

***Contract Documents and Specifications***

**STATE OF INDIANA  
DEPARTMENT OF ADMINISTRATION**

**FOR**

**INDIANA DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF ENGINEERING**

**FAWN RIVER FISH HATCHERY**

**NEW WELL AND WATER DISTRIBUTION IMPROVEMENTS**

**STEUBEN COUNTY, INDIANA**

**PUBLIC WORKS PROJECT NO. E020096-A**

**SEPTEMBER, 2015**



**LAWSON-FISHER ASSOCIATES P.C.  
CONSULTING ENGINEERS**

525 WEST WASHINGTON AVENUE · SOUTH BEND, IN 46601  
PH: (574) 234-3167 FAX: (574) 236-1330

## SUPPLEMENTARY CONDITIONS

These "Supplementary Conditions" supplement the "Instructions To Bidders" and the "General Conditions". The paragraph numbers correspond to the "Instructions To Bidders" and the "General Conditions" paragraph to which they are supplemental.

The construction of the "Heavy and Highway" type roadway items of this project are to be accomplished in accordance with the provisions of the Indiana Department of Transportation (INDOT) Standard Specifications (2014 Edition), except as specifically modified or augmented by the Detailed Specifications and the Plans.

The Indiana Department of Transportation Standard Specifications (2014 Edition) with all Supplements to the date of bidding are hereby incorporated into these Contract Documents by reference, and will hereafter be referred to as the Standard Specifications. The bidder shall secure his own copies of the Standard Specifications and Supplements thereto and INDOT Standard Sheets listed by the Plans.

Where paragraph or section reference numbers are quoted in the Detailed Specifications, or are shown by the Plans, said numbers refer to the paragraph or section numbers of the Standard Specifications.

The General Conditions of the contract and special provisions are to take precedence over the INDOT Standard Specifications.

### **IB-04 – Pre-Bidding, Bidding and Post Bidding Requirements – Section B**

A test boring and sieve analysis has been prepared for the site by Ortman Drilling & Water Services. The report is included in Appendix "A" of these specifications. The report was prepared for the Engineer's use in design and is available for the bidder's information.

### **IB-04 – Pre-Bidding, Bidding and Post Bidding Requirements – Section D**

Bid as described in Contractors Bid (DAPW) shall include a lump sum Base Bid (in figures and words). In verifying bids, word amounts shall have precedence over figure amounts. There will be No Alternates allowed in the Bidding.

The cost for all items required to complete the work as shown on the Plans and noted in the Specifications shall be included in the lump sum base bid, no exceptions.

### **GC-1.3.1 – Copies Furnished and Ownership**

Owner shall furnish to Contractor up to five copies of the Contract Documents as are reasonably necessary for the execution of the work. Additional copies will be furnished, upon request, at the cost of reproduction.

### **GC-2.1.1 – Definition of Designer**

The firm of Lawson-Fisher Associates P.C. is the Designer and Engineer for this project.

**GC-4.6 – Permits, Fees and Notices**

The construction permits or approvals, if required, from the Indiana Department of Natural Resources (IDNR), Indiana Department of Transportation (INDOT), Indiana Department of Homeland Security, the IDNR Division of Historic Preservation & Archaeology, the Indiana Department of Environmental Management, the Indiana State Department of Health and the U.S. Army Corps of Engineers, will be obtained by the Owner.

All other permits or approvals pertaining to the proposed work, if any, shall be obtained and paid for by the Contractor.

**GC-4.7.1 – Remediation Allowance**

- A. Contractor shall include an allowance of \$25,000 in the Base Bid for remediation of unforeseen constraints.
- B. Such constraints may include, but are not necessarily limited to, unforeseen subsurface conditions particular to this construction site; obstruction of or delays to reasonable work sequences by the Property, or the Owner; uncommon adverse weather or site conditions; and, conflict within or omissions from the Contract Documents.
- C. All remediation work shall be proposed to and authorized by the Director of Public Works Division prior to execution, jointly documented by Contractor and Designer, and recorded in Contractor's "as-builts" and Designer's project record documents.
- D. As an example: The Contractor believes he can do the job for \$500,000, independent of the remediation allowance. His submitted bid would then be  $\$500,000 + \$25,000 = \$525,000$ .
- E. If there are no problems or Change Orders encountered during the job, the Contract would closeout at \$500,000 and the remediation allowance would not be used or paid.

**GC-4.12 – Shop Drawings**

Six copies of shop drawings shall be submitted to the Designer to be distributed as follows:

Two sets for the Owner, two sets for the Designer, and two sets to be returned to the Contractor.

In lieu of paper submittals, the Contractor may submit the shop drawings to the Designer electronically.

**GC-4.15 – Cleaning-Up**

All disturbed areas are to be restored with materials to match existing surface conditions.

The Contractor shall be responsible for the protection of all existing facilities during the entire period of construction. Any damage to the existing facilities caused by the Contractor shall be repaired by the Contractor at his expense and in a manner approved by the Designer.

The Contractor shall, at all times, keep the premises free from accumulation of waste materials or rubbish caused by his employees or work. At the completion of the work, he shall remove all accumulated rubbish, tools and surplus materials from and about the job site, and shall leave the premises in a neat, clean and orderly condition.

**GC-8.2 – Progress and Completion**

The contract time for substantial completion shall be 75 calendar days from the date of the Notice to Proceed. Liquidated damages shall be assessed at the rate of \$1,000/day for each day that expires after the time specified, until the work is substantially complete.

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## **DETAILED SPECIFICATIONS**

### **WORK ITEM 105-1 - CONSTRUCTION ENGINEERING**

#### **DESCRIPTION**

The Contractor shall provide all materials, equipment and personnel necessary to complete the detailed construction engineering, detailed staking and layout for installation of the Contract work.

#### **MATERIALS**

As required.

#### **CONSTRUCTION REQUIREMENTS**

The Contractor shall be responsible for all construction engineering as outlined in Section 105.08 of the INDOT Standard Specifications.

The Engineer shall furnish only the vertical and horizontal control data shown by the Plans. The Contractor shall preserve and/or reference horizontal control points and property corner markers.

## WORK ITEM 106-1 - MATERIAL APPROVAL AND SYSTEM TESTING

### **DESCRIPTION**

The Contractor shall employ a qualified, professional testing laboratory to provide all material testing, approval testing and system testing. There will be no testing performed by the Owner's staff or the Engineer. The tests to be provided and the frequency of testing shall be as required for the INDOT Standard Specifications for highway materials and approvals unless modified in this section.

Two copies of all test reports are to be submitted to the Engineer. All reports are to be certified by a Professional Engineer registered in the State of Indiana who is not an employee of the Owner or Engineer. Results shall be submitted within 72 hours.

**If a supplier of materials has a current "immediate usage" approval by INDOT, testing for source approval will not be required.**

The areas of testing are:

1. Earthwork:

Maximum density shall be determined by AASHTO T-99 as modified by Section 203.24 of the State Specifications using Method A for soil and Method C for granular material.

The minimum soil compaction requirements for backfill material and pavement subgrade shall be 100% Standard Proctor (95% Modified Proctor).

2. Compaction Testing Frequency:

- a. Compaction testing frequency for pipe trenches shall be one test for every 100 LF of pipe. Pipe zone materials shall be compacted per the pipe bedding detail on the plans.
- b. A minimum of one (1) Compaction Test per 20 square yards, per lift of earth fill or subgrade.
- c. Location of the Compaction Tests will be selected by the Engineer or the Owner's representative.
- d. Unless there is a reason to believe that aggregates and asphaltic cement do not meet the requirements of the latest Standards of the Indiana Department of Transportation, a certification from the supplier certifying that the material does meet said specifications will be acceptable. However, if tests are required, the customary physical and chemical tests must be made.

3. Portland Cement Concrete:

Air content test, slump test, 7-day and 28-day compression cylinders shall be provided for each 5 cubic yards of concrete utilized for cast-in-place structures.

4. Drain Pipe:

Testing for the installed drain pipe shall be in accordance with the Detailed Specifications for the drain pipe items.

5. Water Supply:

Testing for the installed water supply piping shall be in accordance with the associated Detailed Specifications for the water supply pipe items.

6. Any other test incidental to the performance of the work and required for demonstrating the quality of material and workmanship.

**WORK ITEM 110-1 - MOBILIZATION AND DEMOBILIZATION**

**DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor, and materials for movement of equipment and personnel to and from the project site. The work shall be in accordance with Section 110.

**MATERIALS**

As needed.

## **WORK ITEM 201-1 – CLEARING, GRUBBING AND OBSTRUCTION REMOVAL**

### **DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor and materials required to complete Clearing, Grubbing and Obstruction Removal within the construction limits including pavement removal and any other items required to be removed to complete the proposed work.

### **MATERIALS**

All materials shall conform to applicable requirements of Section 201.

### **CONSTRUCTION REQUIREMENTS**

The Contractor shall have all underground utilities field located before start of construction. Construction shall conform to the applicable provisions of Sections 201 and 202.

The Contractor shall visit the site to familiarize himself or herself with the nature of the clearing and removal operation.

All debris shall be disposed of at an acceptable off-site location provided by the Contractor.

Areas of bituminous pavement removal shall be saw-cut to neat lines prior to removal.

Removal, careful storage and reinstallation of any item required for the performance of the work shall be considered incidental to this work item and will not be paid for separately.

**WORK ITEM 203-1- UNCLASSIFIED EXCAVATION**

**DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor and material required to complete all excavation and borrow work that is incidental to the grading and subgrade preparation work including the asphalt surface restoration and pump house access drive.

**MATERIALS**

All materials shall conform to applicable requirements of INDOT Section 203.

**CONSTRUCTION REQUIREMENTS**

Construction shall conform to the applicable provisions of INDOT Section 203.

**WORK ITEM 205-1 – TEMPORARY EROSION AND SEDIMENT CONTROL**

**DESCRIPTION**

Contractor shall provide temporary erosion and sediment control for the project as needed and as shown on the plans including temporary access drives.

The Contractor shall furnish all necessary equipment, labor and materials required for the Temporary Erosion and Sediment Control.

**MATERIALS**

All materials shall conform to the applicable requirements of Section 205.

**CONSTRUCTION**

Construction shall conform to the applicable requirements of Section 205.

The Contractor shall inspect the project site after every rain event and perform maintenance as needed to provide a fully functional erosion and sediment control plan.

**WORK ITEM 211-1 – STRUCTURE BACKFILL, TYPE 1**

**DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor and materials to complete structure backfill of trench excavations that are related to pipe installation in areas where excavated material is unsatisfactory for backfill.

**MATERIALS**

All materials should conform to the requirements of INDOT Section 211.

**CONSTRUCTION REQUIREMENTS**

Construction shall conform to the requirements of INDOT Section 211. This item shall only be used if native excavated material is determined to be unsatisfactory for backfill by the Engineer.

**WORK ITEM 301-1 – COMPACTED AGGREGATE FOR BASE (# 53) AND SURFACE (# 73)**

**DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor and materials required to complete the Compacted Aggregate for Base and Surface where noted on the Plans.

