROUGH CARPENTRY	7
061001	CARPENTRY	5
061500	WOOD DECKING	5
061723	SHOP FABRICATED WOOD TRUSSES.....	5
066000	TRENCH DRAINS (FOR HYDRAULIC LINE ENCLOSURE).....	2
066001	FIBERGLASS REINFORCED PLASTIC GRATING	4

DIVISION 07- THERMAL AND MOISTURE PROTECTION

071900	WATER REPELLENT	4
072100	INSULATION	2
076110	STANDING SEAM SHEET METAL ROOFING SYSTEM.....	7
079200	JOINT SEALANTS.....	7

DIVISION 08 - OPENINGS

081113	DOORS AND FRAMES	5
087100	DOOR HARDWARE	8

DIVISION 09 - FINISHES

099000	PAINTING.....	12
099600	TANK COATING.....	4

DIVISION 22 - PLUMBING

221100	DIP AND PVC PIPE AND FITTINGS.....	7
221101	STEEL PIPE AND FITTINGS	8
221102	STAINLESS STEEL PIPE.....	3
221150	GROOVED PIPE SYSTEM.....	4

221200	TELESCOPING VALVES	2
221300	DOWNWARD OPENING WEIR GATES AND BOXES.....	3
221400	GATE VALVES AND BUTTERFLY VALVES.....	5
226610	HYDROSTATIC TESTING OF WATER DISTRIBUTION SYSTEM.....	2
DIVISION 23 - UTILITIES		
230604	EXHAUST FANS	2
233100	GRAVITY WASTEWATER LINE	6
233913	MANHOLES, FRAMES, AND COVERS	8
DIVISION 26 - ELECTRICAL		
260500	ELECTRICAL RELATED WORK.....	3
260519	LOW VOLTAGE CONDUCTORS AND CABLES	4
260526	GROUNDING FOR ELECTRICAL SYSTEMS.....	3
260529	ELECTRICAL SUPPORTING DEVICES	3
260533	ELECTRICAL RACEWAYS	3
260534	ELECTRICAL BOXES AND FITTINGS.....	4
262418	LOAD CENTERS.....	3
262726	ELECTRICAL WIRING DEVICES	3
262816	ENCLOSED SWITCHES	3
265100	INTERIOR LIGHTING	2
DIVISION 27 - COMMUNICATIONS		
271500	COMMUNICATIONS CABELING	3
DIVISION 31 - EARTHWORK		
312300	TRENCH AND EXCAVATION SAFETY SYSTEM.....	1
312302	EXCAVATING FOR UTILITIES	6
312316	EXCAVATING, BACKFILLING AND COMPACTING FOR STRUCTURE .	7
312333	TRENCH EXCAVATING, BACKFILLING AND COMPACTING FOR PIPE	9
DIVISION 32 – EXTERIOR IMPROVEMENTS		
321216	ASPHALT PAVEMENT REPAIR	4
DIVISION 33 – UTILITIES		
331401	WATERTIGHTNESS TEST FOR HYDRAULIC STRUCTURES.....	4
DIVISION 44 – POLLUTION AND WASTE CONTROL EQUIPMENT		
444300	MECHANICALLY CLEANED BAR SCREENS	9
444350	BELT CONVEYOR	4

444400	PERFORATED PLATE SCREENS.....	1
444473	ULTRAVIOLET DISINFECTION EQUIPMENT	5

APPENDIX A OSHA

SECTION 015713

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. In all respects during prosecution of the Work called for by the Contract Documents, Contractor shall minimize the discharge of stormwater pollutants from the construction activity.
- B. The work shall be so planned and executed so as to prevent siltation of area streams, ditches, swales, and drainages. Barriers, silt fences and filters shall be constructed as necessary by the Contractor to intercept and impede silt or debris laden runoff from the construction site and prevent excessive quantities of silt and debris from reaching area streams and drainages.
- C. Barriers and filters shall be constructed as necessary by the Contractor to intercept and impede silt or debris laden runoff from the construction site and prevent excessive quantities of silt and debris from reaching area streams and drainages.
- D. The Contractor shall complete, for the Owner, all Storm Water Permit forms, as necessary and as required by the Arkansas Energy & Environment – Environmental Quality (AEE-EQ), and send to the Engineer for Owner signature and forwarding to AEE-EQ, as required. The Contractor shall be responsible for any and all fees, notices, notice of intent, notice of termination, disclosure statements, storm water pollution prevention plan, etc. associated with obtaining the Storm Water Permit. The Contractor shall prepare the Storm Water Pollution Prevention Plan (SWPPP), as required, for the project in accordance with AEE-EQ regulations. The Contractor shall submit all forms and the SWPPP, as required, to the Engineer for Owner signature and forwarding to AEE-EQ.
- E. If the disturbed area is less than 1 acre, the Notice of Coverage (NOC) and the SWPPP are not required. The Contractor shall prepare a drawing showing location and details of silt fences, barriers, etc. that the Contractor plans to install. The Contractor shall give the drawing to the Owner and Engineer for review. The Contractor shall follow Best Management Practices (BMP's) in accordance with AEE-EQ requirements.
- F. Permit and other required documents to be in the name of the Owner.
- G. The Contractor shall be responsible for implementing the SWPPP (if a SWPPP is required by AEE-EQ) and/or runoff control measures including maintenance of the SWPPP, maintenance of control features, conducting inspections, implementing best management practices, site posting, and responsible for plan amendments. Contractor shall be responsible for the cost of all claims, losses, fines, penalties, or damages charged to Owner or Engineer due to Contractor's failure to comply with the requirements of the NPDES Storm Water Permit.
- H. Contractor shall, on Owner/Operator's behalf, execute all applicable requirements and discharge all duties as may be required for this project as described in AEE-EQ issued Construction General Permit titled "Authorization to Discharge Stormwater Under the National Pollutant Discharge Elimination system and the Arkansas Water and Air Pollution Control Act" including, but not limited to:

- 1. Complete and post the NOC using forms acceptable to AEE-EQ;

2. Timely preparation of the SWPPP, using a format acceptable to AEE-EQ;
 3. Ensuring that the site is in compliance with any changes or updates of the Permit;
 4. Select, install, implement, and maintain best management practices at the construction site that minimize pollutants in stormwater discharges so as to meet applicable water quality standards;
 5. Provide qualified personnel to conduct inspections and prepare inspection reports;
 6. Maintain a file on site containing documents required by the SWPPP;
 7. Achieve final stabilization;
 8. Prepare and submit the NOT;
 9. Execute other requirements as may be required by AEE-EQ and the Permit.
 10. The Contractor shall be responsible for all fees, notices, notice of intent, notice of termination, disclosure statements, etc. associated with obtaining the Storm Water Permit.
- I. The Contractor shall not begin construction before the Notice of Coverage (NOC) and SWPPP is posted at the construction site. According to current AEE-EQ regulations, if the disturbed area is less than 1 acre the NOC and SWPPP are not required. If the disturbed area will be less than one acre, the Contractor shall submit a letter to the Owner stating such. The Contractor shall be required to use Best Management Practices if the disturbed area is less than one acre.
- J. All costs pertaining to items specified in this section shall be at the expense of the Contractor.

1.2 SECTION INCLUDES

- A. Temporary measures required to control erosion and sediment during construction. This includes measures to meet the requirements of the NPDES administered by the Environmental Protection Agency and the Arkansas Department of Environmental Quality, including but not limited to:
1. Temporary hay bale dikes;
 2. Stabilized construction entrance;
 3. Silt fence;
 4. Rock Check/Sand Bag Dams and/or Velocity Dissipation Devices;
 5. Storm Water Pollution Prevention Plan (SWPPP).

1.3 SUBMITTALS

- A. Submit in accordance with Section 013300 - Submittals. Submit only on items required by the work.
- B. Submit the SWPPP, if required.
- C. Product Data:
1. Provide storm water prevention measures for compliance with approved and appropriately maintained SWPPP.
 - a. Hay Bales
 - b. Silt Fences
 - c. Sand Bag Ditch Checks
 - d. Rock Ditch Checks
 - e. Sediment Basins

- f. Rock Check Outlet Structures
 - g. Temporary Seeding Stabilization
 - h. Filter Fabric
 - i. Other approved SWPPP control measures as approved by AEE-EQ
- 2. Non-woven filter fabric
 - a. Inspection Reports and Certificates:
 - b. Submit periodic inspection reports and certificates required for SWPPP.
 - c. Submit Contractor/Subcontractor certifications required for SWPPP.
- D. Submit revisions or modifications to the erosion and sediment control plan and SWPPP.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hay bales shall weigh a minimum of fifty (50) pounds and shall be at least thirty (30) inches in length. Bales shall be composed entirely of vegetable matter and be free of seeds. Binding shall be either wire or nylon string, jute or cotton binding is unacceptable. Bales shall be used for not more than two months before being replaced. However, if weather conditions cause biological degradation of the hay bales, they shall be replaced sooner than the two-month time period to prevent a loss of structural integrity of the hay bale dike.
- B. Stone material shall consist of rip-rap conforming to Arkansas Department of Transportation Standard Specifications and shall be placed as shown or in a layer of at least 12 inches thick.
- C. Geotextile Fabrics shall be a non-woven polypropylene fabric designed specifically for use as a soil filtration media. Fabric shall have an approximate weight of 6 oz/yd², and shall conform to the following:

<u>Designation</u>	<u>Topic</u>	<u>Value</u>
ASTM D4632	Grab Strength (lbs.)	200
ASTM D4632	Grab Elongation	15%
ASTM D4533	Trapezoidal Tear (lbs.)	50
ASTM D751	Burst (psi)	320
ASTM D751	Puncture (psi)	80

ASTM D4751 Equivalent Opening Size (EOS) (mm)-soil retention.

<u>For Soils in Which:</u>	<u>EOS:</u>
50% or less passes a #200 mesh sieve	Greater than a #30 sieve
More than 50% passes a #200 mesh sieve	Greater than a #50 sieve

ASTM D4491 Permeability (k):

<u>For Soils in Which:</u>	<u>EOS:</u>
Critical/Severe:	k (fabric) >10k (soil)
Normal Applications:	k (fabric) >k (soil)

- D. Geotextile Silt Fence Fabric shall be a nylon reinforced polypropylene fabric having a reinforcing cord running the entire length to the top edge of the fabric. The fabric must meet or exceed the following criteria:

<u>Test Designation</u>	<u>Topic</u>	<u>Average Roll Minimum Value</u>
ASTM D4632	Grab Strength (lbs.)	90 lbs. @ 12"/minute
ASTM D4632	Grab Elongation	15% @ 12"/minute
ASTM D4751	Equivalent Opening Size (EOS)	U.S. sieve No. 20
ASTM D4491	Permittivity	>.01 sec.-1
ASTM D4355	U.V Resistance (500 hours exposure)	70%

- E. Fence Posts for Silt Fence shall be steel "T" posts of sufficient length to support the silt fence system.
- F. Woven Wire Support for Silt Fence: W1.4, 4" x 4", zinc coated (galvanized) steel woven wire fabric conforming to ASTM A116.
- G. Corrugated Metal Pipe: 16-gauge helical wound galvanized corrugated metal pipe.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Prepare SWPPP on behalf of the Owner as required by AEE-EQ. The Contractor shall be responsible for reading and being thoroughly familiar with the permit and the storm water pollution prevention plan (SWPPP).
- B. The Contractor shall follow all requirements of AEE-EQ Short Term Activity Authorizations and Corps of Engineers Permits.
- C. Locate and protect survey horizontal and vertical control.
- D. Contractor shall install silt fencing as necessary to prevent siltation of area streams, ditches, swales, and drainages.

3.2 MAINTENANCE

- A. Maintain erosion control devices as necessary to comply with the NPDES Storm Water Permit and Pollution Prevention Plan. This includes any revisions or modifications to the SWPPP. Any work required for modifications, revisions, and maintenance shall be the responsibility of the Contractor and shall not be a basis for additional compensation.
- B. Maintain existing erosion and sedimentation control systems located within the project site.
- C. Inspect and repair or replace components of all erosion and sedimentation control systems as specified for each type of system. Unless otherwise directed, maintain the erosion and sedimentation control systems until the project is accepted by the Owner. Remove erosion and sedimentation control systems promptly when directed by the Owner. Discard removed materials off site.
- D. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damages caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately.

- E. Remove and dispose of sediment deposits. Offsite disposal will be the responsibility of the Contractor. Sediment to be placed at the project site shall be spread, compacted and stabilized in accordance with the Owner's directions. Sediment shall not be allowed to flush into stream or drainage way. If sediment has been contaminated, it shall be disposed of in accordance with existing federal, state and local regulations.
- F. Unless otherwise indicated, compact embankments, excavations, and trenches by mechanically blading, tamping, and rolling soil in maximum 8-inch lifts. Compaction density shall be at a minimum of 90 percent Standard Proctor ASTM D-698 density. Protect embankments from erosion by grassing or other Owner approved methods.

3.3 TEMPORARY HAY BALE DIKE

- A. Install where shown or as needed for erosion control.
- B. Hay bales shall be embedded a minimum of four (4) inches and securely anchored using 3/8-inch diameter steel stakes or 2" x 2" wood stakes driven through the bales into the ground a minimum of six (6) inches. Hay bales are to be placed directly adjacent to one another leaving no gap between them.

3.4 CONSTRUCTION ENTRANCE

- A. When necessary, wheels must be cleaned to remove sediment prior to entrance onto public right-of-way. When washing is required, it shall be done on an area stabilized with crushed stone (Type "A" rip-rap) which drains into an approved sediment trap or sediment basin. All sediment shall be prevented from entering any storm drain, ditch or watercourse using approved methods.

3.5 SILT FENCE

- A. Silt fences shall be constructed as needed and as required by the NPDES permit to prevent siltation of area streams, ditches, swales, and drainages.
- B. Silt fence shall consist of nylon reinforced polypropylene netting supported by woven wire mesh, W1.4 x W1.4 and galvanized steel posts set a minimum depth of 2 feet and spaced not more than 6 feet on center. A 6-inch wide trench is to be cut 8 inches deep at the toe of the fence on the uphill side to allow the fabric to be laid below the surface and backfilled. Fabric shall overlap at abutting ends a minimum of 3 feet, and shall be joined such that no leakage or bypass occurs. Remove accumulated sediment when the depth reaches 6 inches.

3.6 ROCK CHECK/ SAND BAG CHECK DAM

- A. Rock Check/Sand Bag Dams shall be constructed as needed and as required by the NPDES permit to reduce velocity in channels. Geotextile fabric shall be placed beneath the rock and shall conform to these specifications.

3.7 SEDIMENT BASIN WITH STONE AND PIPE OUTLET

- A. Provide sediment basins as needed and as required by the NPDES permit at locations as needed by Contractor's construction sequence and operations.
- B. Install stone and pipe outlets for sediment basin at location shown and/or located as needed by Contractor's construction sequence and as required by the NPDES permit.

- C. Inspect sediment basin after each rainfall, daily during periods of prolonged rainfall, and a minimum of once a week. Maintain basin dimensions necessary to obtain the needed basin volume. Repair and replace damaged components of the basin.

3.8 DIVERSION DIKE

- A. Diversion dikes shall be installed prior to and maintained for the duration of construction and shall intercept no more than five (5) acres of runoff. Dikes shall have a minimum top width of 2 feet and a minimum height of compacted fill of 18" measured from the top of the existing ground at the up-slope toe to top of the dike and having side slopes of 3:1 or flatter. The channel which is formed by the dike must have a minimum slope of one (1) percent for the entire length to an outlet. When the slope exceeds three (3) percent, or velocities exceed one foot per second (regardless of slope), stone stabilization is required. Plant grass on dikes not requiring stone stabilization.

3.9 STORM WATER POLLUTION PREVENTION PLAN (SWPPP) – AS REQUIRED

- A. Contractor's SWPPP shall conform with requirements of Arkansas Department of Environmental Quality.

3.10 NOTICE OF INTENT (NOI), NOTICE OF TERMINATION (NOT) – AS REQUIRED

- A. Contractor shall submit a Notice of Intent (NOI) at least 48 hours prior to the start of construction.
- B. Contractor shall submit a Notice of Termination (NOT) as required by the NPDES regulations.

END OF SECTION

SECTION 017329

CUTTING, CORING, AND PATCHING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section covers the cutting, coring, rough and finished, patching of holes and openings. Holes and opening may be in existing construction, or in parts of new construction. Procedures for cutting and patching will be the same for either condition.
- B. All cutting, coring, and rough patching shall be performed by the Contractor or Prime Contractor requiring the opening. Finish patching shall be the responsibility of the Contractor or Prime Contractor requiring the opening and shall be performed by the trade associated with the application of the particular finish.
- C. Provide all cutting, fitting and patching, including attendant excavation and backfill, required to complete the work or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of the work to provide for installation of ill-timed or improperly scheduled work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of Contract Documents.
 - 5. Remove samples of installed work as specified for testing.
 - 6. Provide penetrations of structural surfaces and materials for installation of piping, ductwork, equipment and electrical conduit.
 - 7. Provide penetrations of non-structural surfaces and materials for installation of piping, ductwork, equipment and electrical conduit. The determination of what is a nonstructural surface or material shall be made by the Engineer.
 - 8. Remove, install, or relocate materials or equipment.

1.2 RELATED WORK

- A. Section 010000 – Basic Requirements.
- B. Division 02 – Demolition.
- C. Division 03 – Concrete.
- D. Division 08 – Openings.
- E. Division 22 – Plumbing.
- F. Division 23 – Heating, Ventilation, and Air Conditioning.
- G. Division 26 – Electrical.
- H. Division 33 – Utilities.
- I. Division 46 – Water/Wastewater Equipment.

- J. Section 013300 – Submittal Procedures.
- K. Section 0266000 – Dewatering and Drainage.

1.3 SUBMITTALS

- A. Submit, in accordance with Section 013300 “Submittal Procedures”, a written request prior to executing any cutting or alteration which is not shown or detailed on the contract documents which affects or requires:
 - 1. Cutting structural members.
 - 2. Holes drilled in beams or other structural members.
 - 3. Work of the Owner or any separate contractor.
 - 4. Structural value or integrity of any element of the project.
 - 5. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 6. Efficiency, operational life, maintenance or safety of operational elements.
 - 7. Visual qualities of sight-exposed elements.
- B. Request shall include:
 - 1. Identification of the project.
 - 2. Description of affected work.
 - 3. The reason for cutting, alteration or excavation.
 - 4. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of project.
 - 5. Description of proposed work:
 - a. Method and extent of cutting, patching, alteration, or excavation.
 - b. Trades who will execute the work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 - 6. Alternatives to cutting and patching.
 - 7. If the work is considered out of scope, provide a cost proposal.
 - 8. Confirmation of coordination with any separate contractor whose work will be affected.
 - 9. Related shutdown requests if required to do the work.
 - 10. Request for hot work permit if required to do the work.
- C. Submit written notice to the Engineer designating the date and the time the work will be uncovered.
- D. When a written request is required, do not proceed with the work until a written notice to proceed is received from the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with specifications and standards for each specific product involved. Where there is no equivalent specification, the Contractor shall notify the Engineer who will provide a specification for the materials to be used.
- B. Concrete and grout for rough patching shall be as specified in Divisions 03 – Concrete.

- C. Materials for finish patching shall be equal to those of adjacent construction. Where existing materials are no longer available, use materials with equivalent properties and that will provide the same appearance. The materials are to be approved by the Engineer prior to their use.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of products, or performance of work.
- C. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with work until the Engineer has provided further instructions.

3.2 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
- B. Protect surrounding materials and equipment prior to starting work.
- C. Contain and control cooling liquids and slurry produced by the cutting and coring operations.
- D. When the cutting or coring will result in the structure or equipment being exposed to provide adequate weather protection.
- E. Provide dewatering for excavation work in accordance with Section 026600 "Dewatering and Drainage".

3.3 PERFORMANCE

- A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
- B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work. When excavating in close proximity to piping, duct banks or other items subject to damage, use hand excavation.
- C. All equipment and workplace safety shall conform to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring and maintenance.
- D. Where possible, employ original installer or fabricator to perform cutting and patching for:
 - 1. Weather-exposed or moisture-resistant elements.
 - 2. Sight-exposed finished surfaces.
- E. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

- F. Restore work which has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.
- G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish entire unit.
- H. Remove rubble and excess patching materials from the premises.

3.4 CORING

- A. All coring shall be performed in such a manner as to limit the extent of patching. Locate the rebar before coring to minimize cut throughs.
- B. Coring shall be performed with an approved non-impact rotary tool with diamond core drills.
- C. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.
- D. Fit work to minimize space to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- E. Fit to pipes and other penetrations in tanks to be water tight using seals or other methods defined in the specifications.
- F. All holes cut through concrete and masonry walls, slabs or arches shall be core drilled unless otherwise approved. All work shall be performed by mechanics skilled in this type of work.
- G. If holes are cored through floor slabs they shall be drilled from below where possible. If holes are drilled from above, provide protection and containment below the area being drilled to catch the plug and contain liquid and slurry.

3.5 CUTTING

- A. All cutting shall be performed in such a manner as to limit the extent of patching.
- B. Fit work to minimize space to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- C. Cutting shall be performed with a concrete saw and diamond saw blades of proper size.
- D. Provide for control of slurry generated by sawing operation on both sides of wall and from below if cutting a floor.
- E. When cutting a reinforced concrete wall or floor, the cutting shall be done so as not to damage the bond between the concrete and reinforcing steel left in structure. Cut shall be made so that steel neither protrudes nor is recessed from face of the cut.
- F. Adequate bracing of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.

- G. Provide equipment of adequate size to remove cut panel.
- H. Saw cut concrete and masonry prior to breaking out sections.
- I. Install work at such time as to require the minimum amount of cutting and patching.
- J. All cutting of structural members shall be done in a manner directed by the Engineer.
- K. Cut opening only large enough to allow easy installation of the equipment, ducting, piping, or conduit.
- L. When existing conduits or pipe sleeves are cut off at the floor line or wall line, they shall be filled with grout or suitable patching material.

3.6 PROTECTION

- A. Provide devices and methods to protect other portions of project from damage.
- B. Provide protection from elements for that portion of the project which may be exposed by cutting and patching work.
- C. Maintain excavations free from water.

3.7 PATCHING

- A. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown.
- B. Finish patching shall match existing surfaces as approved.
- C. Patching shall be of the same kind and quality of material as was removed.
- D. The completed patching work shall restore the surface to its original appearance or better.
- E. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed to include the joint between the existing material and the patch.
- F. Equipment damaged during cutting and patching shall be replaced or repaired by the equipment manufacturer, at the Engineer's sole discretion and at the expense of the Contractor doing the work.
- G. Repaint any damage to factory applied paint finishes using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted in accordance with the field painting requirements specified, at the expense of the Contractor doing the work.
- H. Slurry or tailings resulting from coring or cutting operations shall be contained and vacuumed or otherwise removed from the area following drilling or cut.
- I. Equipment shall be protected against mechanical and water damage during cutting and patching. Provide protective covers or use other means such as temporary relocation to protect equipment that is at risk of damage from the cutting and patching.

- J. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.

END OF SECTION

SECTION 026600

DEWATERING AND DRAINAGE

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Obtain and pay for all permits required for temporary dewatering and drainage. Display and maintain original permits in a prominent location at the site prior to construction of the drainage system.
- B. Furnish the services of a licensed professional engineer, registered in the state in which the project is located, to prepare dewatering and drainage system designs and submittals.
- C. Furnish, install, operate, monitor, maintain and remove temporary dewatering and drainage systems as necessary to lower and maintain groundwater levels below subgrades of excavation to permit construction in-the-dry. Prevent surface water runoff from entering or accumulating in excavation.
- D. Collect and properly dispose of all discharge water from dewatering and drainage systems in accordance with local and State requirements, permits, and any special provisions of Section 013200.
- E. Repair damage caused by dewatering and drainage system operations.
- F. Remove temporary dewatering and drainage systems when no longer needed. Restore all disturbed areas.

1.2 RELATED WORK

- A. Section 311000 – Site Preparation
- B. Section 015713 – Sedimentation and Erosion Control
- C. Section 329219 – Seeding for Site Restoration

1.3 SUBMITTALS

- A. Submit in accordance with Section 013300 all temporary dewatering and drainage system designs. Dewatering and drainage system designs shall be prepared by a licensed professional engineer, registered in the state in which the Work is located, having a minimum of five years of professional experience in the design and construction of dewatering and drainage systems. Submittal will be for information purposes only. Contractor shall retain responsibility for adequacy and safety of construction means, methods and techniques.
- B. In accordance with Section 013300, submit copies of all required permits prior to installing and operating dewatering and drainage systems.

1.4 DEFINITIONS

- A. Where the phrase "in-the-dry" is used in these specifications, it shall be defined as in situ soil moisture content of no more than two (2) percentage points above the optimum moisture content for that soil.

1.5 DESIGN AND PERFORMANCE RESPONSIBILITY

- A. The Contractor is responsible for the design and execution of methods for controlling surface water and groundwater.
- B. The Contractor is responsible for repairing damage to properties, buildings or structures, sewers and other utility installations, pavements, and work that may result from dewatering or surface water control operations.
- C. Design review and field monitoring activities by the Owner or the Engineer shall not relieve the Contractor of responsibility for the work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe for observation wells, if required, shall consist of 1-in. I.D. minimum, Schedule 80 PVC pipe and machine slotted PVC wellpoints, maximum slot size 0.020-in.

PART 3 - EXECUTION

3.1 GENERAL

- A. Control surface water and groundwater such that excavation to final grade is made in-the-dry and bearing soils are maintained undisturbed. Prevent softening, or instability of, or disturbance to, the subgrade due to water seepage.
- B. Provide protection against flotation for all work.
- C. The impact of anticipated subsurface soil/water conditions shall be considered when selecting methods of excavation and temporary dewatering and drainage systems. Where groundwater levels are above the proposed bottoms of excavations, a pumped dewatering system is expected for predrainage of the soils prior to excavation to final grade and for maintenance of the lowered groundwater level until construction has been completed to such an extent that the foundation, structure, pipe, conduit, or fill will not be floated or otherwise damaged. Type of dewatering system, spacing of dewatering units, and other details of the work are expected to vary with soil/water conditions at a particular location.
- D. At least two (2) weeks prior to the start of construction in any areas of anticipated dewatering, submit to the Engineer for review a proposed plan for removal of water, a method(s) of excavation, and a method(s) of excavation support. Do not proceed with construction in any of these areas until the initial plan has been reviewed and commented upon by the Engineer. It is expected that the initial plan may require modification to suit any variable soil/water conditions encountered on the construction site.

3.2 SURFACE WATER CONTROL

- A. Control surface water runoff to prevent flow into excavations. Provide temporary measures such as dikes, ditches and sumps.
- B. Collect precipitation or surface runoff in shallow ditches around the perimeter of the excavation, drain to sump, and pump from the excavation to maintain in-the-dry conditions.