**MATERIALS**

The Compacted Aggregate Base shall be in accordance with INDOT Standard Specifications Section 301. Recycled crushed concrete will be allowed providing it meets the No. 53 gradation and it is free of debris. Compacted Aggregate for Surface No. 73 shall be limestone in accordance with INDOT Standard Specification 303.

**CONSTRUCTION REQUIREMENTS**

Compacted Aggregate for Base shall be constructed in accordance with Sections 301 and 303.

## **WORK ITEM 402-1 – HOT MIX ASPHALT FOR PATCHING**

### **DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor and materials required to complete the Hot Mix Asphalt for Patching as required for installation of pipe as shown on the Plans.

### **MATERIALS**

All materials shall conform to the applicable requirements of Section 715.12.

All bituminous mixtures shall include crushed limestone or slag.

The pavement section for the HMA for Patching shall be as indicated on the Plans.

This pavement shall be constructed on a compacted and proof-rolled subgrade and shall be in accordance with 409.03(d).

An approved INDOT job mix formula shall be acceptable.

### **CONSTRUCTION REQUIREMENTS**

Construction shall conform to the applicable provisions of Section 715.12.

Tack coat shall be provided between all bituminous lifts.

All transverse joints shall be saw-cut the full depth of the existing course. A clean saw-cut edge shall be established at the time of reconstruction of the joints. Joints shall be straight edge while hot and corrective work undertaken, as necessary, to ensure smooth riding joints.

## **WORK ITEM 616-1 – RIPRAP ON GEOTEXTILE**

### **DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor and materials required to install riprap and geotextile as shown on the Plans and specified herein.

### **MATERIALS**

All materials shall conform to applicable requirements of Sections 616, 904.04 and 918.02. The riprap shall be revetment gradation limestone.

### **CONSTRUCTION REQUIREMENTS**

Construction shall conform to applicable requirements of Section 616 and as shown on the Plans.

## **WORK ITEM 621-1 – SEEDING AND MULCHING**

### **DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor and material required to seed and mulch all areas disturbed by this project.

### **MATERIALS**

The seed shall be seed mixture Type "U". All materials shall conform to applicable requirements of Section 621 of the Standard Specifications.

Fertilizer shall be standard commercial fertilizer with an analysis of 12-12-12.

Mulch for seeding shall be wood cellulose fiber mulch.

### **CONSTRUCTION REQUIREMENTS**

The area to be seeded shall be smooth and uniform. The seed bed, if not loose, shall be loosened to a maximum depth of 3 inches before fertilizer or seed is applied. Fertilizer shall be spread uniformly over the area to be seeded.

Seed may be drilled in or mixed with water. The mixture shall be sprayed over the area to be seeded. An approved mechanical method which shall place the seed in direct contact with the soil may be used. In places inaccessible to mechanical equipment, or where the area to be seeded is small, a hand operated cyclone seeder or other approved equipment may be used. Mulching material shall be applied uniformly in a continuous blanket. Mulch shall be placed within 24 hours after seeding. After procedures for holding the mulch in place have been completed, the mulch shall be watered thoroughly. The seed or soil beneath the mulch shall not be displaced. The mulching material shall be maintained in place satisfactorily until final completion and acceptance of the contract.

**WORK ITEM 621-2 – TOPSOIL**

**DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor and material required to complete topsoil dressing of the areas to be seeded and mulched.

**MATERIALS**

All materials shall be salvaged from the site or brought in from an approved source as needed, and shall meet the topsoil requirements of Section 621 and 914.

**CONSTRUCTION REQUIREMENTS**

Construction shall conform to the applicable provisions of Section 621.

All disturbed areas are to receive a minimum of 4" of topsoil.

**WORK ITEM 715-1 - WATER SUPPLY PIPING, VALVES, FITTINGS AND APPURTENANCES**

**DESCRIPTION**

The work shall include the furnishing and installation of all materials, labor and equipment necessary to complete the water supply piping and well house piping and appurtenances per the plans and these specifications; including all excavation, pipe bedding, backfill, and compaction.

In these Specifications, references are made to the Standard Specifications for the American Society of Testing and Materials (ASTM), American Water Works Association (AWWA), and/or the American National Standards Institute (ANSI). Where such references occur, the standard in effect at the date of the Bid opening will apply.

**MATERIALS**

All Ductile Iron Pipe shall conform to the requirements of the American Water Works Association (AWWA) C151, AWWA C-111 and AWWA C-104, Pressure Class 350, cement lined unless otherwise specified. Ductile Iron Piping inside the well house shall be flanged and gasketed conforming to AWWA C115 and AWWA C151.

Push-on joint pipe or mechanical joint may be used unless otherwise specified by the Plans.

Caps shall be restrained joint.

All fittings shall be mechanical joint Ductile Iron; cement mortar lined conforming to the requirements of AWWA C-110 or AWWA C-111, unless otherwise specified. Ductile Iron Fittings inside the well house shall be flanged and gasketed conforming to AWWA C110, AWWA C115 and AWWA C151.

The ductile iron pipe and fittings shall have a hot coal tar coating in accordance with American Standards Institute for Coal-Tar Dip Coating for Cast Iron Pipe and Fittings.

Where noted on the Plans, the water supply piping shall be PVC C900 DR 25 conforming to AWWA C900 and NSF61. Pipe color shall be blue. Where PVC C900 pipe is used for drain pipe, it shall be the color green. Pipe joints shall be push-on with gaskets conforming to ASTM D3139.

In above grade locations, all piping, fittings and valves shall be supported by pipe supports in such a manner that no strain will be imposed on any equipment or piping component. Pipe supports shall be wrought steel floor supports with vertical adjustment. Pipe supports shall be painted to match the color of the piping system.

Tracer wire shall be installed on all PVC water supply piping. Tracer wire shall meet the requirements described in specifications Section 716-1.

Butterfly valves at the well house shall have flanged joints and conform to AWWA C504. The butterfly valves shall be provided with hand-wheel operator.

The horizontal swing check valve at the well house shall have flanged joints and shall comply with AWWA C508.

Gate valves shall be Clow F-6100, epoxy-coated, resilient wedge, open left, or equivalent, meeting the requirements of AWWA C509.

All valve boxes shall be cast iron three piece valve box assemblies; bottom section, top section and lid. Lid shall have the text WATER cast into it.

Retainer glands shall be MegaLug per ASTM A536, Grade 65-45-12. The length of restraint shall be per the manufacturer's recommendations for the given type of fittings, depth of cover, trench type and soil condition.

Concrete thrust blocking shall be placed where shown on the Plans.

### **CONSTRUCTION METHODS**

Excavation: In these Specifications, "excavation", "removal of earth", or similar phrases shall mean and include: clearing the site of the work; removal of all materials of any kinds which may be encountered, whether wet or dry, disposal of all surplus materials; supporting all structures above or below ground; removal of water; sheeting and bracing; backfill; restoration of the site; and all incidental work.

The Contractor shall include in his price for all items in place, the cost of all excavation work as defined above, unless specifically noted otherwise.

Piping: The Contractor shall make all excavation for piping for open cut installation, unless tunneling, boring, or jacking is specifically ordered, authorized and permitted. The excavation shall be made to the width and depth necessary to safely construct the work in accordance with all State and Federal codes, including the OSHA requirements for open trench excavations. The Contractor shall be careful that the excavation is to the proper line, section and grade, as shown on the Plans, in order to provide an acceptable surface for installation of the pipe.

The water supply pipe shall be installed with a minimum depth of cover of 5-feet. The water supply pipe may be required to be installed at a deeper depth to maintain the required 18-inches vertical separation distance from sanitary and storm sewers. Costs associated with depth of cover adjustments to maintain vertical separation requirements shall be incidental to the water supply pipe items.

Excavation shall be included in the price for all pipe and shall include excavation of materials, all sheeting, trenching, trimming, bracing, supporting of structures above and below ground, backfilling, and compaction ready for surface restoration.

Additional Excavation: It is assumed that satisfactory earth materials will be encountered at the elevations shown on the drawings, but in case the materials found are of unsuitable character, or in case it is found necessary to make additional excavation, the excavation shall be carried to such additional depth or width as may be directed by the Engineer. An extra work agreement will be negotiated before the additional excavation is accomplished.

Sheeting and Shoring: All excavations and trenches shall be properly sloped or braced to furnish and provide proper and safe working conditions for the equipment and workmen in accordance with IOSHA requirements as set forth in Indiana Code IC-22-8-4, Section 238. The costs to comply with IOSHA shall be included in the prices for the installed water main facilities.

The Contractor shall provide sheeting to protect adjacent structures when the work is close to existing structures or facilities.

When running sand is encountered, tight sheeting, well points, or both, shall be used to control the excavation.

It shall be the responsibility of the Contractor to provide proper materials, bracing and working conditions for and during construction.

Laying Pipe: Before laying any pipe in trench, the pipe shall be inspected for defects. Damaged or unsound pipe shall immediately be removed from the site. Foreign matter and dirt shall be removed from the inside of the pipe before lowering into the trench and the pipe shall be kept clear during and after lying.

All curved fittings and other fittings as shown, described or necessary for the installation, shall be furnished and installed and shall be included in the Contractor's price for water supply pipe, except for those specifically listed in the itemized proposal.

Pipe shall be firmly set on a good foundation and care shall be taken that pipe does not rest on stones, rock or any unyielding material.

Pipe bends, caps, blind flanges, tees, and other fittings shall have restrained joints provided at no additional costs.

Deflection greater than the allowable deflection set by the manufacturer shall be made by the use of standard fittings or by special fabricated fittings.

The pipe shall be firmly set on a good foundation and secured against settlement. Where the pipe is to be laid in a trench excavated in unyielding materials, sand bedding shall be used in the trench bottom as directed by the Engineer.

The pipe shall be placed under existing pipes, ducts, structures and other obstructions if necessary to obtain the required cover. The pipe shall be installed to maintain at least a 3-inch clearance between it and all-existing structures, pipes, ducts, etc. At crossings of a sanitary or storm sewer, 18-inches of vertical separation will be required. Water supply pipe shall be separated at least 10-feet horizontally from sanitary and storm sewers, measured from the outside surface to outside surface of pipes.

Backfilling Pipe: From the bottom of the excavation to a point 1-foot above the top of the pipe, backfill shall be placed as follows:

Natural granular material shall be placed in 6-inch layer loose measure around the pipe. Each layer shall be thoroughly tamped under and around the pipe, and when sufficient layers have been placed in this manner to cover the pipe, the tamping shall proceed across the width of the trench. Hand, pneumatic or mechanical tampers may be used. The backfill shall be moist but not wet, and it shall not include any stones larger than 2-inches in any dimension.

If the native material is not granular and is unsuitable for backfilling, Structure Backfill shall be installed around the pipe in the manner described above.