3.3 EXCAVATION DEWATERING

- A. Provide and maintain adequate equipment and facilities to remove promptly and dispose of properly all water entering excavations. Excavations shall be kept in-the-dry, so as to maintain all undisturbed subgrade conditions throughout construction below grade, including backfill and fill placement.
- B. Pipe and conduit shall not be installed in water or allowed to be submerged prior to backfilling. Pipe and conduit that becomes submerged shall be removed and the excavation dewatered and restored to proper conditions prior to reinstalling the pipe and conduit.
- C. Excavation for foundations and structures shall be maintained in-the-dry for a minimum of four days after concrete placement. In no event shall water be allowed to enter an excavation and rise to cause unbalanced pressure on foundations and structures until the concrete or mortar has set at least 24 hours.
- D. Dewatering and drainage operations shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade at the bottom of the excavation. If the subgrade becomes disturbed for any reason, the unsuitable subgrade material shall be removed and replaced with concrete, compacted granular fill, or other approved material to restore the bearing capacity of the subgrade to its original undisturbed condition.

3.4 WELL POINT SYSTEM

- A. As part of the dewatering system, a vacuum wellpoint system may be required around the excavation to dewater granular soils. Each wellpoint and riser pipe shall be surrounded by a sand filter. Sand shall be of such a gradation that, after initial development of wellpoints, the quantity and size of soil particles discharged shall be negligible. The wellpoint system shall be capable of operating continuously under the highest possible vacuum.
- B. The installation of the well point system shall be done under the supervision of a qualified representative of the wellpoint equipment supplier.

3.5 DISPOSAL OF DRAINAGE

- A. All water discharged from temporary dewatering and drainage systems shall be disposed of in accordance with the sedimentation and erosion control plans as specified in Section 015713. Existing or new sanitary sewer systems shall not be used to dispose of drainage unless the written permission of the utility or Owner is obtained.
- B. Dispose of drainage to prevent flow or seepage back into excavated areas. Disposal area shall be approved by the Engineer.

3.6 GROUNDWATER OBSERVATION WELLS

- A. Prior to excavating 10-ft. or more below original grade, install one (1) groundwater observation well at the center, or adjacent to each structure under construction for the purpose of measuring water levels during excavation. The observation well shall consist of a screen, casing and cap, all of approved size and materials of construction. Place observation well in a 2-½-in. bore hole, which shall be carried to or below final bottom grade of the structure. Backfill the annular space surrounding the intake point and the riser pipe with mortar sand. Seal the well top to prevent infiltration from surface water. Locate and install the observations well in such a manner as to insure proper reflection of subsurface water levels adjacent to the well.

- B. Maintain the observation well until the adjacent structure is completed and backfilled. Observe and record daily the groundwater elevation in each observation well. Furnish measurements daily to the Engineer. Redevelop or replace plugged observation wells as necessary to reflect true groundwater levels.

END OF SECTION

SECTION 331401

WATERTIGHTNESS TEST FOR HYDRAULIC STRUCTURES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials and incidentals required and perform water tightness testing of water- containing structures as listed herein and all retesting until the structures meet the requirements as specified herein for all applicable structures including the following:

- 1. Reinforced Concrete Tanks

1.2 SUBMITTALS

- A. Submit the results of each watertightness test of each structure to the Engineer for review. The submittal format shall be similar to that shown in Figure A attached to end of this Section

1.3 REFERENCE STANDARDS

- A. American Concrete Institute (ACI)
 - 1. ACI 350.1R/AWWA 400 - Testing Reinforced Concrete Structures for Watertightness
- B. Where reference is made to one of the above standards, the revision in effect at time of bid opening shall apply

1.4 PROJECT/SITE REQUIREMENTS

- A. Coordinate timing and procedures for obtaining testing water and structure testing with the Engineer and Owner well in advance of the actual testing
- B. Water Source and Disposal
 - 1. Water for testing shall be provided by the Owner
 - 2. Water shall potable water. All labor, equipment and materials shall be supplied by the Contractor
 - 3. Test water shall be disposed of by the Owner in a manner approved by the Arkansas Department of Environmental Quality. Contractor is responsible for any pumping, piping, and appurtenances necessary to convey the test water to the point of disposal designated by the Owner

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

- A. The testing of reinforced concrete tanks or water containment structures shall conform to the following standards and as modified herein
 - 1. Reinforced concrete water retaining structures - ACI 350.1R (or as appropriate) and as specified herein
- B. Perform watertightness tests prior to placing backfill around structures in order to permit observation and detection of leakage points. Walls may be backfilled prior to testing only when approved in writing by the Engineer. The request to backfill prior to testing shall include a description of the method proposed to detect leakage points after the backfill is in place. Approval to place backfill prior to testing shall not relieve the Contractor of the responsibility for conducting watertightness tests

3.2 EXAMINATION

- A. Inspect the structure to be tested for potential leakage paths such as cracks, voids, etc and repair such paths in compliance with the provisions of these Specifications or as approved by the Engineer

3.3 PREPARATION

- A. Thoroughly clean the structure to be tested of dirt, mud and construction debris prior to initiating watertightness tests. The floor and sumps shall be flushed with water to provide a clean surface, ready for testing
- B. Inlet and outlet pipes not required to be operational for the tests may be temporarily sealed or bulkheaded prior to testing
- C. Confirm adequacy of seals around gates and valves and reset or seal as approved by the Engineer. Estimates of gate or valve leakage will not be allowed as adjustments to the measured tank or structure leakage

3.4 TESTING PROCEDURES

- A. Conditions of Testing
 - 1. Do not begin initial filling of concrete structures until all concrete elements of the structure have attained the designed compressive strength of the concrete, nor less than 14 days after all concrete walls or base slabs have been placed
 - 2. Initial filling of reinforced concrete structures shall not exceed a rate of 4-ft in 24 hours
 - 3. Fill unlined concrete structures to the maximum operating water surface level and maintain the water at that level for at least 72 hours prior to beginning watertightness tests to minimize water absorption by the concrete during testing. The testing of fully lined concrete structures may be started as soon as the structure is filled
- B. Testing Procedures
 - 1. Duration of the test shall not be less than that required for a drop in the water surface of 2-in based on the calculated maximum allowable leakage rate nor three days

2. Loss of volume measurements shall be taken at 24-hour intervals. The loss of volume is usually determined by measuring the drop in water surface elevation and computing the change in volume of the contained water. Measure water surface elevation at not less than two locations at 180 degrees apart and preferably at four locations 90 degrees apart. Record water temperature 18-in below the water surface when taking the first and last sets of measurements
3. The contractor shall be responsible for providing blind flanges and controlling water structures to maintain full depth in the tank.

C. Reports

1. Submit to the Engineer watertightness test results for each structure tested on the form shown in Figure A or a form with a similar format
2. Notify the Engineer of the scheduling of tests three working days prior to the tests. The Engineer may monitor any watertightness testing performed on the structures

3.5 ACCEPTANCE

- A. The following conditions shall be considered as NOT meeting the criteria for acceptance regardless of the actual loss of water volume from the structure
 1. Ground water leakage into the structure through floors, walls, or wall-floor joints
 2. Structures which exhibit flowing water from joints, cracks or from beneath the foundation (except for underdrain systems).
- B. The watertightness of concrete tanks and structures shall be considered acceptable when loss of water volume is within the criteria listed below:
 1. For unlined tanks with a sidewater depth of 25-ft or less, loss of volume not exceeding 0.1 percent in 24 hours

3.6 REPAIRS AND RETESTING

- A. Structures failing the watertightness test and not exhibiting visible leakage may be retested after an additional stabilization period of seven days. Tanks failing this test shall be repaired prior to further testing
- B. Repair structures which fail the watertightness test and structures showing visible leakage in compliance with the provisions of these Specifications or as approved by the Engineer.
- C. Repairs and retesting of tanks shall be accomplished at no additional cost to the Owner.

FIGURE A WATERTIGHTNESS

TEST REPORT

PROJECT Jim Hinkle Spring River State Fish Hatchery Renovations SUBMITTED BY _____

STRUCTURE* _____ TEST DATES _____

Allowable loss of water volume _____ percent in 24 hrs.

Measured loss of water volume percent in 24 hrs. TEST READINGS

Water temperature at start _____ °F Water temperature at end °F

Humidity _____ % Ambient Air Temp _____ °F Wind Direction _____

Rainfall _____ in Evaporation _____ in.

	<u>Date</u>	<u>Time</u>	<u>Location 1</u>	<u>Location 2</u>	<u>Location 3</u>	<u>Location 4</u>	<u>Initials</u>
1	_____	_____	_____	_____	_____	_____	_____
.	—	—	—	—	—	—	—
2	_____	_____	_____	_____	_____	_____	_____
.	—	—	—	—	—	—	—
3	_____	_____	_____	_____	_____	_____	_____
.	—	—	—	—	—	—	—
4	_____	_____	_____	_____	_____	_____	_____
.	—	—	—	—	—	—	—
5	_____	_____	_____	_____	_____	_____	_____
.	—	—	—	—	—	—	—

Change in level _____

Average change in level _____

Correction for precipitation/evaporation _____

Corrected change in level = CL = _____

$(CL) \times (\text{surface area}) \times (100) = \text{measured percent water loss in}$

24 hrs. $(\text{initial water volume}) \times (\text{number of test days})$

Notes and field observations**

*Attach a sketch showing a plan of the structure and measurement locations.

**Place date and initials at the beginning of each entry.

END OF SECTION

SECTION 221100
PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. The Contractor shall furnish and install pipe and all appurtenances, complete in place, all in accordance with the requirements of the Drawings and Specifications. Where standards, specifications or methods are cited without dates, the reference shall be construed to apply to the latest revision in effect at the time of contract.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
1. ASTM A126 - Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 2. ASTM A240 - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 3. ASTM A536 - Ductile Iron Castings.
 4. ASTM C94 - Ready-Mix Concrete.
 5. ASTM C150 - Portland Cement.
 6. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
 7. ASTM D1784 - Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
 8. ASTM D2241 - Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 9. ASTM D3139 - Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
 10. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- B. American Water Works Association (AWWA):
1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
 2. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
 3. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
 4. AWWA C153 - Ductile-Iron Compact Fittings.
- C. American Welding Society (AWS).

1.3 SUBMITTALS

- A. Submit in accordance with Section 013300 "Submittals Procedures".

1.4 QUALITY ASSURANCE

- A. Pipe and fittings furnished and installed shall be inspected and tested by the manufacturer. The manufacturer shall furnish to the Engineer, prior to delivery, certificates stating that all pipe and fittings is manufactured in accordance with these Specifications. The certificate shall fully describe the pipe proposed to be furnished.

- B. If evidence appears that all provisions of the applicable AWWA and ASTM Standards have not been complied with after the pipe has been delivered, the Owner will require field testing and sampling as necessary for certified statements of compliance to the provisions of said standards to be furnished by an approved independent laboratory. The cost for the testing and sampling or job delay shall be the responsibility of the Contractor. The independent laboratory shall be one which may be chosen by the pipe manufacturer and approved by the Owner.
- C. All materials are subject to inspection and approval at the manufacturing plant at the discretion of the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All pipe shall be of the same specification and furnished by the same manufacturer.
- B. All pipe and other materials shall be new.

2.2 PVC PIPE

- A. PVC Pipe shall conform to the requirements of AWWA C900 for 165 psi working pressure (DR25) for 14" and 18" pipe diameter. The outside diameter shall be equivalent to cast iron pipe.
- B. PVC pipe for 4" through 12" pipe diameter shall be SDR 21 CL. 200.
- C. Pipe shall be made from quality PVC resin compounded to provide physical and mechanical properties that equal or exceed cell class 12454 as defined in ASTM D1784.
- D. Pipe shall be permanently marked at 5-foot intervals with the following information:
 - 1. Nominal size.
 - 2. Material code designation.
 - 3. Manufacturer's name or trademark and production record code.
 - 4. ASTM or AWWA certification.
 - 5. DR designation.
- E. Pipe shall have push-on rubber gasketed joints designed in accordance with ASTM D3139 and rubber gaskets complying with ASTM F477.
- F. Transition gaskets shall be provided for DIP fitting connections.
- G. Pipe shall be GREEN in color for sewer.

2.3 DUCTILE IRON PIPE

- A. Ductile iron pipe shall conform to the requirements of AWWA C150 and AWWA C151 and shall be made in the USA.
- B. Pipe shall have a minimum pressure rating as indicated below, or higher ratings as indicated on the drawings.

<u>Pipe Sizes (inch)</u>	<u>Pressure Class (psi)</u>
4-12	350
14-20	250
24	200
30-64	150

- C. Pipe shall be furnished as follows unless otherwise noted on the Drawings.
1. Buried Pipe: Push-on joint and integral bell complying with AWWA C111.
 2. Exposed Pipe: Flanged joint complying with AWWA C110 and AWWA C115, 125 lb. standard. Bolts for flanged connections shall comply with ANSI B16.1.
- D. Cement Lining – (Potable Water Service)
1. Cement lining for ductile iron pipe and fittings shall meet ANSI/AWWA C104/A21.4.
 2. Pipe and fittings with cement lining shall be handled with equipment to prevent damage, bare fork or hooks inserted to pipe ends shall not be allowed.
 3. Damage to cement lining shall be repaired in accordance with AWWA C104.
- E. Protecto 401 Epoxy Lining - (Sewer Service)
1. Ductile iron pipe shall be internally lined with Protecto 401 epoxy lining in accordance with PROTECTO 401.
 2. All repairs of handling or other damage shall be made in accordance with the recommendations of the Manufacturer and shall be reasonably smooth and may not project into the waterway.
- F. Gaskets shall be red sheet rubber or cloth inserted rubber gaskets of the ring gasket style unless designated to be otherwise.
- G. Ductile iron pipe shall be furnished as follows unless otherwise noted on the Drawings:
1. Buried Pipe shall be furnished with standard bitumastic coating per AWWA standard.
 2. Exposed pipe shall be coated with Tnemec 140-1211 primer or equal coating.
- H. All buried Ductile iron pipe shall be wrapped in polyethylene material in accordance with ANSI/AWWA C105/A21.5, Polyethylene Encasement for Ductile Iron Pipe Systems.