For the remainder of the fill, the material shall be spread across the excavation in layers of 2-foot loose measure. Each layer shall be tamped thoroughly and completely with tampers as described above before the next layer is placed. Compaction tests will be required under pavements and along or adjacent to the pavement edge. Backfill operations under pavements and adjacent to the pavement edge shall be simultaneous with pipe installation. See "Compaction Tests."

For backfill in locations where no further treatment is required, the backfill shall be carried out, as described, to a point above the grade and the backfill shall be neatly mounded over the excavation to prevent depressions after settlement occurs in the top layers.

If, in the opinion of the Engineer, granular material can be compacted in an acceptable manner with jetting or flooding procedures, and if approved in writing by the Engineer, this method may be used.

Compaction and Tests: Compaction to 100% maximum density is a requirement for all backfill in trenches which will support driveway and street pavement and adjacent to the pavement edge. The 100% maximum density shall be determined by ASTM D698 based on the moisture-density relation of soils, Method C, using a 5.5 pound hammer and a 12-inch drop.

An approved testing laboratory shall make the density-compaction tests with results sent directly to the Engineer. Two tests will be required for each 400-feet of 2-foot layer of trench backfilled for a total of four tests per 400-foot length of trench backfilled. Additional testing may be required at the discretion of the Engineer if he has reason to suspect non-conformance with the Specifications.

Testing (Per AWWA Specifications): Pressure pipe (Ductile Iron and PVC) shall be tested at 150 pounds per square inch hydrostatic pressure per AWWA C-600. Each section to be tested shall be slowly filled with water at the lowest point and air shall be expelled from the pipe. The pump connections, fittings and all necessary labor and materials for conducting the tests, shall be furnished by the Contractor and included in the price for the appropriate item. No separate payment will be allowed for this work.

Leakage is defined as the quantity of water to be supplied by the newly-laid pipe, or any valved section under test, which is necessary to recover the specified leakage test pressure (150 psi) after the pipe has been filled with water and the air expelled for a period of two hours. The Engineer shall witness all pressure test. The Contractor shall notify the Engineer at least 72 hours in advance of any pressure testing. Leakage shall not exceed the allowance presented in Table 6A of AWWA Standard Code C-600.

4" Water Main Leakage Allowance = 0.37 gph/1,000 ft. of pipe.

6" Water Main Leakage Allowance = 0.55 gph/1,000 ft. of pipe.

8" Water Main Leakage Allowance = 0.74 gph/1,000 ft. of pipe.

Testing per the National Fire Prevention Code is not required.

Lines or joints, which leak, shall be repaired and retested. All pipe, fittings and other materials found to be defective under test shall be removed and replaced by the Contractor at his own expense.

## **WORK ITEM 715-2 – DRAIN PIPING**

### **DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor and materials required to complete the drain piping improvements from the hatchery building to the fish rearing pond and the drain piping improvements from the intake structure to the river and from the well house floor drains, including necessary pipe, fittings, cleanouts, couplings, valves and appurtenances, as shown on the Plans and described in these specifications.

### **MATERIALS**

All materials shall conform to applicable requirements of Sections 715 and 720.

The PVC pipe for the drain shall be ASTM D-3034 SDR 35 unless noted otherwise.

Pipe bedding shall conform to the applicable requirements of the trench details as shown in the plans.

Plug valves shall conform to AWWA C517 with 100% full port, cast iron, mechanical joints and have a nut operator with valve box unless noted otherwise. Valve box lid shall have the text SEWER cast into it.

### **CONSTRUCTION REQUIREMENTS**

Construction shall conform to the applicable provisions of Sections 715 and 720 and as described in these specifications.

Particular attention shall be given to compaction of backfill. The Contractor shall insure compaction of at least 95% of maximum dry density. Refer to trench bedding details as shown in the plans for specific density requirements.

All drain pipe shall be bedded in accordance with the associated trench bedding detail as shown in the Plans.

A separate Geotechnical Investigation was not performed for this project. The Contractor shall perform any investigations he feels are necessary and shall provide all equipment, materials, and labor as required to keep trench/work area dry from all water sources during the installation of the proposed drain pipe.

The PVC drain pipe shall be tested by a low pressure air test per ASTM F1417.

## **WORK ITEM 715-3 – PRODUCTION WELL INSTALLATION AND PUMP**

### **DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor and material required to drill, test and equip a new gravel pack water supply well rated at 650 gpm  $\pm$  with a 20 HP vertical, motor driven deep well turbine pump with variable frequency drive.

### **MATERIALS AND CONSTRUCTION METHODS**

The minimum standards for construction shall be the IC 25-39 and 312 IAC 13, unless more stringent requirements are required by these Detailed Specifications. The on-site well driller and pump installer shall be licensed as a Water Well Driller by the Indiana Department of Natural Resources (IDNR).

#### **Permanent Hole, Casing, and Grouting**

The Contractor shall use rotary drilling to bore a hole for a 12" diameter well and screen to a depth of 97 feet below existing grade. This drilling specification is based on the test boring performed by Ortman Drilling in May, 2014 (see Appendix A).

The well casing shall be 12-inch inside diameter, Schedule 40, 0.375" wall, steel well casing, plain end and beveled for welding. The well casing shall meet the requirements of the American Pipe Institute's "Steel Water Well Pipe" and the pipe quality requirements of ASTM A-53. All casing shall be new and shall bear markings that will identify the materials as those which are specified.

The casing shall be installed plumb, and alignment shall be verified.

The well screen shall be Type 304 stainless steel wire wound continuous slot welded screen as manufactured by Alloy Machine Works, Inc.

The screen shall be 12" IPS in diameter and 20 feet in length. The bottom of the screen shall be fitted with a 1/4" stainless steel plate. The screen opening size shall be 0.080" slot. Sieve analysis from test boring can be found in Appendix A. The operational entrance velocity of water into the screen shall not exceed 0.1' per second.

The well gravel pack size shall be American Materials, Red Flint, designed for the selected screen slot size. The gravel shall be a minimum 97% silica gravel, washed, screened and without sharp edges, and the gravel shall be free of debris. The annular space between the screen and the borehole shall be filled with the selected gravel pack to a point 50' below grade.

The gravel shall be sterilized with a 50 parts per million chlorine solution as it is placed in the well.

The well casing shall be grouted in place using a bentonite clay product, such as ABenseal@, which is specifically designed for well grouting. The bentonite grout shall be pumped into place through a tremie pipe from the bottom of the open annular space at the top of the gravel pack (50'), up to finished grade. The grout shall be approximately 2" thick at all points around the casing. Under no circumstances shall drilling fluid/mud be used as a grout material. Grout shall not be poured into the annular space.

The grout placement pipe shall extend from the ground surface to the top of the gravel pack, and the placement pipe shall have a minimum inside diameter of 1". Grout shall be placed, from bottom to top, in one continuous operation.

Other drilling techniques; change in gravel pack requirements; changes in the grouting material, thickness, placement requirements and other alternative techniques and/or materials will be allowed provided they comply with AWWA A100.

Well development shall comply with AWWA A100, including Appendix E. If the jet wash with simultaneous airlift method is utilized, it shall be conducted at a minimum of one (1) hour of development per foot of well screen (20 hours). If the double disk surging method is utilized, it shall be conducted at a minimum of two (2) hours of development per foot of screen (40 hours).

#### **Abandonment**

If it should become necessary for the Contractor to abandon a drill hole or well, all abandonment procedures shall be in accordance with IDNR regulations.

#### **Production Well Performance Test**

The Contractor shall furnish, install and remove (after testing is complete) all necessary measuring instruments and pumping equipment capable of pumping up to 650 gpm from a maximum pumping water level of 77 feet below existing grade.

The pumping unit shall be complete with ample power source, controls, and appurtenances and shall be capable of being operated without interruption for a period of not less than 24 hours.

The discharge shall be measured with a circular orifice meter or a venturi meter which shall have an accuracy of  $\pm 2\%$ . All water level readings shall be taken utilizing a data logging transducer, installed in the well a minimum of 2 hours prior to starting the pumping test. Airline and altitude gauge systems shall not be permitted. Interim readings shall be taken with a manual water level instrument as verification of the electronic data.

The well shall be subjected to a constant rate pumping test for a period of not less than 24 hours, at a production rate of not less than the well design capacity of 650 gpm.

#### **Aborted Tests**

Failure of pump operation for a period greater than one percent (1%) of the design pumping time shall require suspension of the test until the water level has recovered to the original static level.

#### **Location of Discharge**

Discharge water from the pumping test shall be conducted to a point approximately 100' from the well being tested. It is imperative to insure that the discharge water does not cause flooding or erosion.

### **Record of Production Well Performance Test**

The Contractor shall keep an accurate record of the pumping test and furnish a pumping test data plot to the Owner upon completion of the test.

Information accompanying the data plot shall include the test start date, the static water level prior to the start of the test, the test pumping rate, the elapsed pumping time of each water level measurement, the drawdown distance of each water level measurement and the specific capacity at the end of the test.

### **Well Pump, Appurtenances and Controller**

Provide a complete vertical motor-driven deep well turbine pump. The pump shall be Peerless Vertical Model – 10HXB or approved equal. With a 20 HP motor capable of pumping 650 gpm at 93-feet of head by Grundfos / Peerless or equal. The motor frame shall be L256TP12, VHS, GE or approved equal.

**Operating Conditions:** The following are the operating conditions:

1. Size of Well (inside diameter)	<u>8 inches</u>
2. Depth of Well from pump discharge	<u>101.33 feet</u>
3. Standing water level below top of well	<u>N/A</u>
4. Pumping level below top of well discharge at rated pump capacity	<u>81.33 feet</u>
5. Pumping head or pressure above top of well	<u>11.67 feet</u>
6. Total pumping head (4 and 5)	<u>93 feet</u>
7. Capacity of Pump	<u>650 gpm</u>

The total pumping head does not include losses in the pump, which must be allowed by the bidder. The efficiency of the pumping unit shall be as high as correct design and good engineering will permit. All things being equal, consideration will be given to overall pumping costs.

The motor shall be NEMA standard design B, Vertical Hollow Shaft high thrust, WP-1 enclosure, 1770 RPM, squirrel cage induction full voltage, part winding, wye-delta, type starting, powered by an electrical service rated at 460 \volts, 60 hertz, 3 phase. Each motor shall be capable of driving the pump under all head conditions without exceeding the rated capacity of the motor. Motor shall have class B insulation and 1.15 service factor. Motor shall be supplied with a non-reverse ratchet. Motor shall conform to AIEE and NEMA, standards. Motor design shall be premium efficiency style.

The motor thrust bearing shall be designed to carry the hydraulic thrust plus the weight of the shaft and the impellers. The thrust bearing life expectancy shall have a five year average rating based on 24 hours per day usage. The motor shall be capable of carrying up thrust equal to approximately 30% of the total down thrust. Bearings shall be oil or grease lubricated as per manufactures standard design.

The motor shall be inverter duty rated; suitable for use with variable frequency drive.

Each motor shall be provided with a corrosion-resistant nameplate giving the name of the manufacturer, horsepower, voltage, frequency, speed, efficiency and current for unit at full load.

### **Discharge Head Assembly**

Discharge head shall be a cast iron surface discharge with 125 lb. ANSI dimension discharge flange and shall support the motor, column, shafting, and pump assembly. The discharge head shall be mounted on a fabricated steel, sole plate which shall be anchored to a concrete pad over the well or sump. The bottom surface of the head shall be machined smooth. A tapped drain line connection shall be provided for the removal of the excess water to a drain.

A cast iron stuffing box shall be provided with a bronze removable stuffing box bushing, galvanized split gland, T-bolts with stainless steel clips and brass nuts. Stuffing box shall utilize a minimum of five synthetic Garlock 8913 packing rings, compressed around the pump shaft and lubricated by the pumped water.

### **Column Assembly**

Column pipe shall be furnished in interchangeable sections not over 10 feet in length and shall be connected with threaded sleeve type couplings. The friction loss in the column shall not exceed 5 feet per 100 feet of column, based on the rated capacity of the pump. The weight and size of the column shall be no less than required in AWWA spec E101-1. The line shafting shall be AISI 416 stainless steel of ample size, minimum of 1" diameter, to operate the pump without distortion or vibration. The shaft shall be furnished in interchangeable sections not more than 10 feet in length and shall be coupled with AISI 410 stainless steel coupling. The column assembly shall have bronze bearing retainers retained by the butted pipe ends. Each bearing retainer shall contain a water-lubricated, cutless rubber bearing designed for vertical turbine pump service.

### **Pump Bowl Assembly**

The pump bowls shall be of close grained cast iron, having a minimum tensile strength of 30,000 pounds per square inch, free from blow holes, sand holes, and all other faults; accurately machined and fitted to close dimensions. Bowls are to be coated inside with a smooth vitreous enamel to reduce friction losses, corrosion and sand wear in the water passages and thus gives better efficiency. Each intermediate bowl is to be constructed by using a bronze bearing and a neoprene bearing to support the impeller shaft which gives the longest possible life, based on the widest range of pump conditions.

The bowl is to provide a side seal at the impeller skirt and in addition, a resilient neoprene ring, reinforced with an imbedded steel core, is to be installed in the bowl directly below the impeller skirt. This "lateral bowl ring" is to reduce the wear of the impeller skirt. Original capacities and efficiencies are to be maintained by adjustment of the top shaft nut at the top of the motor. The impellers shall be of bronze enclosed type only, accurately machined and finished, and balanced. They shall be securely fastened to the impeller shaft with a steel taper bushing. The impeller shaft shall be of stainless steel of not less than 12% chrome. The impeller shaft shall be supported by a combination of water lubricated, fluted rubber and bronze bearings. Discharge and suction cases shall both be fitted with steel sand collars. All bowl bolting shall be of stainless steel.

### **Strainer**

The bell suction shall be fitted with a cone type bronze basket strainer. The openings in the strainer shall be of proper size to exclude anything large enough to clog the impeller. The open area of the strainer shall not be less than four times the impeller eye area.

### **Water Level Indicator**

A suitable air line of galvanized iron pipe, copper or plastic tubing of sufficient length to extend from the surface to the top of the bowl assembly, with an altitude gage reading in feet, and connections for an air pump shall be furnished.

### **Factory Assembly**

Close coupled vertical pump(s) shall be factory assembled if the overall length does not exceed 20 feet from top of discharge head to bottom of suction casing. The motor(s) and motor shaft of the two-piece top shaft shall be shipped un-mounted for field installation by contractor.

### **Start-Up Procedure**

The pump and motor shall be installed in strict compliance with the pump manufacturer's instructions. The correct motor rotation shall be confirmed prior to installing the top shaft and the impeller lateral adjustment shall be in accordance with the pump manufacturer's instructions. The pump supplier shall provide 8 hours of start-up training to the DNR Fish Hatchery staff.

### **Variance Frequency Drive**

#### **Scope of Work:**

**General:** This specification defines the minimum requirements for Variable Frequency Drives (VFD) and accessories for speed control of either constant or variable torque loads for the proposed well pump motor.

#### **References:**

- A. UL 508C
- B. CE
- C. NEC
- D. Canadian Underwrites Laboratory (CUL)
- E. ISO 9001
- F. IEEE519-1992

#### **Products:**

##### **A. Acceptable Manufacturers:**

1. Danfoss VLT<sup>®</sup> AQUA Series VFD (Variable Frequency Drive) or approved equal.

##### **B. General:**

1. Furnish complete VFD as specified herein or in the equipment schedule for loads designated to be variable speed. VFD's shall be user-selectable for either constant or variable torque loads.
2. VFD shall be rated to carry 125% of motor FLA continuously, 33.8A minimum at 460V, 3ph.
3. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC induction motors. The VFD

shall be a six-pulse input design, and the input voltage rectifier shall employ a full wave diode bridge; VFD's utilizing controlled SCR rectifiers shall not be acceptable. The output waveform shall closely approximate a sine wave. The VFD shall be of a PWM output design utilizing current IGBT inverter technology and voltage vector control of the output PWM waveform.

4. The VFD shall include a full-wave diode bridge rectifier and maintain a displacement power factor of near unity regardless of speed and load.
5. The manufacturer of the VFD shall demonstrate a continuous period of manufacturing and development of VFD's for a minimum of 30 years. VFD's that are brand-labeled are not acceptable.
6. The VFD shall produce an output waveform capable of handling maximum motor cable distances of up to 1,000 ft. (unshielded) without tripping or derating.
7. The VFD shall utilize VVC<sup>PLUS</sup>, an output voltage-vector switching algorithm, or equivalent, in both variable and constant torque modes. VVC<sup>PLUS</sup> provides rated RMS fundamental voltage from the VFD. This allows the motor to operate at a lower temperature rise, extending its thermal life. VFD's that cannot produce rated RMS fundamental output voltage or require the input voltage to be increased above motor nameplate value to achieve rated RMS fundamental output voltage are not acceptable. VFD's that utilize Sine-Coded PWM or Look-up tables shall not be acceptable.
8. The VFD selected must be able to source the motor's full load nameplate amperage (fundamental RMS) on a continuous basis, and be capable of running the motor at its nameplate RPM, voltage, current, and slip without having to utilize the service factor of the motor.
9. The VFD shall offer a programmable motor parameter that allows the total number of poles of a motor to be programmed to optimize motor performance.
10. VFD shall automatically boost power factor at lower speeds.
11. The VFD will be capable of running either variable or constant torque loads. In variable torque applications, the VFD shall provide a CT-start feature and be able to provide full torque at any speed up to the base speed of the motor. In either CT or VT mode, the VFD shall be able to provide its full rated output current continuously and 110% of rated current for 60 seconds.
12. An Automatic Energy Optimization (AEO) selection feature shall be provided in the VFD to minimize energy consumption in variable torque applications. Feature shall optimize motor magnetization voltage. This feature shall dynamically adjust output voltage in response to load, independent of speed. Output voltage adjustment based on frequency alone is not acceptable for single motor VT configurations.

13. For multi-motor variable torque configurations, user-selectable load profile curves including VT-High, VT-Medium, and VT-Low shall be provided to ensure easy commissioning and improved energy efficiency. VFD's requiring the operator to assign load torque data-points to create a V/Hz profile, are not acceptable.
14. An initial ramp function shall be available to provide a different beginning ramp time, up to 60 seconds, for applications requiring a faster or slower ramp than the normal ramp.
15. VFD shall offer up to 4 separate PID controllers. One controller shall operate the drive in closed loop, while the other 3 provide control signals to other equipment. VFD's with PI controllers only are not acceptable.
16. An empty pipe fill mode shall be available to fill an empty pipe in a short period of time, and then revert to the PID controller for stable operation. Pipe fill mode shall have a programmable time to reduce water hammer in the system or fill the pipe at a unit per time rate.
17. VFD shall offer a motor spinning test that will run the motor at 5 Hz until the OK button is pressed to allow the user to determine if the motor is running in the correct direction.
18. An embedded cascade pump controller shall be included to provide lead pump alternation, improved redundancy and, with an option card, shall operate with unequal sized pumps.
19. Switching of the input power to the VFD shall be possible without interlocks or damage to the VFD at a minimum interval of 2 minutes.
20. Switching of power on the output side between the VFD and the motor shall be possible with no limitation or damage to the VFD and shall require no additional interlocks.
21. An Automatic Motor Adaptation (AMA) function shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to spin the motor shaft or decouple the motor from the load to accomplish this optimization. Additionally, the parameters for motor resistance and motor reactance shall be user-programmable.
22. The VFD shall have temperature controlled cooling fans for quiet operation, minimized internal losses, and greatly increased fan life.
23. VFD shall provide full torque to the motor given input voltage fluctuations of up to +10% to -15% of the rated input voltage.

C. Harmonics:

The VFD shall provide internal DC link reactors to minimize power line harmonics and to provide near unity power factor. VFD's without a DC link reactor shall provide a 5% impedance line side reactor.

D. Protective Features:

1. VFD shall have input surge protection utilizing MOV's, spark gaps, and Zener diodes to withstand surges of 2.3 times line voltage for 1.3 msec.

2. VFD shall include circuitry to detect phase imbalance and phase loss on the input side of the VFD.
3. VFD shall auto-derate the output voltage and frequency to the motor if an input phase is lost. This result will maintain operation without decreasing the life expectancy of the VFD. The use of this feature shall be user selectable and export a warning during the event.
4. Automatic "No-Flow Detection" shall be available to detect a no-flow situation in pump systems where all valves can be closed. This shall be functional in closed loop control or when controlled by an external signal.
5. Dry-pump detection shall be available to detect if the pump has run dry and trip the drive. A timer shall be included to prevent nuisance tripping.
6. End-of-Pump curve detection shall stop motor when the pump is operating outside of its programmed pump curve.
7. VFD shall provide flow compensation to reduce energy by adjusting the Setpoint to match changes in flow (friction loss). Flow compensation shall also operate in Cascade control mode.
8. VFD shall include current sensors on all three-output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.
9. VFD shall auto-derate the output voltage and frequency to the motor in the presence of sustained ambient temperatures higher than the normal operating range, so as not to trip on an inverter temperature fault. The use of this feature shall be user-selectable and a warning will be exported during the event. Function shall reduce switching frequency before reducing motor speed.
10. VFD shall auto-derate the output frequency by limiting the output current before allowing the VFD to trip on overload. Speed can be reduced, but not stopped.
11. The VFD shall have the option of an integral RFI filter. VFD enclosures shall be made of metal to minimize RFI and provide immunity.

E. Interface Features:

1. VFD shall provide an alphanumeric backlit display keypad (LCP) which may be remotely mounted using standard 9-pin cable. VFD may be operated with keypad disconnected or removed entirely. Keypad may be disconnected during normal operation without the need to stop the motor or disconnect power to the VFD.
2. VFD Keypad shall offer an INFO key that, when pressed, shall offer the contents of the programming manual for the feature that is currently in the display. The contents shall explain the feature and how the settings can be made.
3. VFD shall display all faults in plain text; VFD's which can display only fault codes are not acceptable.