2.4 DUCTILE IRON FITTINGS

- A. Unless noted otherwise on the Drawings, fittings shall be ductile iron compact fittings in accordance with AWWA C153, latest revision. Glands and rubber gaskets shall be furnished with fittings.
- B. Fittings shall be internally lined with protecto 401 epoxy in accordance with PROTECTO 401. The epoxy lining nominal thicknesses shall be equal to 40 mils.
- C. Fitting joints shall be furnished as follows unless noted otherwise on the Drawings:
1. Buried Pipe: Mechanical Joint (MJ) complying with AWWA C153 and AWWA C111.
 2. Exposed Pipe: 125 lb. flanged joint complying with ANSI/AWWA C153 and ANSI B16.1.

D. Coatings:

1. Buried pipe shall be furnished with standard bitumastic coating per AWWA standard.
2. Exposed pipe shall be coated with Tnemec 140-1211 primer or approved equal and painted in accordance with specification section 099000.

E. Where taps are shown on fittings 2-inches and larger, tapping bosses shall be provided.

F. Fittings shall have distinctly cast on them the manufacturer's identification number, pressure rating, nominal diameter of openings, and the number of degrees or fraction of the circle on bends.

G. All MJ fittings shall be furnished with restraining glands (Megalugs or approved equal) in accordance with these specifications.

H. All buried fittings shall be wrapped in polyethylene material, as specified herein.

2.5 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement shall be used on all buried pipe and fittings.

B. Polyethylene encasement shall be manufactured and installed in accordance with ANSI/AWWA C105/A21.5 and shall be a tube or in the form of flat sheet or rolls.

C. Tape shall be provided with polyethylene encasement.

2.6 RESTRAINING GLANDS

A. Restraining glands designed to use radially oriented cupped screws that indent the pipe barrel with points are not allowed.

B. Restraining glands shall be made in the USA.

C. For PVC pipe, provide 2000 PV Series MEGALUG® restraints by EBAA Iron of Eastland, TX, or approved equal.

1. Restraint devices shall consist of multiple gripping wedges incorporated into a follower gland meeting the requirements of ANSI/AWWA C110/A21.10.
2. Gland body, wedges and wedge actuating components shall be cast from ductile iron in accordance with ASTM A536.
3. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470BHN.
4. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.
5. All wedge assemblies and related parts shall be processed through a phosphate wash, rinse and drying operation prior to coating application. The coating shall consist of a minimum of two coats of liquid fluoropolymer coating with heat cure to follow each coat. All casting bodies shall be surfaced pretreated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance.

D. For restrained flanged ductile iron fittings, provide MEGAFLANGE® restraining glands by EBAA Iron of Eastland TX, or approved equal.

1. Flange adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C110/A21.10.
2. Restraint for the flange adapter shall consist of individual actuating gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to ensure proper initial set of gripping wedges.
3. The flange adapter shall be capable of deflection during assembly or permit lengths of pipe to be field cut, to allow a minimum of 0.6-inch gap between the end of the pipe and the mating flange without affecting the integrity of the seal.
4. For ductile iron pipe, the flange adapter shall have a safety factor of 2:1 minimum.

2.7 BELL RESTRAINT HARNESS

- A. Bell restraints shall be installed where shown on the Drawings.
- B. Restraint for PVC pipe at the bell shall be manufactured of ductile iron conforming to ASTM A536. A backup ring shall be used behind the PVC bell. A restraint ring, incorporating a plurality of individual actuating gripping surfaces, shall be used to grip the pipe, and a sufficient number of bolts shall be used to connect the bell ring and the gripping ring.
- C. The restraint devices shall be Series 2800 as manufactured by EBAA Iron, Inc. or approved equal.

2.8 LOCATING TAPE

- A. Sewer line locating tape shall be green in color and include the words "Sewer Line Below" in black print.
- B. Sewage force main locating tape shall be Terra Tape "Extra Stretch" or approved equal.

2.9 TRACER WIRE

- A. Tracer wire shall be provided for all non-metallic pipe and shall be designed and manufactured for direct burial service.
- B. Trace wire insulating jacket shall be GREEN in color for sewer lines.
- C. Typical THHN or nylon coated electrical wire is not allowed. Tracer wire for open trench installation shall be 12-gauge, insulated solid copper wire. The insulating jacket shall be a minimum of 30 mil polyethylene complying with ASTM D1248, 30-volt rating. Tracer wire shall be Copperhead® SuperFlex 1230 or approved equal.
- D. Tracer wire for directional bores or jacking shall be 12-gauge hard drawn, solid extra-high-strength copper-clad steel tracer wire (EHS-CCS), with an average tensile break strength of at least 1150#, and a minimum of 45 mil polyethylene jacket complying with ASTM D1248, 30-volt rating. Tracer wire shall be Copperhead® SoloShot 1245 EHS or approved equal.
- E. At Contractor's option, CCS wire can also be used for open trench installation.
- F. Contractor shall supply tracer wire system, including necessary fittings, splice caps, splice poles, splice kits, and other accessories, as required.
- G. Splices along the continuous run of tracer wire for repair of a wire break or replacement of failed segment of wire shall use 3M Brand Direct Bury Splice Kit DBR/Y-6 or approved equal. Approved alternatives must securely connect two or more wires, effectively

moisture seal by means of a dielectric non-hardening silicone sealant, manufacturer approved for direct burial and rated for a minimum of 50-volts.

- H. Branch connections for laterals, turnouts, services, and appurtenances shall use Dry Conn Direct Bury Lug Aqua or approved equal. Approved alternatives must securely connect one or two wires to the main tracer wire without cutting the main tracer wire, effectively moisture seal by means of a dielectric non-hardening silicone sealant, manufacturer approved for direct bury and rated for a minimum of 50-volts.
- I. Wire shall be new and shall have the size, grade of insulation, voltage, and manufacturer's name permanently marked on outer covering at regular intervals. Insulation shall be type THHN, THWN, or XHHW and rated **600 volt**, 75 degrees C or higher for wet locations.

2.10 TEMPORARY PIPE PLUGS

- A. Non-pressure polyethylene plugs with handles sized to fit bells or spigots or sizes 6-inch to 60-inch shall be Taylor Made Plastics or approved equal.

2.11 MANHOLE GASKETS

- A. Pipe penetrations through manhole walls shall be provided with a watertight gasket suitable for the size of pipe being installed.
- B. Manhole gaskets shall be installed in accordance with the manufacturer's recommendations.
- D. Manhole gaskets shall be as specified in Section 333913 "Sanitary Sewer Manholes".

2.12 CEMENTITIOUS NON-SHRINK GROUT

- A. Cementitious non-shrink grout shall be in accordance with Section 333913 "Sanitary Sewer Manholes".

2.13 CONCRETE FOR THRUST BLOCKING

- A. Concrete shall be ready mixed concrete conforming to ASTM C94. Concrete used for thrust blocking and concrete encasement shall Class "B" concrete containing not more than 7 gallons of water per sack of cement, including the water in the aggregate, and not less than 5 sacks of cement per cubic yard of concrete.
- B. Cement: Portland Cement conforming to ASTM C150, Type 1
- C. Water used shall be clean and free from injurious amounts of oil, acids, alkalis, salt, organic matter, or other deleterious substances.
- D. Compressive Strength: 3,000 psi at 28 days.
- E. The concrete shall be delivered and placed within 45 minutes after all materials including mixing water have been placed in the mixing drum.
- F. Bagged concrete mix shall not be permitted.

2.14 TAPPING SLEEVE AND SADDLE

- A. Provide stainless steel tapping sleeve Smith Blair Model 663 or approved equal.

2.15 B. Provide double bite tapping saddle Smith Blair Model 313 or approved equal.
FLANGE COUPLING ADAPTER

A. Provide Smith Blair Model 920 or approved equal.

2.16 DISMANTLING JOINT

A. Provide Smith Blair Model 975 or approved equal

PART 3 - EXECUTION

3.1 GENERAL

A. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for lubricants, cements, and other installation requirements.

B. Flow control and bypass pumping shall be in accordance with specification Section 010000 "Basic Requirements".

C. At the end of each day's work, and when for any reason the laying of pipe will be discontinued for an appreciable period, place a temporary section of pipe in live lines.

3.2 STRINGING THE PIPE

A. The contractor shall properly and safely chock the strung pipe so that it cannot roll loose and strike either personnel, livestock, or property.

B. Do not place anything inside pipe for the purpose of handling.

3.3 HANDLING AND LAYING PIPE AND FITTINGS

A. Trench and backfill shall be in accordance with specification Section 312302 "Trench Excavation, Backfill, and Compacting". Pipe bedding shall be in accordance with details on the Drawings.

B. All materials shall be transported, unloaded, stored, stacked, cut, handled, and installed in accordance with the manufacturer's recommendations and in a manner to prevent damage to the materials and material coating and lining. Do not place anything, such as forklift fork or hook, inside pipe for the purpose of handling. Pipe and fittings shall not be dragged along the ground or dropped into the trench.

C. All material shall be carefully inspected immediately before installation and any found to be faulty or damaged shall be marked in an obvious and permanent manner and removed from the site. A faulty or damaged length of pipe may be used in the Work if the fault or damaged area is removed by cutting the pipe leaving a shortened section of sound pipe.

D. Pipe joints shall be assembled in accordance with procedures recommended by the pipe manufacturer, using proper gaskets, lubricants, tools, and jointing techniques. All surfaces of the joint including the socket and bell of the pipe or fitting shall be cleaned before the pipe is laid and the joint started. Use clean rags for this purpose.

E. No gasket loops or bulges shall protrude into the path of the pipe when it enters.

F. Apply gasket lubricant supplied by the manufacturer to both the spigot end and to the gasket. Use a clean applicator brush.

- G. Each spigot shall be properly centered in the bell of the preceding pipe and that the entire length of each pipe section is solidly bedded so as to prevent displacement during subsequent backfill and settlement.
- H. Deflections from a straight line or grade, as required by horizontal or vertical curves shall not exceed limits as recommended by the pipe manufacturer. If pipe alignment requires deflection in excess of the recommended limits, standard bend fittings or a sufficient number of shorter lengths of pipe shall be installed to provide angular deflections. Deviation of any type, from true alignment, shall be approved by the Owner.
- I. Pipe inserted into valves and fittings shall be cut at an angle of 90 degrees to the pipe centerline. When pipe is cut, the plain ends shall be beveled similar to the bevel on full lengths of pipe from the manufacturer. After beveling, stop marks shall be applied to the ends. Pipe and/or pipe lining shall not be damaged when cutting or trimming.
- J. If the joint is incorrectly made, disassemble it and correct the problem. Do not attempt to pressure test a joint that is improperly put together.
- K. Contractor shall keep the interior of the pipe free from dirt, rocks, and other debris during construction.
- L. Pipe shall not be left unattended with an open end. Plug the open end with a temporary plastic plug or cap to prevent trench water, foreign matter, debris, and dirt from entering the pipe.
- M. Under no circumstances shall pipe be laid in water, and no pipe shall be laid in trenches when conditions or weather are not suitable for work. Diversion of drainage and dewatering of trenches during construction shall be the Contractor's responsibility and shall be in accordance with Section 010000 "Basic Requirements" and Section 015713 "Temporary Erosion and Sediment Control".
- N. Under no circumstances shall pipe be laid in water, and no pipe shall be laid in trenches when conditions or weather are not suitable for work. Diversion of drainage and dewatering of trenches during construction shall be the Contractor's responsibility and shall be in accordance with Section 010000 "Basic Requirements" and Section 015713 "Temporary Erosion and Sediment Control".
- O. All joints shall be watertight in accordance with ASTM standards.

3.4 JOINTING MECHANICAL JOINT FITTINGS

- A. Pipe joints shall be assembled in accordance with procedures recommended by the pipe manufacturer, using proper gaskets, lubricants, tools, and jointing techniques. All surfaces of the joint including the socket and bell of the pipe or fitting shall be cleaned before the pipe is laid and the joint started. Use clean rags for this purpose.
- B. Joints shall be made tight by advancing the nuts with a wrench, 180-degrees apart, until a tight joint is made.
- C. Buried fittings, including glands and bolts, shall be encased in polyethylene material.

3.5 INSTALLATION OF POLYETHYLENE PROTECTION MATERIAL

- A. Polyethylene material, either in tubing form or in the form of flat sheet or rolls shall be placed around all mechanical joints of pipe and fittings, all valves, sleeves and couplings,

saddles, and any other appurtenances with exposed bolts.