4. The keypad shall feature a 6-line graphical display and be capable of digitally displaying up to five separate operational parameters or status values simultaneously (including process values with the appropriate engineering unit) in addition to Hand/Off/Auto, Local/Remote, and operating status.
5. Two lines of the display shall allow "free text programming" so that a description, or the actual name, of the equipment being controlled by the VFD can be entered into the display.
6. Keypad shall provide an integral H-O-A (Hand-Off-Auto) and Local-Remote selection capability, and manual control of speed locally without the need for adding selector switches, potentiometers, or other devices.
7. All VFD's shall be of the same series, and shall utilize a common control card and LCP (keypad/display unit) throughout the rating range. The control cards and keypads shall be interchangeable through the entire range of drives used on the project.
8. VFD keypad shall be capable of storing drive parameter values in non-volatile RAM uploaded to it from the VFD, and shall be capable of downloading stored values to the VFD to facilitate programming of multiple drives in similar applications, or as a means of backing up the programmed parameters.
9. VFD Display shall have the ability to display 5 different parameters about the VFD or load including: current, speed, DC bus voltage, output voltage, input signal in mA, or other values from a list of 92 different parameters.
10. VFD display shall indicate which digital inputs are active, and the status of each relay.
11. It shall be possible to toggle between three status read-out screens by pressing the [Status] key. Different operating variables with different formatting can be shown in each status screen.
12. VFD display shall indicate the value of any voltage or current signal connected to the analog input terminals.
13. VFD display shall indicate the value of the current on the analog output terminals.
14. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.
15. Two-level password protection shall be provided to prevent unauthorized changes to the programming of the VFD. The parameters can be locked via a digital input and/or the unit can be programmed not to allow an unauthorized user to change the parameter settings.
16. A quick setup menu with factory preset typical parameters shall be provided on the VFD to facilitate commissioning. Use of macros shall not be required.
17. A digital elapsed time meter and kilowatt hour meter shall be provided in the display.

18. VFD shall offer as standard an internal clock. The internal clock can be used for: Timed Actions, Energy Meter, Trend Analysis, date/time stamps on alarms, Logged data, Preventive maintenance, or other uses. It shall be possible to program the clock for Daylight Saving Time / summertime, weekly working days or non-working days including 20 exceptions (holidays etc.). It shall be possible to program a Warning in case clock has not been reset after a power loss.
19. VFD shall provide full galvanic isolation with suitable potential separation from the power sources (control, signal, and power circuitry within the drive) to ensure compliance with PELV requirements and to protect PLC's and other connected equipment from power surges and spikes.
20. All inputs and outputs shall be optically isolated. Isolation boards between the VFD and external control devices shall not be required.
21. There shall be six fully programmable digital inputs for interfacing with the systems external control and safety interlock circuitry. Two of these inputs shall be programmable as inputs or outputs.
22. The VFD shall have two analog signal inputs. Inputs shall be programmable for either 0 -10V or 0/4-20 mA.
23. One programmable analog output shall be provided for indication of a drive status. This output shall be programmable for output speed, voltage, frequency, motor current and output power. The analog output signal shall be 0/4-20 mA.
24. The VFD shall provide two user programmable relays with 75 selectable functions. Two form 'C' 230VAC/2A rated dry contact relay outputs shall be provided.
25. Floating point control interface shall be provided to increase/decrease frequency in response to external switch closures.
26. The VFD shall accept a NC motor temperature over-temperature switch input, as well as possess the capability to accept a motor thermistor input.
27. The VFD shall store in memory the last 10 faults with time stamp and recorded data.
28. Run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VFD does not start until isolation valves, seal water pumps or other types of auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.
29. The VFD shall be equipped with a standard RS-485 serial communications port and front-of-drive accessible USB port. Danfoss FC or ModBus RTU shall be integrally mounted.
30. A Windows® compatible software to display all monitoring, fault, alarm, and status signals shall be available. This software shall allow parameter changes, storage of all VFD operating and setup parameters, and remote operation of the VFD.

F. Adjustments:

1. The VFD shall have an adjustable output switching frequency.
2. Four complete programming parameter setups shall be provided, which can be locally selected through the keypad or remotely selected via digital input(s), allowing the VFD to be programmed for up to four alternate control scenarios without requiring parameter changes.
3. In each programming set up, independent acceleration and deceleration ramps shall be provided. Acceleration and deceleration time shall be adjustable over the range from 0 to 3,600 seconds to base speed.
4. The VFD shall have four programmable "skip frequencies" with adjustable bandwidths to prevent the driven equipment from running at a mechanically resonant frequency.
5. VFD shall include an automatic acceleration and deceleration ramp-time function to prevent nuisance tripping and simplify start-up.
6. In each programming setup, independent current limit settings, programmable between 50% and 110% of the drives output current rating, shall be provided.
7. PID parameter settings shall be adjustable while the VFD is operating, to aid in tuning the loop at start up. The VFD will also be capable of simultaneously displaying set-point reference and feedback values with appropriate engineering units, as well as output frequency, output current, and run status while programming the PID function.
8. The VFD will include a "loss of follower" function to detect the loss of process feedback or reference signals with a live-zero value, with a user-selectable choice of responses (go to set speed, min speed, max speed, stop, stop and trip).
9. A Sleep Mode function shall be provided to reduce wear and heating of the pump and other equipment in periods where system demands are minimal. This function will operate in both open and closed loop modes:
  - A. In closed loop process control, when the output speed drops to a user-programmed minimum value ("sleep frequency") for a specified time ("sleep mode timer"), the drive will enter sleep mode and either go into standby, or boost mode before entering standby. The drive shall automatically restart the motor once the output of the PID processor exceeds a programmable value "wake up frequency".
    1. Boost mode shall prevent short-cycling of the motor by temporarily adjusting the set-point by a user programmable percentage. Upon reaching this value, the unit will go into standby.
    2. In open loop, the drive shall be capable of entering sleep mode if the input reference drops below a user programmable value. When the input reference increases above a programmable reference, the drive will automatically start.

10. An integral motor alternation function shall be provided to enable the drives output to alternate between two motors. The alternation interval shall be programmable in hours. This function shall operate external relays as required to control the motor alternation sequence. A dwell time shall be integral to the function and can prevent damage to the motor contactors.
11. The VFD will include a user selectable Reset function, which enables the selection of between zero and twenty restart attempts after any self-clearing fault condition (under-voltage, over-voltage, current limit, inverter overload and motor overload), or the selection of an infinite number of attempts. The time between attempts shall be adjustable from 0 through 600 seconds.
12. An automatic "on delay" function may be selected from 0 to 120 seconds.
13. The VFD will include a user-selectable Auto-Restart function that enables the VFD to power up in a running condition after a power loss, to prevent the need to manually reset and restart the VFD.
14. VFD shall catch a rotating motor operating either in forward or reverse at up to full speed.

G. Service Conditions:

1. Ambient Temperature of the VFD, -10 to 45°C (14 to 113°F)
2. 0 to 95% relative humidity, non-condensing.
3. Elevation to 1000 meters (3,300 feet) without derating.
4. VFD's shall be rated for line voltage of 380 to 480VAC, with +10% to -15% variations. Line frequency variation of  $\pm 2\%$  shall be acceptable.
5. No side clearance shall be required for cooling of the units.

EXECUTION

A. Submittals:

1. Submit manufacturer's performance data including dimensional drawings, power circuit diagrams, installation and maintenance manuals, warranty description, VFD's FLA rating, certification agency file numbers, catalog information and catalog cut-sheets for all major components.
2. All drawings shall be in an 8.5 X 11" reproducible format, and incorporate the manufacturer's title block on the drawing.
3. This specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification. If no departures from the specification are identified, the supplier shall be bound by the specification.
4. Three copies of all submittals shall be provided.
5. Submit a computer generated Harmonic Distortion Analysis for the jobsite location.

**B. Quality Assurance:**

1. The manufacturer shall be both ISO-9001 and ISO-14001 certified.
2. All products shall be CE marked; UL labeled, and meet the requirements of UL-508C.
3. To ensure quality and minimize infantile failures on the jobsite, all VFD's shall be completely tested by the manufacturer. The VFD shall operate a dynamometer at full load and speed under elevated temperature conditions.
4. All optional features shall be functionally tested at the factory for proper operation.
5. Factory test documentation shall be available upon request.

**C. Examination:**

1. Contractor to verify that job site conditions for installation meet factory recommended and code-required conditions for VFD installation prior to start-up, including clearance spacing, temperature, contamination, dust, and moisture of the environment. Separate conduit installation of the motor wiring, power wiring, and control wiring, and installation per the manufacturer's recommendations shall be verified.
2. The VFD is to be covered and protected from installation dust and contamination until the environment is cleaned and ready for operation. The VFD shall not be operated while the unit is covered.

**D. Start-up and Warranty**

1. A factory-authorized service technician shall perform start-up on each drive. Start-up costs provided with the bid shall include time and travel for the estimated number of visits required, but shall not be less than an 8-hour day with travel. Upon completion, a start up service report shall be provided.
2. A 6-year on-site warranty shall be provided such that the owner is not responsible for any warranty costs including travel, labor, parts, or other costs for a full 6 years from the date of manufacture of the Drive. The cost of the warranty shall be included in the bid.

**Water Line**

A vertical separation distance of not less than 18" shall be established between the water supply line and other transmission lines (if any) at points of intersection. A horizontal separation distance of not less than 10' shall be established between the water supply line and other transmission lines (if any) in cases of parallel alignment.

## **WORK ITEM 716-1 – H.D.P.E. WATER SUPPLY PIPE AND APPURTENANCES**

### **DESCRIPTION**

The work shall include the furnishing and installation of all materials, labor and equipment necessary to complete the H.D.P.E. water supply piping where shown on the Plans. The work shall be completed by trenchless excavation/horizontal directional drilling per the Plans and these Specifications, including all verification of existing utilities, dewatering, excavation and backfill included in this section.

In these Specifications, references are made to the Standard Specifications for the American Society of Testing and Materials (ASTM), American Water Works Association (AWWA), and/or the American National Standards Institute (ANSI). Where such references occur, the standard in effect at the date of the bid opening will apply.

### **MATERIALS**

All materials shall conform to the applicable requirements of Sections 715 and 716 and as indicated below.

High Density Polyethylene (H.D.P.E.) Pipe: The H.D.P.E. water supply pipe shall be 8-inch (DIPS), DR 11 as shown on the plans.

Materials used for the manufacture of polyethylene pipe and fittings conform to AWWA C-906 and NSF Standard 61 and shall be PE3408 high density polyethylene for pressure pipe meeting cell classification PE345464C per ASTM D 3350; and, shall be listed in the name of the pipe and fitting Manufacturer in Plastics Pipe Institute (PPI) TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade HDB rating of 1600 psi at 73°F. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meets these requirements. Permanent identification of the pipe shall be provided by co-extruding color stripes into the pipe outside surface. The striping material shall be the same material as the pipe material except for color. Stripes printed on the pipe outside surface shall not be accepted. DIPS pipe shall have three equally spaced pairs of longitudinal color stripes. The stripe color shall be blue.

Polyethylene pipe shall be manufactured in accordance with ASTM F 714-97, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter, and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, % carbon, (from pipe) dimensions and ring tensile strength.

The Contractor shall submit Manufacturer's Certificate of Compliance certifying compliance with the referenced specifications and standards and certified copies of reports of factory tests specified in this section and required by the referenced standards.

Heat Fusion Joining: Joints between plain end pipes and fittings shall be made by butt fusion (ASTM D3261-03) using only procedures that are recommended by pipe and fitting manufacturer. The Contractor shall ensure that persons making heat fusion joints have received training in the manufacturer's recommended procedure. The Contractor shall maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed. Socket fusion shall not be used. Electrofusion joints will be allowed, as approved by the Engineer, in areas which are difficult to access.

H.D.P.E. Fittings: H.D.P.E. fittings, as required, shall conform to the same manufacture and material requirements as listed for the H.D.P.E. pipe. The electrofusion fittings and couplings shall meet the requirements of ASTM D3350-02 and ASTM F1055 and be of the same resin type as the pipe.

H.D.P.E. Mechanical Joint Adaptors with Kits: H.D.P.E. Mechanical Joint Adaptors with Kits shall be used to connect the H.D.P.E. water main river crossing pipe to D.I. fittings or D.I. pipe. Instead of mechanical joint adaptors, the combination of a mechanical joint restrainer and pipe stiffener may be used. Stainless steel pipe stiffeners shall be used for insertion into the H.D.P.E. pipe for support at each mechanical joint. The stiffeners shall be constructed of 304 stainless steel and be 12-inches wide with a diameter sized appropriately for the respective water main river crossing pipe.

Tracer Wire: All HDPE pipe shall be installed with stainless steel tracer wire, Stranded SS/45 MIL HDPE, 30 Volt, meeting the following requirements:

<u>Wire:</u>	
Material:	302 Stainless Steel Alloy, 49 strands, annealed.
Rating:	30 Volts maximum. 1,700 lb. yield.
Thickness:	0.125-inch overall diameter (Dimensionally equivalent to AWG8).
<u>Insulating Jacket:</u>	
Material:	High Molecular Weight, High Density Polyethylene (HMW-HDPE) to be repeated at a minimum interval of every two (2) linear feet.
Thickness:	0.045-inch maximum (45 mil.)
Rating:	30 Volts maximum.
Label (Minimum required):	"Pipe Tracer Wire, Stranded SS/45 MIL HMW-HDPE, 30 Volt, HDD Direct Burial Use Only".
Color:	Blue

The tracer wire for the water supply pipe shall be attached to the pipe and shall terminate at each valve box structure. The tracer wire shall be attached at the surface to the outside of each valve box to allow for reliable connection of the tracing equipment. Wire at each valve box structure shall be tag labeled identifying its purpose. Testing for conductivity shall be performed on each section of tracer wire, immediately following installation and prior to final project acceptance.

## **CONSTRUCTION METHODS**

### H.D.P.E. Pipe:

When planning the procedures for the directional drilled H.D.P.E. water supply pipe installation, the Contractor must comply with all permit and bonding requirements. The Contractor shall prepare and submit a Plan of Operation for the Engineer's approval. This plan should show the exact procedures the Contractor intends to use in accomplishing the work (including calibration of the transmitter/receiver, the horizontal and vertical tracking/plotting of the pilot bore alignment, and handling and disposal of drilling fluids), and shall show any special activities, and other features of the proposed work. He shall submit a listing of such subcontractors he intends to use, major directional drilling equipment to be used, and any special equipment, including barges, pontoons, etc., or other equipment.

The H.D.P.E. water supply piping in the locations shown on the Plans shall be installed using trenchless excavation/horizontal directional boring methods. Spot section open cut excavation for installation of fittings and short segments of water supply pipe will be allowed and shall conform to the H.D.P.E. pipe manufacturer's trench details and as directed by the Engineer.

All excavations and trenches shall be properly sloped or braced to furnish and provide proper and safe working conditions for the equipment and workmen in accordance with IOSHA requirements as set forth in Indiana Code IC-22-8-4, Section 238. The costs to comply with IOSHA shall be included in the prices for the installed water main facility.

The Contractor shall provide sheeting to protect adjacent structures when the work is close to existing structures or facilities.

When running sand is encountered, tight sheeting, well points, or both, shall be used to control the excavation.

It shall be the responsibility of the Contractor to provide proper materials, bracing and working conditions for and during construction.

Select excavated material shall be used for backfill. If the native material is not granular and is unsuitable for backfilling, Structure Backfill shall be installed around the pipe in the manner described above. Structure Backfill must be approved by the Engineer.

Contractor shall install and maintain filter fabric in any existing storm inlets prior to beginning any excavation (open-cut or spot). Fabric shall be removed at project closeout.

The Contractor shall submit details of equipment and written procedure with working drawings describing in detail the proposed boring method and the entire operation to be used. Completion and review of details and procedures by Engineer and Owner will be a condition of Notice to Proceed authorization.

Contractor shall verify the locations of all utilities and structures prior to any boring. Vacuum excavation or hand excavation shall be used to spot verify locations of existing utilities to minimize disturbance to surrounding facilities. These utilities and structures include:

1. Underground utilities such as, but not limited to:
  - a. Storm Drains
  - b. Electric Cables
  - c. Water Mains
  - d. Sewer Lines and Septic Systems
  - e. Gas Lines
  - f. Telephone Lines
  - g. Fiber Optic Lines
  - h. Cable Television Lines
  - i. Wells
  - j. Field Drain Tiles

2. Above-ground utilities and other obstructions such as, but not limited to:

- a. Electric and Telephone Poles
- b. Buildings
- c. Trees
- d. Existing Road Signs
- e. Right-of-way Markers

Before installing any pipe, the pipe shall be inspected for defects. Damaged or unsound pipe shall immediately be removed from the site.

A minimum separation distance of 10-feet horizontally and 18-inches vertically shall be maintained between the proposed water supply pipe and any existing sanitary and storm sewers. If these separation distances cannot be maintained then the Contractor shall follow the requirements of 327 IAC 3-6-9.

The directional drilling system to be used shall have the following features:

1. The system shall be remotely steerable and permit electronic monitoring of bore/tunnel depth and location. The system shall be able to control the depth and direction of the pipes and must be accurate to a tolerance of  $\pm 6$  inches.
2. The Contractor shall track and plot the actual horizontal and vertical alignment of the pilot bore at intervals not exceeding 30-feet over the course of the entire horizontal directionally drilled pipe installation. The Contractor shall, at all times, provide and maintain instrumentation that will accurately locate the pilot hole and measure drilling fluid flow pressure. The Contractor shall grant the Engineer access to all data and readouts pertaining to the position of the bore head and the fluid pressures and flows and shall provide the Engineer a copy of this data each day during the horizontal drilling operation.

The pipe installed by the horizontal directional drilling method shall be located in plan as shown in the drawings and shall be no shallower than as shown on the drawings unless otherwise approved. The minimum depth of cover shall be as shown on the plans and the maximum depth of cover shall be as shown on the plans, unless approved by the engineer to avoid a conflict with existing utilities.

The locating system shall, at a minimum, consist of an electronic transmitter (sonde) positioned at the drill head and a receiver which displays the signal strength. The transmitter shall also employ a pitch (inclination) and roll sensor.

3. The Contractor shall calibrate the transmitter and receiver system per the manufacturer's specifications for signal strength and verify depth accuracy with a tape measure. The Contractor shall also check other parameters such as pitch, roll, battery life and temperature according to the manufacturer's specifications. Calibration shall be conducted in an area which is clear of possible interference sources. The Contractor shall submit to the Engineer a copy of the calibration and field check records prior to beginning installation.

After calibration of the transmitter and receiver system, the Contractor shall walk the bore path to the extent allowable with the receiver "on" and the transmitter "off" in order to check for signal interference. The Contractor shall record the location and particulars of any unusual interference readings and take adequate measures to ensure a proper installation.

4. A swivel type apparatus shall be used to connect the water supply pipe to the drill pipe to prevent torsional stresses from occurring in the pipe during installation.
5. The system shall utilize a fluid cutting process, using liquid clay such as bentonite. This clay shall be totally inert and contain no risk to the environment. The Contractor shall submit to the Engineer a Drilling Fluid Plan which details types of drilling fluids, cleaning and recycling equipment, estimated drilling fluid flow rates, and procedures for minimizing drilling fluid escape. This Drilling Fluid Plan shall be submitted to the Engineer before starting the horizontal directional drilling installation process.
6. The liquid clay shall remain in the bore hole/tunnel to increase the stability of the bore hole/tunnel and to provide a lubricant to reduce frictional drag when the pipe is installed.
7. The H.D.P.E. Pipe shall be filled with a fluid during pullback to offset buoyancy.
8. Immediately after installation of the H.D.P.E. Pipe, the pipe shall be filled with clean water from the new well to offset buoyancy.
9. Drilling fluids shall not be discharged into sanitary sewers, storm sewers, or waterways.. Pits shall be constructed at the pipe entry and exit points to completely contain the drilling fluid and prevent its escape into waterways.
10. The spoils shall be recovered by use of a vacuum system mounted on a vehicle for removal of the spoils. Spoils are not to be discharged into sewers, storm drains, or waterways. The Contractor is responsible for disposal of all spoil material.
11. Equipment shall be fitted with a permanent alarm system capable of detecting an electrical current. The system will have an audible alarm to warn the operator when the drill head nears electrified cables within a safe operating distance. Refer to "Safety" for additional safety requirements.

## **EXPERIENCE**

1. The Contractor shall demonstrate experience and expertise in trenchless excavation methods by providing a list of four references for which similar work has been performed prior to commencing any work. These references shall include a name and telephone number for contact so Owner/Engineer may verify the claims.
2. The Contractor (Contractor, drilling sub-contractor and supervisory personnel) shall also provide documentation showing successful completion of at least:
  - 50,000 linear feet minimum of Horizontal Directional Drilled Pipe, of which a minimum of 20,000 linear feet of pipe shall be have an outside diameter of 6.0-inches or greater.
  - Minimum of three River/Stream Crossings with pipes having an outside diameter of 6.0-inches or greater with a minimum crossing length of 75-feet for each crossing.

3. Contractor shall be responsible for means and methods and shall utilize equipment sized adequately to install the proposed water main to the elevations shown on the plans.
4. All supervisory personnel shall be adequately trained and shall have at least four years experience in horizontal directional drilling. The Contractor shall also submit the names and resumes of all supervisory field personnel for review by the Engineer prior to commencing any work.
5. The Contractor shall submit a listing of such subcontractors he intends to use, major directional drilling equipment to be used, and any special equipment.
6. The Contractor's Bid shall include completion of the Experience, Equipment and Plan of Operation Form included with the Bid Forms.