- B. Fittings and appurtenances shall be completely encased in polyethylene material. It is not the intent that the material forms an enclosure that is absolutely air and water tight, but to prevent pipe to soil contact. Polyethylene material shall be installed so that no dirt or bedding material comes in contact with the pipe. All lumps of clay, mud, cinders, etc. on the pipe surface shall be removed before pipe is covered with polyethylene.
- C. Polyethylene material shall be applied to pipe, fittings, and appurtenances by one of the following methods:
 - 1. Method A - Cut polyethylene tubing material to a length approximately 2-feet longer than the length of pipe section. Slip the tube around the pipe centering it to provide a one-foot overlap on each adjacent pipe section and bunching it accordion fashion lengthwise until it clears the pipe ends. Lower the pipe section into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube. After assembling the pipe joint, take bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe, and secure in place. Then slip the end of the polyethylene from the new pipe section at the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width to make snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points with tape.
 - 2. Method B - Cut polyethylene tube to a length approximately one-foot shorter than the length of the pipe section. Slip the tube around the pipe, centering it to provide 6-inches of bare pipe at each end. Make polyethylene snug, but not tight and secure the ends. Before making up a joint, slip a 3-foot length of polyethylene tube over the end of the preceding pipe section, bunching it accordion fashion lengthwise. After completing the joint, pull the 3-foot length of polyethylene over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least one-foot; make snug and secure each end. Pipe shaped appurtenances such as bends, reducers, offsets and other pipe shaped appurtenances shall be covered with polyethylene in the same manner as pipe.
- D. Odd shaped appurtenances such as valves, tees, crosses and other odd shaped pieces which cannot practically be wrapped in a tube, shall be wrapped with a flat sheet or split length of polyethylene tube. The sheet shall be passed under the appurtenance and brought up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Slack width and overlaps at joints shall be handled as described above. Tape polyethylene securely in place at valve stem and other penetrations.
- E. Openings in tubing material for branches, service taps, blow-offs, air valves, and similar appurtenances shall be made by making an X-shaped cut in the polyethylene and temporarily folding the film back. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut, as well as any other damaged areas in the polyethylene with tape.
- F. At junctions between wrapped and unwrapped pipe - Where polyethylene wrapped pipe joins a pipe which is not wrapped, extend the polyethylene tube to cover the unwrapped pipe a distance of at least 2 feet and secure the end.
- G. The polyethylene material shall be secured around the pipe and appurtenances by at least three circumferential wraps of tape.
- H. When installing polywrap below the water table, seal as thoroughly as possible both ends

of polyethylene material with adhesive tape or plastic tie straps at the joint overlap. Also, place tape or plastic tie straps at two (2) foot intervals around the polyethylene wrapped pipe with the excess material folded over the top of the pipe.

- I. All tongs, cables or chains that are used for lifting pipe and appurtenances that have been encased in polyethylene material shall be adequately padded to prevent damage to the material.
- J. Repair any rips, punctures, or other damage to the polyethylene with tape (for small tears and holes) or with additional polyethylene material wrapped around the pipe or appurtenance and secured in place with tape (for large holes or tears). All damaged polyethylene shall be repaired before the trench is backfilled.
- K. Polyethylene material shall be stored on the project site in such a manner that it is not exposed to direct sunlight. Exposure during installation shall not exceed 48-hours.
- L. Backfill material shall be the same as specified and shown on the Drawings for pipe or appurtenances without polyethylene wrapping. Special care shall be taken to prevent damage to the polyethylene wrapping when placing backfill.

3.6 MINIMUM DEPTH OF COVER

- A. Pipe shall be installed with a minimum cover of 36-inches over the top of the pipe, unless otherwise shown on the Drawings.

3.7 SEPARATION FROM EXISTING UTILITIES

- A. Maintain 18-inches minimum vertical separation (water over sewer) between water mains and sewer mains. The vertical distance shall be measured from the bottom of the water main to the top of the sewer. Any crossing shall be arranged so that the sewer joints are equidistant and as far as possible from the water main joints.
- B. Maintain 10-feet minimum horizontal separation between water mains and sewer mains. The distance shall be measured from edge of pipe to edge of pipe.
- C. Contractor shall notify Engineer immediately if these separation requirements cannot be met, or as soon as any such crossing is found but not identified on the Drawings.

3.8 CONNECTIONS TO EXISTING MANHOLES

- A. Sewage flow through existing manholes shall be controlled by temporary plugs or bypass pumping as necessary to facilitate the new connection and grouting of the manhole invert. The existing flow of sewage shall be maintained in a manner to prevent overflow or discharge of sewage onto the ground surface and prevent damage caused by excessive surcharge in upstream sewer mains and service connections. Control of existing sewage flow shall be in accordance with this section and with Section 010000 "Basic Requirements".
- B. Connections to existing manholes shall be in accordance with Section 333913 "Sanitary Sewer Manholes".
- C. Cut opening in the wall of existing manhole of sufficient size to permit proper installation of the new pipe at the designated line and grade.
- D. The opening in the wall around the new pipe shall be filled with non-shrink grout, if specified by manhole gasket manufacturer, and properly finished inside and outside with cement

mortar, so that leakage does not occur.

- E. The invert of the existing manhole shall be chipped out and re-grouted with cement mortar as necessary to provide a smooth transition between the invert of the new pipe and the other pipes entering and leaving the manhole.
- F. No connections shall be made to the existing sewer system without the presence of the Owner, Engineer, and/or their representative(s).

3.9 THRUST BLOCKS

- A. Concrete thrust blocking shall be in accordance with details on the Drawings.
- B. Install 3,000 psi concrete thrust blocks at bends, wyes, tees, tapping sleeves, and other thrust points on pressure piping.
- C. Thrust blocking shall bear against undisturbed soil. The excavation shall be hand shaped and free of loose material. Forms shall be used to confine the concrete in areas other than that part that is in contact with undisturbed soil in the direction of thrust.
- D. Size thrust blocking in the field based on actual field conditions, such as estimated allowable soil bearing, and information provided on the Drawings.
- E. Where directed by the Engineer the thrust block shall be formed in order to efficiently transfer the thrust forces to the soil and to conserve room in the trench or easement for future use.
- F. Concrete shall not be placed where it interferes with the removal of any joint accessories such as bolts, followers, threads, collars, couplings, etc.
- G. The top of the concrete thrust block shall be struck off with a wood straight edge or float.
- H. Concrete shall not be placed when the temperature is below 40 degree F and dropping or below 35 degrees F if the temperature is rising, unless approved by the Engineer.
- I. All placement of concrete shall be in the presence of the Engineer or his representative. The Contractor is cautioned that he may be required to remove, without compensation, any concrete placed in the absence of the Engineer or his representative.
- J. Backfill over concrete thrust blocking shall not be placed before the concrete has attained initial set.
- K. Thrust blocking shall not be less than 6 inches thick between the pipe line or appurtenances and undisturbed soil in the direction of thrust.
- L. The excavation shall be free of water before concrete is placed.
- M. The pipe or appurtenance shall be cleaned before placing concrete when the concrete is to be in direct contact with the pipe or appurtenance.

3.10 LOCATING TAPE

- A. Locating tape shall be used on all pipe including ductile iron.
- B. Install 18" above the sewage force main pipe as shown on the Drawings.
- C. The locating tape shall be in addition to trace wire.

3.11 TRACER WIRE

- A. All PVC pipe shall be installed with copper trace wire.
- B. Tracer wire shall be installed on short intermittent segments of ductile iron used at locations such as creek crossings.
- C. Tracer wire shall be installed with all pipe. The wire shall be installed in such a manner as to be able to properly trace all pipelines and services without loss or deterioration of signal or without the transmitted signal migrating off the tracer wire.
- D. Tracer wire shall be installed in the same trench and inside bored holes and casing with pipe during pipe installation. It shall be secured to the pipe as required to ensure that the wire remains adjacent to the pipe. The tracer wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be accessible at all tracer wire access points.
- E. Except for approved spliced-in repair or replacement connections, tracer wire shall be continuous and without splices from each tracer wire access point.
- F. Provide and install tracer wire access box at every manhole, blowoff, ARV, access manhole, and valve box. Access boxes shall provide a connection point to the tracer wire. Tracer wire test stations as detailed on the drawings, shall be installed every 1,000 feet minimum and at every fiberglass post utility marker. Tracer wire test stations do not need to be installed next to gate valves, air release valves, or clean-out stations.
- G. Wire breaks shall be spliced together by joining and twisting the tracer wire together then installing a silicon filled twist on connector, as specified herein.
- H. If the spacing of valves and meters is greater than 1,000 feet, the Contractor shall install test wire station. The test wire station shall include the tracer wire which shall be looped up in a 2-inch PVC pipe to be located at a right-of-way fence line or at a cross fence line, as applicable, for protection. A PVC cap shall be placed on the 2-inch pipe when used, but it shall not be solvent welded onto the pipe.
- I. Fiberglass post utility markers shall be installed at every tracer wire test station and at every 1,000 feet.
- J. At the point of connection between ductile iron pipe, with any non-iron pipe, the tracer wire shall be properly connected to the iron pipe with a cad weld or approved equivalent. Tracer wire welds shall be completely sealed with the use of an approved mastic type sealer specifically manufactured for underground use. Mastic shall be applied in a thick coat a minimum of one-quarter-inch (1/4") thick and shall be protected from contamination by the backfill material with the use of a plastic membrane.
- K. Tracer wire shall be laid flat and securely affixed to the pipe at 10-foot intervals. The wire shall be protected from damage during the execution of the works. No breaks or cuts in the tracer wire or tracer wire insulation shall be permitted.
- L. A minimum of 6-feet of tracer wire shall be extended beyond the end of newly installed pipe, coiled and secured for future use. The end of the tracer wire shall be spliced to the wire of a six-pound zinc anode and buried at the same elevation as the pipe.
- M. Branched Connections: Connections between the main line tracer wire and branch connection tracer wire shall only be allowed at services, ARVs, and blowoffs. The branch

connection tracer wire shall be a single tracer wire properly spliced to the main line tracer wire. Water tight connectors shall be used to provide electrical continuity.

- N. Directional Boring: For directional boring installations, two #12 tracer wires shall be installed with the pipe and connected to the tracer wire at both ends, or cad welded to the existing iron pipe at both ends. The tracer wires shall be laid flat and securely affixed to the top and side of the pipeline at five-foot (5') intervals to insure its placement during boring operations.
- O. Testing Requirements: The Contractor shall perform a continuity test on all tracer wire in the presence of the Engineer or the Engineers' representative. If the tracer wire is found to be not continuous after testing, the Contractor shall repair or replace the failed segment of the wire.
- P. At all locations where existing tracer wire is found the tracer wire shall be properly reconnected and spliced as outlined above.

3.12 TESTING

- A. The sewage force main shall be subjected to a pressure and leakage test after installation and completion of backfill.
- B. Engineer and Owner shall observe and document tests.
- C. Contractor shall fill piping with water at a controlled rate so as to avoid surging, and all air shall be expelled from the piping. If necessary to properly expel air prior to test, Contractor shall tap the sewage force main at high points with corporation stops. To accommodate the initial pipe expansion, the pipe shall be pumped up to test pressure and allowed to sit for a minimum of four hours while adding water to the pipe at hourly intervals to maintain the test pressure. Once the pipe expansion and pressure has stabilized, the testing phase may commence.
- D. Contractor shall provide all test apparatus, plugs, taps, valves, and temporary connections used for testing.
- E. The Contractor shall contact the Owner of the water distribution system for any water that is required and/or necessary during construction. The Contractor shall connect to the water distribution system in accordance with all requirements of the Owner of the water distribution system. The Contractor shall install a backflow prevention device and meter as required by the water distribution system owner.
- F. The Contractor shall supply all water for the test procedure. The Contractor shall be responsible for all water costs and fees associated with testing the force main. Contractor shall not needlessly waste water.
- G. Sewage force main shall be tested at 90 psi gauge pressure. Test pressure shall be applied for a minimum continuous period of 2 hours and shall not vary more than 5 psi for the duration of test. Pressure shall be applied to the force main by means of a pump, pipe connections, and all other necessary apparatus for applying pressure and measuring the resultant leakage from the line under test.
- H. All interior valves shall be open during testing.
- I. Measured leakage from the sewage force main shall not be greater than that determined by the following formula:

$$Q = \frac{LD\sqrt{P}}{148000}$$

Q = Allowable leakage (gallons per hour)

L = Length of pipe tested (feet)

D = Nominal diameter of pipe (inches)

P = Test pressure (psi)

Leakage is defined as the quantity of water that must be supplied into the test section to maintain the specified test pressure, after the air in the pipe has been expelled and the line completely filled with water.

- J. While the pipe being tested is under pressure, check for leakage appearing at the surface of the ground or from or from any exposed appurtenances. Any leaking joints, fittings, etc. shall be repaired or replaced at the contractor's expense and the test repeated until satisfactory results are achieved.
- K. When leaks are in excess of the above formula, the Contractor shall, at his own expense, perform whatever work and/or replace whatever material that is required in order to remedy the defect and stop the leaks. All corrective work shall be approved by the Engineer and Owner.

END OF SECTION

SECTION 444300

MECHANICALLY CLEANED BAR SCREENS

PART 1 – GENERAL

1.1 SUMMARY

- A. This section includes the furnishing of two front-cleaning, rear-return link driven mechanically cleaned bar screen assemblies and any auxiliary equipment or accessories to be installed in the location as indicated on the drawings and as specified herein.
 - 1. Number of units: 2 with common conveyor
 - 2. Equipment designation: Duperon Harvest Rake, or approved equal
 - 3. Equipment location: Outdoor
- B. All equipment supplied under this section shall be furnished by or through a single Screening System Supplier who shall coordinate with the Contractor, the design, fabrication, delivery, installation and testing of the screening components. The Screening System Supplier shall have the sole responsibility for the coordination and performance of all components of the screenings system with the performance and design criteria specified herein.
- C. The Contractor shall be responsible to coordinate all details of the screening equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. The Contractor shall be responsible for all structural and other alterations in the Work required to accommodate the equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications.

1.2 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)

1.3 SUBMITTALS

A. The equipment manufacturer shall submit the following items:

1. The contractor shall validate all field dimensions shown on the drawings and provide documentation to the screen manufacturer as field validated dimensions for screen manufacturer. The basis of this validation is to accommodate the screen fabrication and installation with the Owner's existing support structure for each screen specified.
2. (6) 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 2.5.
4. (6) Sets 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.

1.4 QUALITY ASSURANCE

- A. The Mechanically Cleaned Bar Screens shall be fully assembled and shop tested at the manufacturing facility prior to shipment. Shop testing shall include a minimum of 4 hours of run time. The contractor, the engineer, the owner or the owner's designated representative reserves the right to witness the shop test. A minimum three (3) week notice shall be provided prior to the test to allow for travel coordination.
- B. 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.
- C. 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.

1.5 WARRANTY

- A. Manufacturer shall provide a written one year standard warranty from the date of substantial completion of the mechanically cleaned bar screen 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 5 years all rotating parts of the Mechanically Cleaned Bar Screen and Conveyor including the gear motor, bearing, drive head, and the link system including the links, 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

2.1 MANUFACTURERS

- A. Screens shall be as manufactured by Duperon Corporation and shall be a Model, Harvest Rake, or approved equal.

2.2 BASIS OF DESIGN

- A. The mechanically cleaned bar screen shall meet the total screen debris removal capacity of:

1. Scraper Ratio below Water Level:

$$\frac{\text{Upstream Water Level (ft)}}{1.745 \text{ ft}} = \text{Number of Scrapers below Water level}$$

$$\text{Debris Volume per Linear Foot} = 0.152 \text{ ft}^3 / \text{ft}$$

$$\text{Total Screen Debris Removal Capacity on Low (ft}^3/\text{hr)} =$$

$$(0.152 \text{ ft}^3/\text{ft}) \times (\text{Screen Width}) \times 60 \times (\text{Number of Scrapers below Water Level})$$

$$\text{Total Screen Debris Removal Capacity on High (ft}^3/\text{hr)} =$$

$$(0.152 \text{ ft}^3/\text{ft}) \times (\text{Screen Width}) \times 260 \times (\text{Number of Scrapers below Water Level})$$

- B. The flow ability of the screen area, specifically, shall be defined as follows: A composite number representing the specific flow- ability of a screen area composed of the bars' Hydraulic Headloss

1. Coefficient Shape Factor, the bar width and the clear opening of the screen field per formula below.

$$(\text{Coefficient Shape Factor}) \times \left(\frac{\text{Bar Width}}{\text{Clear Opening}} \right) = \left(\frac{0.190}{\text{Clear Opening}} \right)$$

- C. The mechanically cleaned bar screen shall be designed to run continuously (24/7), without operator.
- D. The equipment shall have multiple scrapers on the bar screen at one time cleaning continuously from bottom to top, the entire width of the bar screen. The drive output shaft rotation shall be constant and in one direction in order to reduce maintenance and increase product life.

E. Design Conditions:

Channel Width (not screen width):	7 ft and 8 ft wide
Channel Height (not screen width):	3 ft and 5 ft
Bar Opening Size:	3/8"
Angle of Installation:	53 degrees both
Average Water Level:	6.17'(7ft) 7.01'(8ft)
Maximum Flow:	25.6 MGD (7ft) and 51.2 MGD
Maximum Water Level:	23.93'(7ft) 24.77'(8ft)
Equipment Location:	Outdoors
Installation Area Classification:	Unclassified/Class I Div I
Below Freezing Temperatures:	Yes
Collection and Conveyance	Conveyor

2.3 COMPONENTS

- A. Bar screen assembly: Bar screen assembly shall be of stainless steel and designed to withstand 2 feet head differential. Materials of construction shall be 304 Stainless Steel. A stainless-steel channel bottom plate shall be an integral part of the bar screen assembly to fully engage scrapers in the bar screen at the base of the unit and assure that the raking mechanism reaches the bottom of the screen to prevent debris accumulation. The Bar screen assembly shall be shipped in one piece.
1. Screen Bars: Bars shall be 316L stainless steel and be tear-shaped with a Hydraulic Coefficient shape factor of 0.76 and the minimum dimensions of 0.375- inch x 0.75-inch x 0.13 inch. Bars shall be individually replaceable without welding.
 2. Side Fabrication: The screen framework shall be 304 stainless steel bent plate with minimum of 3/16 inch cross section. Horizontal members shall be of stainless-steel bent plate or stainless-steel pipe. Support members and frame shall adequately support the bar screen.
 3. Dead Plate: Dead plate shall be 0.25 inch thick 304 stainless steel. The dead plate shall be flat and true; span the entire width of the unit; and transition from bar screen to discharge point.
 4. Discharge Chute: The discharge chute shall be 11ga. (0.12 inch) 304 stainless steel. The discharge chute shall be designed to allow debris to be transferred from discharge point onto the conveyor.
 5. The two screens will have different lengths but discharge to a common conveyor.
- B. Lower Return Chamber: shall be 304 stainless steel and UHMW and shall assure proper alignment of scrapers as they enter the bar screen and assure that there is no space wider than the clear opening between bars to prevent passage of larger solids than allowed through the screen.
- C. Link System: The link system shall be passivated stainless steel castings and have a minimum ultimate strength of 60,000 labs with a minimum cross section of 1.5 inches and weighing a minimum of 4.5 lbs. each. Parts must meet ASTM A380 specification for surface finish.
1. 304 stainless steel system includes 302 stainless steel retaining rings and 304 stainless steel pins.

- D. Scrapers: Scrapers shall be spaced 21 inches apart. To provide long product life the scraper shall move at no greater than 28"/min @ .7 rpm (20 hz) normal speed, 63"/min @ 1.7 rpm (45 hz) high speed., cleaning all three sides of the bars as well as through to the cross members in openings of 0.375 inches.
1. Thru Bar Scrapers: Thru Bar Scrapers shall be minimum .375 inch thick x 5 inches x screen width 304 stainless steel.
- E. Drive Head: The Drive Head shall be located at the top of the mechanically cleaned bar screen.
1. Drive Unit: Each mechanically cleaned bar screen unit shall operate independently and shall have its own drive unit and driven components.
 - a. Drive Sprockets shall be 304 stainless steel.
 - b. Drive Shaft shall be 304 stainless steel.
 - 1) Gearbox shall be shaft-mounted, right angle type and include spiral bevel gearing. The output shaft speed shall be controlled by a vector type inverter or per rake manufacturer's recommendation. It shall have at least a 1.52 or greater service factor based on machine torque requirements. The gearbox shall not be vented to the outside atmosphere. The gearbox shall be grease filled. Oil filled gearboxes are not allowed.
 - 2) The motor shall be AC induction type, inverter duty, 3 phase 240/480 volt and mounted to the gear reducer. The motor shall be 3 hp, designed for 1800 RPMs base speed and rated for Class I, Groups C & D, Class II Groups F & G environments. The motor shall have an EPNV enclosure, NEMA design B with a 56C frame size. Service factor shall be 1.0 or greater, Class F insulation and be optimized for IGBT type inverters. The motor must be UL listed and designed for continuous operation.
 - 3) Motor shall have built in, normally closed, thermostat to protect from overheating that is to be field wired to corresponding terminal in control panel for redundant (ambient) overload protection.
 - 4) All drive head components shall be of components available in the United States.
 2. Bearing: Bearing shall be greased ball bearing type, non-self-aligning, sealed and lubricated and shall have a 24/7/365 L10 life of 20 years when in compliance with stated O&M recommendations. Non-sealed bearings are not acceptable.
 3. Speed Reducer: Speed reducer shall be a double-reduction, cycloidal style and shall comply with all applicable AGMA standards. The speed reducer shall be capable of a 4/1 speed range with variable output speeds between 0.50 to 2.2 output RPMs (in high flow conditions). The speed reducer shall produce an output torque of 11,417 in.lb. and have a gear ratio of 809:1.
- F. Standard Coating: All non-stainless bar screen components shall be coated in accordance with the paint manufacturer's specification. Surface Preparation

shall be done in accordance with SSPC-SP-10 Near-White. The three-part coating system shall be manufactured by Tnemec as follows: Prime Coat Series 90-97 Tneme Zinc at 2.5-3.5 mils DFT, Intermediate Coat Series 27 F.C. Typoxy at 3.0-5.0 mils DFT, and Top Coat Series 1075U Endura-Shield II at 2.0-3.0 mils DFT. Standard color is 11SF Safety Blue. Material shall meet all state and federal VOC and other regulatory requirements.

2.4 ELECTRICAL, CONTROLS, INSTRUMENTATION

A. General: Controls for both rakes shall be in a single enclosure provided by the bar screen manufacturer. The bar screen manufacturer shall be responsible for proper sizing and function of the controls at 480V 3 phase power.

1. Controls shall be designed to accept incoming power supply per plans/specs and shall include a step-down transformer as needed to achieve 120V.
2. Control Panel(s) shall be constructed to meet the appropriate NEMA classification requirements and will include a main, lockable disconnect. The panel will be constructed by a UL certified control panel build facility and will be supported by the appropriate UL labeling.
3. Controls shall be tested prior to shipment to owner. The rake manufacturer shall verify all overload settings in the rake controller to insure proper overload and speed settings required for the application are properly programmed.
4. Control panel(s) shall be wired complete with a minimum of #16 MTW wire in the appropriate colors for the circuits being supplied. 120VAC control shall be red, grounded AC neutral shall be white, DC control shall be blue, DC neutral shall be blue with a white tracer, equipment ground shall be green and all incoming and outgoing external power source wires shall be a yellow configuration. All AC power wiring shall be a minimum of #12 Black. All wires shall be labeled at both ends with heat-shrink wire markers. Internal panel wiring shall be contained in non-flammable, covered wire way.
5. All panel(s) and panel mounted devices shall be labeled with engraved I.D. markers that reference back to the system schematics. Tags shall be white with black core, engraved as required.
6. All field wiring and power cables between the bar screen Main Control Panel and the Local Push Button Station shall be provided by others under the Electrical Section. VFD rated motor cable (Belden #29502 or equal) is recommended for all motors. Motor cables shall be less than 80 ft unless otherwise specified.

B. Components:

1. Main Control Panel

- a. Enclosure(s) shall be NEMA 4X 304 SSTL for outdoor installations.
- b. Enclosure shall not be located in an explosive environment.
- c. Main Control Panel shall be designed with a SCCR rating of 18KA at 480VAC minimum and labeled as such, unless otherwise specified.
- d. All terminals utilized in the main panel shall be 600V rated terminals and 20% spare terminal space shall be provided for any potential future revisions.
- e. The Main Control Panel shall include at a minimum the following
 1. Main fusible disconnect with lockable operator.
 2. Physical or virtual Hand/Off/Auto (HOA) Selector and Push/pull E-Stop
 3. Elapsed run-time meter
 4. Indication for "Power On", "Forward" and necessary faults.

5. Variable Frequency Drive (VFD)
6. Electronic torque control
7. Hard contact SCADA Interlock(s)
8. Adjustable on/off cycle timers
9. 3-speed operation with switch selection or POT
10. Heater, fan, thermostat and Rain hoods

1. Local Control Push Button Station

- a. Enclosure shall be NEMA 4X rated for unclassified installation. Local push button station must be local to the equipment to maintain requirements of local safety codes as determined by the Engineer.
- b. Local station shall be mounted within 10 feet or as close to the equipment as safely possible and be field wired by the electrical subcontractor to the corresponding terminal inputs in the main control panel.
- c. The remote pushbutton station for each screen shall include Forward, Jog Reverse and E-Stop buttons.
- d. The remote pushbutton station for the conveyor shall include Forward and Stop buttons.

2. Instrumentation: None, machine runs all the time

C. Controls Design Conditions:

Incoming Power: (Voltage/Phase)	<i>460v 3ph</i>
Enclosures:	<i>(1) for both Screens & (1) Conveyor</i>
Installation location:	<i>Outdoors</i>
Approx. distance between main panel and equipment motor	<i>Field Verified by Contractor</i>
Outdoor location (must be shaded):	<i>Shading By Others</i>
For Outdoors Option: Thermostat, heater and fan w/grilles and rain hoods for ventilation. Appropriate N4X rating by the addition of grilles is acceptable.	

2.4 SPECIALTY TOOLS, SPARE PARTS AND LUBRICATION

A. Manufacturer shall provide any specialty tools and recommend spare parts required for maintaining the equipment as follows:

1. Snap/Retaining Rings (10)
2. Link Clevis Pins (4)
3. Scraper Bolts (4)
4. Scraper Nuts (4)
5. Snap Ring Tool (1)
6. Never Seez, 1 oz. tube (1)

B. Manufacturer shall provide one tube of Multi-Purpose grease which is a 5-year supply of lubrication, required for maintaining all bar screen components

PART 3 – EXECUTION

3.1 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.

3.2 INSTALLATION

- A. The installation shall be accommodated on the Owner's existing screen support structure in strict 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, and controls stands as determined by the customer and/or specified by the manufacturer.
- B. Anchor Bolts: Anchor bolts and nuts shall be 304 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. Quantity is site specific but typically each Barscreen assembly requires
(8) to (12) 1/2" dia. x 4 1/2" Lg. embed HILTI HAS RODS w/ RE-500 SD adhesive system anchor bolts for Mechanical Screen anchorage and typically (8) to (12) 3/8" dia. x 3 3/8" Lg. embed HILTI HAS RODS w/ RE-500 adhesive system anchor bolts for the Return Guide/Closeouts anchorage.

3.3 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.

3.4 ONSITE TECHNICAL ASSISTANCE

- A. Manufacturer shall provide services to include Installation Certification, and shall include a minimum of (1) day for Start-Up and (1) day for Training. The training shall be provided after substantial completion at a time specified by the Owner.

END OF SECTION

SECTION 444350

BELT CONVEYOR

PART 1 – GENERAL

1.1 SUMMARY

- A. Scope of work to include one (1) trough-style belt conveyor to serve two (2) mechanically cleaned bar screens, and to operate in conjunction with the screens.