#### **SAFETY**

1. Mechanical, pneumatic or water-jetting methods shall not be acceptable due to the risk of surface subsidence and damage.
2. Upon completion of boring and pipe installation, the Contractor shall remove all spoils from all starting and termination pits. The pits shall be restored to their original condition.
3. Because directional boring may be performed while existing buried electrical cable is energized, the following minimum safety requirements shall be met:
  - a. All drilling equipment must have a permanent, inherent alarm system capable of detecting an electrical current. The ground system shall be equipped with an audible alarm to warn the operator when the drill head nears electrified cable within a safe operating distance.
  - b. All crews shall be provided with grounded safety mats, heavy gauge ground cables with connectors, hot boots and gloves.
  - c. All supervisory personnel shall be adequately trained and have experience in directional boring. See above.

#### **TESTING**

Butt Fusion Testing: Butt fusion testing shall be conducted at least once every day that butt fusions are made. The first fusion of the day shall be a trial fusion. The trial fusion shall be allowed to cool completely to ambient temperature, and then fusion test straps shall be cut out per ASTM D 2657. The test strap shall be 12-inch minimum or 30 times the wall thickness in length with the fusion in the center and 1-inch minimum or 1.5 times the wall thickness in width. Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely and tested. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.

Pressure Testing: Pressure testing of the H.D.P.E. water supply pipe shall be conducted at 150 psi,  $\pm 5$  psi hydrostatic pressure for at least two hours according to ASTM F 2164 and Technical Note 802 – Leak Testing, July 2006, from Performance Pipe and per the manufacturer's recommendations. A copy of Technical Note 802 may be obtained at [www.performancepipe.com](http://www.performancepipe.com). Pressure testing shall be hydrostatic only. Pneumatic pressure testing shall not be used.

Test Duration: The maximum test duration is eight (8) hours including time to pressurize the pipe, time for initial expansion, time for the test at test pressure, and time to depressurize the segment of pipe being tested. If the test is not completed due to leakage, equipment failure, or for any other reason, depressurize the test section completely, and allow for it to relax for at least eight (8) hours before pressurizing the test section again. The hydrostatic test as described in Technical Note 802 is summarized as follows:

Pipe Segment Filling: Fill the test section completely with water from the lowest possible point. Ensure that there is no air trapped in the test section by utilizing vents to expel the air.

Initial Expansion: Gradually pressurize the test section to test pressure and maintain test pressure for three (3) hours. During the initial expansion phase polyethylene pipe will expand slightly. Additional test liquid will be required to maintain pressure. The water added during this phase will not be monitored.

Testing: Immediately following the initial expansion phase, monitor the amount of make-up water required to maintain test pressure (150 psi) for two (2) hours. The test pressure shall be measured at the lowest possible point in the section being tested. The amount of make-up water required shall not exceed the allowance shown in Table 2, Technical Note 802 which is summarized below:

8-inch H.D.P.E. Pressure Main Leakage Allowance = 1.0 gal/100 Ft. of Pipe

Lines or joints, which leak, shall be repaired and retested. All pipes, fittings and other materials found to be defective under test shall be removed and replaced by the Contractor at his own expense.

Depressurizing: At the conclusion of the test, slowly and carefully depressurize the test section by the controlled release of the test liquid.

The pump connections, fittings and all necessary labor and materials for conducting the tests, shall be furnished by the Contractor and included in the price for the appropriate item. The Contractor shall provide and pay for all water as required to conduct the hydrostatic testing.

The water supply pipe shall not have to be disinfected prior to placing in service since it will not be used to supply potable water.

All H.D.P.E. pipe pressure testing shall be witnessed and certified by a Professional Engineer, registered in the State of Indiana. The Contractor shall contact the Owner a minimum of 48-hours in advance of testing to allow a representative to witness the testing. The results of the H.D.P.E. Pipe Pressure Test shall be certified by a Professional Engineer, Registered in the State of Indiana who is not an employee of the Owner or Engineer. A copy of the test results shall be forwarded to both the Owner and the Engineer.

**WORK ITEM 716-2 -- STEEL CASING PIPE - BORE AND JACK**

**DESCRIPTION**

The Contractor shall provide all materials, equipment and labor necessary to complete the 18- inch Steel Casing Pipe installation, jacked and bored under State Road 327 as shown on the Plans and as directed by the Engineer.

**MATERIALS**

All materials shall conform to the applicable requirements of Section 716.

**CONSTRUCTION REQUIREMENTS**

Construction shall conform to the applicable requirements of Section 716.

## **WORK ITEM 900-1 – VIDEO AND PHOTO RECORD**

### **DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor and material required to videotape the project area and to complete a photo record of the project area to verify existing conditions prior to construction.

### **MATERIALS**

As required.

### **CONSTRUCTION REQUIREMENTS**

The Contractor will be required to submit a color video recording of the entire project area to clearly show all features located within and adjacent to the project site, prior to the start of construction. The video shall indicate the time and date of the recording.

Site photographs shall be provided as necessary to clearly show all existing features of the pre-project work site. Photographs shall be taken in sufficient lighting to provide high quality details. Each photo shall indicate the date it was taken and be provided in digital format.

Two digital copies (DVD's) of both the video and photographs shall be forwarded to the Engineer for review prior to beginning construction. All DVD's shall be labeled showing the Owner's name, project name and the name of the Contractor.

## **WORK ITEM E-1 – ELECTRICAL/MECHANICAL**

### **DESCRIPTION**

This work shall consist of furnishing materials, installation, and all necessary incidentals associated with the electrical power and control components of this work in accordance with this special provision and in reasonably close conformance with the lines, grades, and locations shown on the plans.

Also, the interconnecting electrical wiring, incoming power supply, and other features regularly and normally required as a part of the complete system shall be in accordance with the National Electrical Code and the National Electrical Safety Code. All work shall be done in accordance with site requirements, plans, manufacturer's recommendations.

### **1. BASIC ELECTRICAL REQUIREMENTS**

#### **GENERAL**

#### **RELATED DOCUMENTS**

Drawings and general provisions of Contract, including General and Special Conditions apply to work of this section.

#### **DESCRIPTION OF WORK**

The Basic Electrical Requirements apply to all electrical materials, equipment, installations, and services supplied under any portion of the work.

The Contractor shall coordinate the Basic Electrical Requirements as applicable to any equipment, installations, and services of an electrical nature.

It is the intention of this Division of the Specifications and the accompanying drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and successful operation all equipment, materials, devices and necessary appurtenances to provide a complete electrical system, together with such other miscellaneous installations and equipment hereinafter specified and/or shown on the plans. The work shall include all materials, appliances and apparatus not specifically mentioned herein or noted on the plans, but which are necessary to make a complete working installation of all electrical systems shown on the plans or described herein. Equipment and devices furnished and installed under other Divisions of this specification (or by Owner) shall be connected under this Division. The drawings and specifications are complementary and what is called for in either is binding as if called for in both.

The contract drawings indicate the extent and the general location and arrangement of equipment, conduit and wiring. The contractor shall study plans and details and shall cooperate with all other trades to prevent conflict and interference as to space requirements. Fixtures, equipment and outlets shall be located to avoid interference with mechanical or structural features. Lighting fixtures shall be symmetrically located according to the room arrangement. Raceways, junction and outlet boxes, lighting fixtures, and all other electrical equipment shall be properly supported to comply with applicable codes and good work practice.

Electrical Contractor is responsible for installation of a complete and operating electrical system in accordance with the intent of the drawings and specifications.

The scale of drawings cannot show all necessary transitions, offsets, changes in direction, etc. It shall be the responsibility of the Electrical Contractor to provide all pull boxes, elbows, fittings, supports, etc. necessary to install his work to conform to structures, to preserve head room and to keep openings and passageways clear.

Electrical diagrams are schematic and diagrammatic only, not necessarily to scale, and do not necessarily show physical arrangement of equipment. Electrical diagrams and plans are complementary and what is shown on either is same as if shown on both.

The horsepower of motors and equipment wattages indicated on the plans are based on information made available to Engineer and field notes of existing installation, and are as accurate as practical. However, there may be discrepancies. All wiring, switches, circuit breakers, and magnetic motor starters shall be of sizes and capacities to suit the horsepower of the motors and equipment actually furnished and actually being connected. However, in no case shall wiring, switches, circuit breakers and magnetic motor starters be of smaller capacities or sizes than those indicated on the drawings or specified unless approved by the Engineer.

Any minor changes in the location of all equipment, switchboards, panelboards, starters, fixtures, conduits, outlets, etc. from those shown on the plans shall be made without extra charge if so directed by the Engineer or Owner before installation.

Minor changes in location shall be defined as within 10 feet in any direction, horizontally or vertically, from the location indicated on the drawings.

#### PERMITS AND FEES

This work shall include the procurement of and payment for all permits and fees for the performance of the electrical work.

#### COORDINATION OF ELECTRICAL WORK

Contract documents are diagrammatic in showing certain physical relationships which must be established; such establishment and the final physical relationship is the exclusive responsibility of the Contractor.

Arrange electrical work in a neat, well organized manner with conduit and similar services running parallel with primary lines of structures, maximize overhead clearance.

Locate operating and control equipment and arrange entire electrical work with adequate access for operation and maintenance.

Advise other trades of openings required in their work, and scheduling cooperation required, for the subsequent move-in of large units of electrical work (equipment, conduits, pull boxes, etc.).

## COORDINATION OF OPTION, SUBSTITUTIONS, AND ARRANGEMENT

Where the contract documents permit the selection from several product options, and where it becomes necessary to authorize a substitution, do not proceed with purchasing until coordination of interface requirements has been checked and satisfactorily established.

The Contractor will not be paid for cutting, patching, retrofitting, and finishing required for relocation of work installed due to interference and improperly located equipment.

## QUALITY ASSURANCE

In case of difference between building codes, state laws and federal laws, local ordinances, industry standards and utility regulations and the Contract Documents, the most stringent shall govern. The Contractor shall promptly notify the Engineer in writing of any such difference.

## NON-COMPLIANCE

Should the Contractor perform any work that does not comply with the requirements of the applicable building codes, state and federal laws, local ordinances, industry standards and utility regulations, he shall bear all costs in correcting all deficiencies.

Applicable codes and standards shall include all the state laws, local ordinances, utility company regulations and the applicable requirements of the following nationally accepted codes and standards. All of the following codes shall apply to the equipment, and equipment installation, where applicable. All equipment shall bear U.L. labels where labeled equipment is available.

## INDUSTRY STANDARDS, CODES AND SPECIFICATIONS

- |                 |   |
|-----------------|---|
| A. NEC          | National Electric Code (NFPA No. 70).                                   |
| B. UBC          | Uniform Building Code - International Conference of Building Officials. |
| C. ANSI C2      | National Electrical Safety Code.  |
| D. IEEE         | Institute of Electrical and Electronics Engineers.                      |
| E. ASTM         | American Society of Testing Materials.                                  |
| F. IPCEA        | Insulated Power Cable Engineers Association.                            |
| G. NEMA         | National Electrical Manufacturers Association.                          |
| H. NFPA         | National Fire Protection Association.                                   |
| I. UL           | Underwriters Laboratories.  |
| J. NECA         | Standard of Installation, National Electrical Contractor's Association. |
| K. NFPA No. 101 | Life Safety Code.   |

L. FM                      Factory Mutual

M. ADA                     Americans with Disabilities Act.

All electric materials shall be new, in original cartons, bundles, or shipping crates and shall have U.L. label whenever available.