1.2 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI)
- B. American Institute of Steel Construction (AISC)
- C. American Society of Testing and Materials (ASTM)
- D. American Gear Manufacturers Association (AGMA)
- E. Conveyor Equipment Manufacturers Association (CEMA)
- F. National Electrical Manufacturers Association (NEMA)
- G. Occupational Safety and Health Administration (OSHA)
- H. American Welding Society (AWS D.1.1-90)

1.3 SUBMITTALS

- A. General:
 - 1. Submit Product Data and Shop Drawings in sufficient detail to confirm compliance with requirements of this Section. Submit Product Data and Shop Drawings in one complete submittal package.
- B. Shop Drawings:
 - 1. Installation drawings and specifically prepared technical data, including design capacities.
 - 2. Validation of field measured drawings to accommodate the proposed mechanically cleaned screens per Section 444300 with the Owner's supplied support equipment in coordination with proposed Belt Conveyor location.
 - 2. Specially prepared wiring diagrams unless standard wiring diagrams are submitted with Product Data.
 - 3. Layout drawings to include supports, accessories, appurtenances-coordination with peripheral equipment, drives, and required clearances.
- C. Product Data:
 - 1. Catalog cuts and product specifications for each product component specified in this Section.
 - 2. Standard wiring diagrams unless wiring diagrams are specially prepared and submitted with Shop Drawings.

- 3. Catalog cuts and product specifications for control devices.
 - 4. Proposed coating.
- D. Submit in accordance with Section 013300.
- E. Operation and Maintenance (O & M) Data:
 - 1. Submit in accordance with Section 017823.
- 1.4 MANUFACTURERS
 - A. Conveyor system will be manufactured by Custom Conveyor Corporation, Rogers, Minnesota, or approved equal.
- 1.5 SERVICES OF MANUFACTURER
 - A. Inspection, start-up, and field adjustment. The conveyor supplier shall coordinate with the screen manufacturer whom shall visit the site for not less than 2 days to furnish the indicated services.
 - B. Instruction of Owner's Personnel: The authorized service representative will also furnish the indicated services for instruction of the Owner's personnel in the operation and maintenance of the equipment including step-by-step troubleshooting procedures with necessary test equipment for not less than 1 day. This site visit shall occur after substantial completion and at a time specified by the Owner.
- 1.6 QUALIFICATION OF MANUFACTURER
 - A. The supplier and/or manufacturer will have been in the business of designing and manufacturing conveying for a minimum of ten years and have "in-house" fabrication, painting and assembly capabilities to ensure quality controls. The supplier and/or manufacturer will allow periodic inspection of work in progress when requested.

PART 2 – EQUIPMENT

- 2.1 BELT CONVEYOR COMPONENTS
 - A. Motor:
 - 1. Conveyor is to be driven by a 5 HP, 3 ph., 60 Hz, 230/460v weatherproof enclosure motor.
 - B. Reducer:
 - 1. Speed reduction will be achieved by dual B-Section vee belts and sheaves through an AGMA Class II helical shaft mount gear reducer with an OSHA approved belt guard.
 - C. Pulleys & Bearings:
 - 1. The pulleys are to be 12" dia. minimum, mild steel drum pulley with tapered "QD" compression type hubs mounted on 1045CRS shafting supported by 1 15/16" dia. minimum self-aligning roller bearings. The head pulley will have 3/8" thick vulcanized neoprene lagging to prevent a belt slip. The tail pulley will be supported by protected screw take-ups with 12" take-up length minimum. The take-ups will include stainless steel adjusting rods with brass bearing capture nuts.

D. Belting & Splice:

1. Belt conveyors will incorporate a 2-ply nylon carcass belt, 2' wide, of cross rigid construction with 1/8" x 1/16" oil resistant covers and a rated tension of 220 P.I.W. 3" high, oil resistant corrugated sidewalls vulcanized to the belt must be provided to contain the product and prevent spillage. The multi-direction conveyor will include 3" high recessed sidewalls with a carrying surface width 10" less than the overall belt width, and 2 1/2" high t-cleats equally spaced and vulcanized to the cover.
2. The belt is to be spliced with a stainless steel mechanical hinged fastener, drawn and recessed into the belt cover. The sidewalls are to be spliced with a cold vulcanizing kit and a single plate stainless steel fastener offset 6" from the carcass splice.

E. Idlers:

1. Belt will be supported on the carrying run by CEMA C-5, flat idlers on 3'-0" maximum centers except at the load points on 1'-0" centers, and return runs on CEMA C-5 idlers at maximum spacing of 4'-0".
2. Idlers are to be covered with corrosion and wear resistant 1/8" thick molded urethane and supported from the frame by galvanized brackets.
3. Idlers will include 3/4" diameter shafts and tapered roller bearings with controlled greasing. Shaft seals will be multi-passage labyrinth with a positive wiper and an outer shield constructed as established by CEMA.

F. Directional Transitions:

1. The multi-direction belt is to be supported at the transition from horizontal to incline at the belt edge with stub can idlers, minimum 4 per side.

G. Frame:

1. Belt conveyor frames and supports will be constructed of ASTM A36 structural members with spreaders, sized as required to limit deflection to 1/250 at the longest support span. Top of channel frames will be covered with a 3/16" thick nominal "Fiberglass Reinforced Plastic" return belt cover to prevent product spillage onto the return run of the belt. Frame and support assemblies are to be hot dipped galvanized per ASTM A123 standards after fabrication.

H. Accessories:

1. Skirting:
 - a. Conveyor will be provided with continuous 3/16" thick "Fiberglass Reinforced Plastic" skirt at load area with an adjustable neoprene seal strip at the belt to guide and control the product from the mechanical screens to the belt conveyor without spillage during maximum debris loading events.
2. Drip Pan:
 - a. Return run of the belt will be provided with a 3/16" thick "Fiberglass Reinforced Plastic" drip pan 6" wider than overall belt width with water tight

flanged connections in 10'-0" maximum lengths. Drains will be located as shown on the Drawings. The pan should be installed to also serve as a guard for the return run of belting.

3. Guards:

- a. Conveyor will be provided with OSHA style guards at all "nip points" and motor driven rotating components, specifically including motor drive and tail pulley and head pulley guards. Guards will be constructed of FRP.

4. Switches:

- a. The conveyor will be provided with a cable operated OSHA safety stop switch with continuous cable run on both sides and a zero speed switch mounted at the conveyor tail shaft. Switches will be SPDT, 120 vac.

5. Belt Thumper:

- a. The product will be cleaned from the belt surface by a slave driven belt thumper with beater bar, bearings and belt guard.

6. Controls

- a. Controls shall be provided by the Screen Manufacturer as specified in Section 444300 Mechanically Cleaned Bar Screens.

2.2 SPARE PARTS

A. The Conveyor will be provided with the following spare parts:

- 1. 2 – Goodyear B-70 V-Belts
- 2. 1 – Rexnord 1 15/16" Diameter Pillow Block Bearing
- 3. 1 – Rexnord 1 15/16" Diameter Take-Up Bearing
- 4. 3 – Precision CEMA C 20 Degree Troughing Carry Idler
- 5. 1 – Precision CEMA C Flat Return Idler
- 6. 20 feet – 24" wide, 220 PIW, Conveyor Belting with MOR covers
- 7. 1 kit – Flexo 24" wide R2 Belt Splice kit with Template and Tools
- 8. 1 – 1" thick neoprene belt wiper blade

2.3 COATING

- A. Fabricated mild steel frames and supports will be hot dipped galvanized per ASTM A123 standards after fabrication. Component hardware will be epoxy painted. Nonferrous items will remain unfinished. Shafting will be coated with a rust inhibitive compound equal to Mobil ARMA 633.

2.4 FASTENERS

- A. Component assembly will be achieved with 304 stainless steel nuts, bolts, flat and lock washers.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. The contractor will install equipment in accordance with manufacturers' written instructions and approved submittals. Anchor bolts will be provided by contractor.

END OF SECTION



CONTRACTOR
STORAGE AREA
PLAN

SCALE: N.T.S.

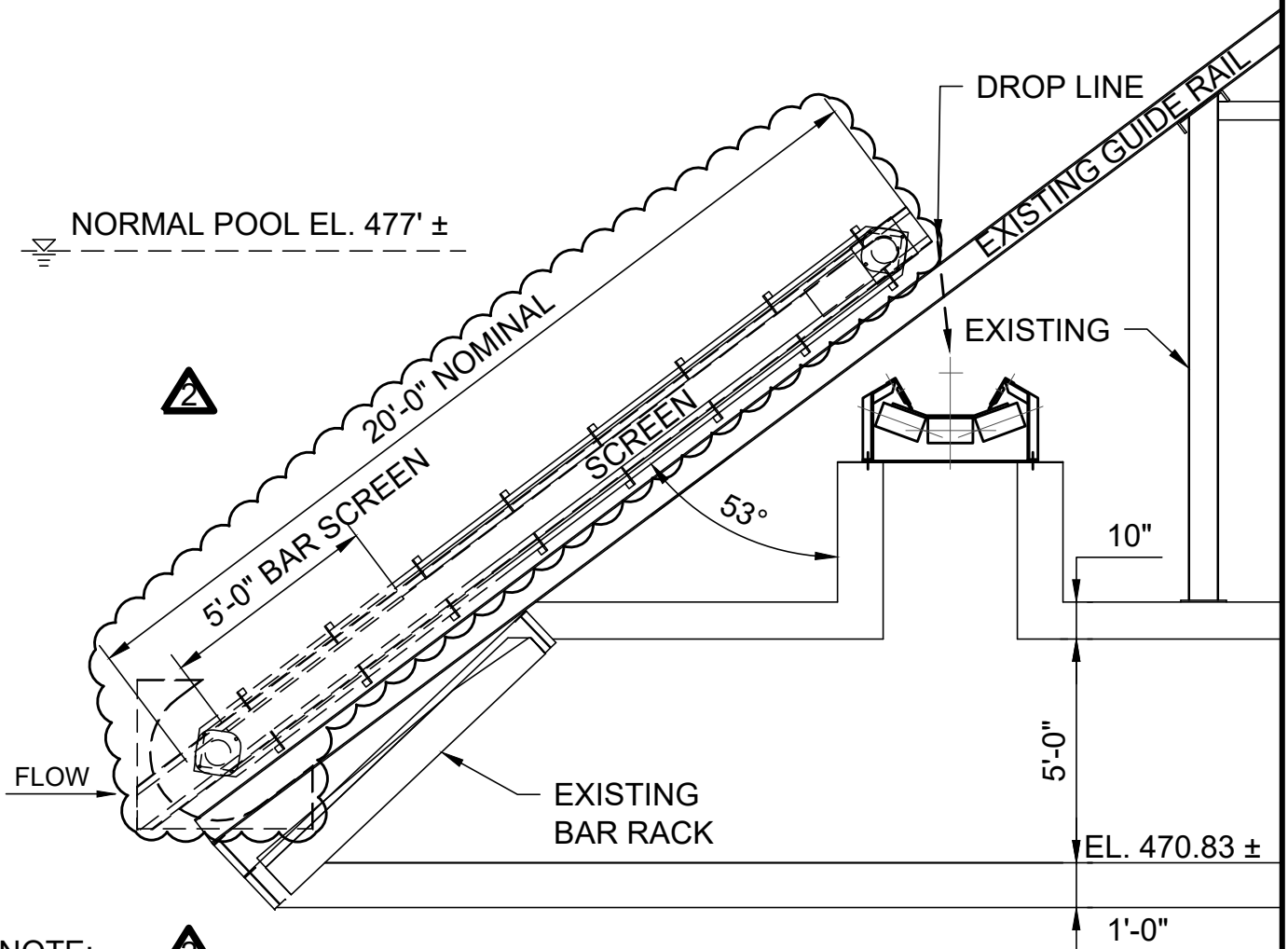
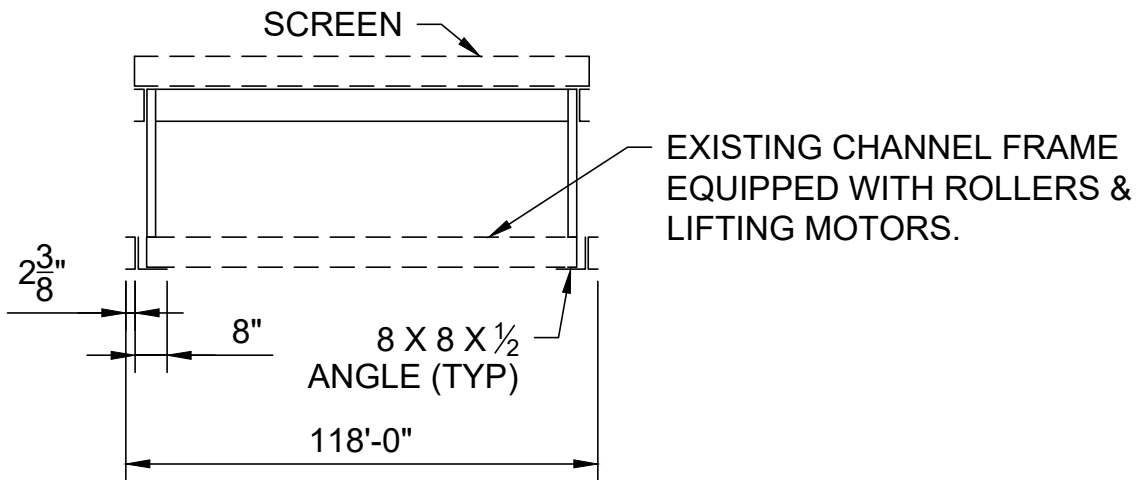


CRIST ENGINEERS, INC.
CONSULTING ENGINEERS LITTLE ROCK, ARKANSAS

FULTON COUNTY, ARKANSAS

**JIM HINKLE SPRING RIVER STATE
FISH HATCHERY RENOVATIONS
CONTRACTOR STORAGE AREA**

DESIGNED: CAJ	JOB NO. 1814	DATE MAY 2021	ADD. NO. 02
DRAFTED: CM	SCALE:	NOT TO SCALE	REF SHEET 1
CHECKED: CAJ			



NOTE:



- SCREEN MANUFACTURER SHALL FABRICATE BAR SCREEN TO ACCOMODATE EXISTING CHANNEL AND FRAME AND LIFTING MECHANISM.



1/4" = 1'-0"

BAR SCREEN - WEST
SECTION

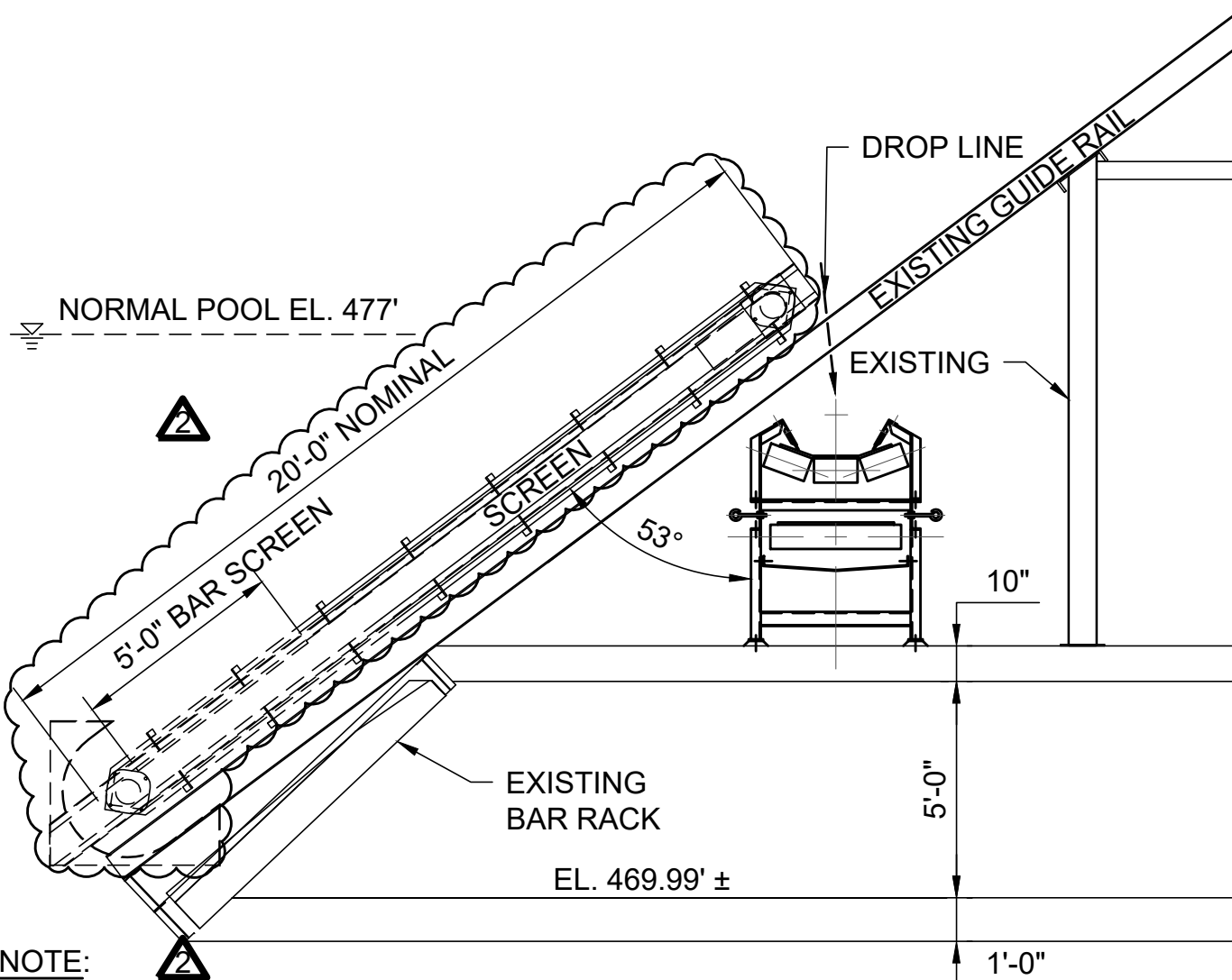
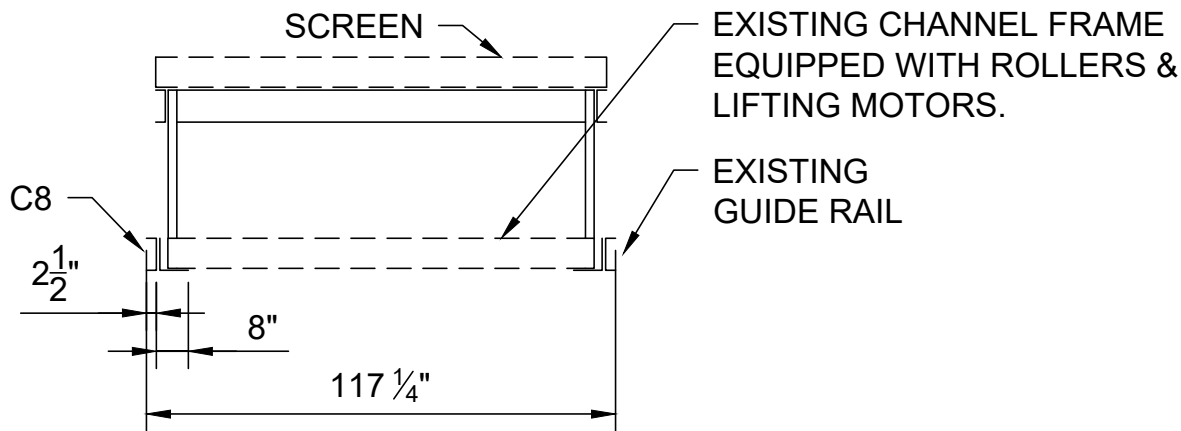
SCALE: 1/4" = 1'-0"



CRIST ENGINEERS, INC.
CONSULTING ENGINEERS LITTLE ROCK, ARKANSAS

FULTON COUNTY, ARKANSAS
JIM HINKLE SPRING RIVER STATE
FISH HATCHERY RENOVATIONS
BAR SCREEN - WEST

DESIGNED: CAJ	JOB NO. 1814	DATE MAY 2021	ADD. NO. 02
DRAFTED: CM	SCALE: NOT TO SCALE	REF SHEET 9	
CHECKED: CAJ			



NOTE:

1. SCREEN MANUFACTURER SHALL FABRICATE BAR SCREEN TO ACCOMODATE EXISTING CHANNEL AND FRAME AND LIFTING MECHANISM.



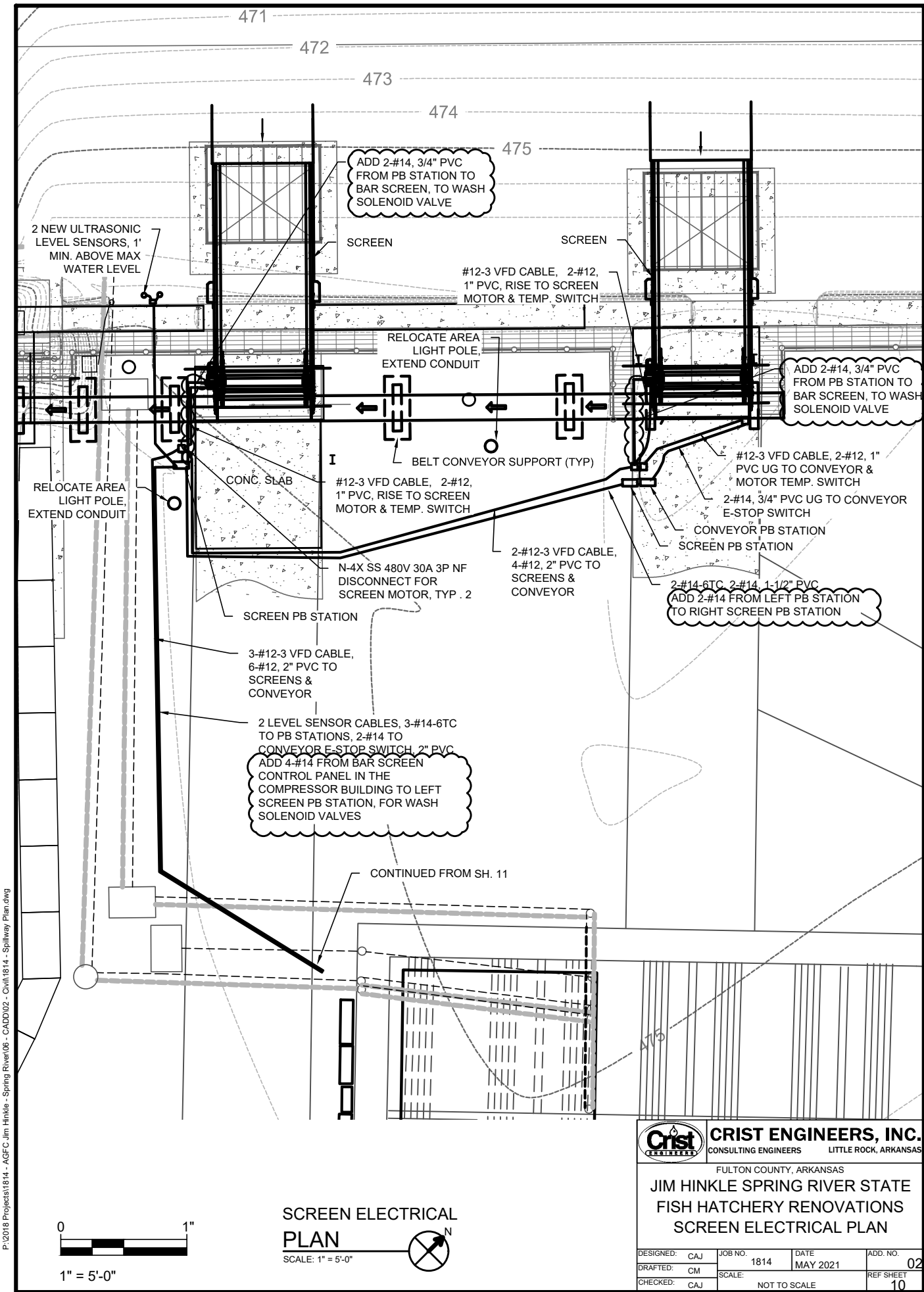
1/4" = 1'-0"

BAR SCREEN - EAST
SECTION

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



Crist ENGINEERS		CRIST ENGINEERS, INC. CONSULTING ENGINEERS LITTLE ROCK, ARKANSAS	
FULTON COUNTY, ARKANSAS			
JIM HINKLE SPRING RIVER STATE FISH HATCHERY RENOVATIONS BAR SCREEN - EAST			
DESIGNED: CAJ	JOB NO. 1814	DATE MAY 2021	ADD. NO. 02
DRAFTED: CM	SCALE:	NOT TO SCALE	REF SHEET 9
CHECKED: CAJ			



P:\2018 Projects\1814 - AGFC Jim Hinkle - Spring River\06 - CAD\02 - Civil\1814 - Spillway Plan.dwg

CRIST ENGINEERS, INC. CONSULTING ENGINEERS LITTLE ROCK, ARKANSAS			
FULTON COUNTY, ARKANSAS JIM HINKLE SPRING RIVER STATE FISH HATCHERY RENOVATIONS SCREEN ELECTRICAL PLAN			
DESIGNED: CAJ	JOB NO. 1814	DATE MAY 2021	ADD. NO. 02
DRAFTED: CM	SCALE:	NOT TO SCALE	REF SHEET 10
CHECKED: CAJ			

PROTECT



**RECONNECT
WATER SUPPLY TO
NEW SCREEN
SOLENOID VALVE
(TYP. OF 2)**

PHOTOGRAPH 6
N.T.S.

 CRIST ENGINEERS, INC. CONSULTING ENGINEERS LITTLE ROCK, ARKANSAS		FULTON COUNTY, ARKANSAS	
		JIM HINKLE SPRING RIVER STATE FISH HATCHERY RENOVATIONS MISC. PHOTO 6	
DESIGNED: CAJ	JOB NO. 1814	DATE MAY 2021	ADD. NO. 02
DRAFTED: CM	SCALE: NOT TO SCALE	REF SHEET 18	
CHECKED: CAJ			

RELOCATE
HYDRAULIC PUMP
UNIT FROM
EXISTING CONTROL
ROOM TO NEW
CONTROL ROOM



PHOTOGRAPH 12
N.T.S.

		CRIST ENGINEERS, INC.	
CONSULTING ENGINEERS		LITTLE ROCK, ARKANSAS	
FULTON COUNTY, ARKANSAS			
JIM HINKLE SPRING RIVER STATE FISH HATCHERY RENOVATIONS MISC. PHOTO 12			
DESIGNED: CAJ	JOB NO. 1814	DATE MAY 2021	ADD. NO. 02
DRAFTED: CM	SCALE:	NOT TO SCALE	REF SHEET 20
CHECKED: CAJ			

DEMOLISH
EXISTING WASTE
FLUME



PHOTOGRAPH 13
N.T.S.

		CRIST ENGINEERS, INC. CONSULTING ENGINEERS LITTLE ROCK, ARKANSAS	
FULTON COUNTY, ARKANSAS			
JIM HINKLE SPRING RIVER STATE FISH HATCHERY RENOVATIONS MISC. PHOTO 13			
DESIGNED: CAJ	JOB NO. 1814	DATE MAY 2021	ADD. NO. 02
DRAFTED: CM	SCALE: NOT TO SCALE	REF SHEET 20	
CHECKED: CAJ			