Nothing in these drawings and specifications shall be construed to permit work not conforming with governing codes. Also, this shall not be construed as relieving the Contractor from complying with any requirements of the plans or specifications which may exceed requirements of the hereinbefore mentioned governing codes and rules and not contrary to same.

#### MANUFACTURERS

Firms regularly engaged in the manufacture of the equipment specified of the types and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years, unless specified otherwise.

#### INSTALLERS

A firm with at least 3 years of successful installation experience on projects with electrical installation work similar to that required for the project, unless specified otherwise.

#### SUBMITTALS

General: Provide submittals of shop drawings and descriptive data for selected all electrical power, control, lighting, and similar items, and obtain Engineer's approval of same prior to proceeding with work.

Submittals shall comply with the following:

- A. Include complete catalog information such as construction, ratings, and insulating systems, as applicable.
- B. For any material specified to meet U.L. or trade standards, furnish manufacturer's or vendor's certification that material furnished for work does in fact equal or exceed Specifications.
- C. Shop drawings shall be submitted in complete groups of material (i.e., all lighting fixtures or all switchgear, etc.), and each item of material submitted shall have Contractor's stamp and be initialed by Contractor as verification that submittal has been reviewed in detail and is in fact Contractor's choice of materials. Bind catalog cuts, descriptive bulletins and drawings 11" x 17" or smaller in sets with covers showing titles. Contractor shall verify dimensions of equipment and be satisfied as to code compliance for fit prior to submitting shop drawings for approval. Departure from above procedure will result in resubmittal and delays. Include all information required by Specifications.

## O&M MANUALS

Submit three sets of Operation and Maintenance Manuals. Refer to General Conditions.

## WARRANTIES

All new equipment shall have a warranty in accordance with General Conditions of the project.

## 2. IDENTIFICATION AND SIGNAGE

### GENERAL

#### INDUSTRY STANDARDS

Current editions of publications of the following institutes, are referred to in this section.

American National Standards Institutes, ANSI.

### PRODUCTS

Nameplates shall be of white engraved plastic laminate. Letters shall be black and a minimum of 3/16" high.

Wire/cable tags shall be self-adhesive wrap-around vinyl cloth; Brady or equal.

### EXECUTION

#### NAMEPLATES

Provide engraved laminate nameplates on all of the following devices listing the equipment name, equipment controlled or served and the circuit number.

- A. Panelboards.
- B. Dry-Type Transformers.
- C. Enclosed Circuit Breaker
- D. Circuit breakers.

On the inside of each wiring device box indicate the panelboard and circuit number of the circuit serving the device by using a cable tag.

In pull boxes, and within switchboards, panelboards, motor starters, switches, etc. and at the equipment served by the circuit or feeder, on each cable of panelboard feeder circuits, and on each cable of all motor circuits, provide a cable tag identifying circuit number and phase.

All Instrument and Control wires and cables shall be similarly tagged as noted above within the pump

control panel, pull boxes, and terminal boxes.

Instrument tags shall be stainless steel with identification punched into the tag. Tag shall be secured with stainless steel tie wraps or stainless steel chain.

### **3. RACEWAYS AND CONDUIT**

#### **GENERAL**

##### **DESCRIPTION OF WORK**

The work required under this section includes the provision, fabrication, and installation of all raceways and conduit required for this Work.

This section covers all conduit to be used on the various portions of the project and the Contractor shall meet the requirements of these Specifications wherever applicable.

The types of electrical raceways include the following:

- A. Galvanized rigid steel conduit.
- B. Flexible metal liquid-tight conduit.
- C. Aluminum rigid conduit.
- D. Rigid nonmetallic PVC conduit.

##### **QUALITY ASSURANCE**

**Manufacturers:** Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service, and whose products meet all requirements specified herein.

**Installer:** Qualified with successful installation experience on projects with electrical raceway work similar to that required for this project.

An experienced journeyman shall be in responsible charge of all raceway and conduit work.

**NEMA Compliance:** Comply with applicable requirements of NEMA standards pertaining to raceways.  
**UL Compliance and Labeling:** Comply with provisions of UL safety standards pertaining to electrical raceway systems; and provide products and components which have been UL-listed and labeled.

**NEC Compliance:** Comply with requirements as applicable to construction and installation of raceway systems.

##### **SUBMITTALS**

Shop drawing submittals for raceways are not required.

## PRODUCT DELIVERY, STORAGE AND HANDLING

Provide end-cap thread protectors on exposed threads of threaded metal conduit.

Handle conduit and tubing carefully to prevent bending and end-damage and to avoid scoring finish.

Store conduit and tubing inside and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, watertight wrapping.

## PRODUCTS

### GENERAL

For each electrical raceway system provide a complete assembly of conduit or tubing with all required fittings; including, but not necessarily limited to, connectors, nipples, couplings, elbows, expansion fittings, pull boxes and other components and accessories as needed to form a complete system.

Provide conduit, tubing, and raceway accessories including straps, hangers, angles, expansion fittings as required for a complete system.

### GALVANIZED RIGID STEEL CONDUIT

Galvanized rigid metal conduit shall be mild steel, hot-dip galvanized conduit complying with ANSI C80.1 and Fed. Spec. WW-C-581 and shall be U.L. listed.

Elbows, bends, and similar offsets shall be made of full weight material complying with the above and shall be coated and threaded the same as conduit.

Threads for conduit, couplings, and fittings shall be full depth and clean cut.

Conduit shall be 3/4" trade size or larger or as indicated on the drawings or as required for the application if not indicated, and shall be manufactured by National Electrical Products Company, Youngstown Steel and Tube Company, Republic Steel, Allied Steel Tube and Conduit Company, or equal.

Rigid metal conduit fittings shall comply with Fed. Spec. FS W-F-408.

All couplings and fittings shall use threaded connections. Do not use any non-threaded fittings or connections.

### LIQUID-TIGHT FLEXIBLE METAL CONDUIT

Liquid-tight flexible metal conduit shall comply with Fed. Spec. WW-C-566 and shall be minimum 1/2" trade size, UL listed, standard weight, flexible, galvanized zinc-coated and PVC jacketed steel conduit.

Fittings shall be designed for use with liquid-tight flexible metal conduit and shall maintain electrical continuity throughout fittings and conduit. Fittings shall comply with Fed. Spec. W-F-406, Type 1, Class 1, Style A.

## RIGID ALUMINUM CONDUIT

Rigid aluminum conduit shall be 6063 alloy, T41 temper, complying with ANSI C80.5 and Fed. Spec. WW-C-540 and shall be UL 6 listed.

Elbows, bends, and similar offsets shall be made of full weight material complying with the above and shall be coated and threaded the same as conduit.

Threads for conduit, couplings, and fittings shall be full depth and clean cut.

Conduit shall be 3/4" trade size or larger or as indicated on the drawings or as required for the application if not indicated, and shall be manufactured by VAW, or equal.

Rigid aluminum conduit fittings shall comply with Fed. Spec. FS W-F-408.

All couplings and fittings shall use threaded connections. Do not use any non-threaded fittings or connections.

## RIGID NONMETALLIC CONDUIT

Electrical Plastic Conduit: NEMA Stds. Pub. No. TC2, Type 3, Schedule 40, for direct burial and normal aboveground duty, Schedule 80 aboveground for the first 8' above finished grade, manufactured from ASTM D1784 PVC in compliance with NEMA TC-2. PVC conduit shall be UL listed. Joints shall be solvent cement types.

Provide PVC elbows, bends, fittings, and adapters as required for a complete installation. PVC conduit and tubing fittings shall comply with NEMA Stds. Pub. No TC3, match to conduit/tubing type and material. Provide solvent cement as recommended by the conduit manufacturer.

Minimum size of underground and underpavement conduits shall be 1-1/4".

## EXECUTION

### INSTALLATION - GENERAL

Install raceway products as indicated on the drawings and as required, in accordance with manufacturer's written instructions, applicable requirements of NEC and National Electrical Contractors Association's "Standard of Installation," and in accordance with recognized industry practices to ensure that products serve intended function.

Unless indicated otherwise on the drawings; install conduit exposed in mechanical and electrical rooms and tight to structure and walls.

Conduit field joints shall be cut square and reamed smooth. Threads shall be cleanly cut and joints drawn up tight. No running threads will be permitted.

Offsets and bends shall be made carefully, without reducing cross sectional area, and shall not be less than the radius of standard elbows.

Conduits shall be supported from the structural system; not from ceiling, ductwork, or piping systems. Provide additional support at junction and pull boxes.

All spare conduits shall have a No. 12 pull wire installed and available at each end for future conductor installation.

Wherever possible, install horizontal raceway runs above water and steam piping.

All conduit runs shall be grounded in an effective and approved manner at point of origin and shall maintain a continuous ground throughout all runs, cabinets, pull boxes, and fittings from point of service to all outlets.

All runs shall be completed and cleaned and free from foreign matter inside before the conductors are drawn in. During the installation, conduit ends are to be plugged or capped to prevent the entrance of foreign materials.

Conduit supports shall be spaced in accordance with the National Electrical Code.

Conduit fittings made for the conduit type shall be used as required to keep conduits close to the building surface.

Install raceways that stub up through concrete surfaces at such depth that the exposed raceway is vertical and no curved section of the elbow is visible.

All penetrations through masonry or concrete surfaces shall be made with galvanized rigid conduit, coated with corrosion resistant material.

Coordinate with other work as necessary to interface installation of electrical raceways and components with other work.

Level and square raceway runs, and install at proper elevations/heights.

Conduit fittings for exterior installation shall be hot dipped galvanized gray iron or copper free aluminum with aluminum enamel; these may be used interchangeably.

Exterior installed conduit – Wall or structure mounted conduit shall be supported with clamp back style conduit supports with spacers; material shall be malleable iron with hot dipped galvanized finish. Anchors shall be stainless steel expansion style bolts and hardware.

Exterior installed conduit – Hand rail/equipment mounted conduit shall be supported with a combination of stainless steel unistrut (and stainless steel hardware) and hot dipped galvanized conduit clamps.

Surface mounted device boxes shall be cast metal FS/FD style.

#### RACEWAY USAGE

Utilize galvanized steel conduit or rigid aluminum conduit in exterior environments, locations exposed to moisture, and non-air conditioned spaces. Do not mix conduit types.

Provide flexible metal liquid-tight steel conduit and fittings for engine-generator final connections, dry-type transformer final connections, and for other electrical equipment connections subject to movement and vibrations. Do not use flexible conduit where a rigid conduit elbow should be used. Provide support and straps for flexible conduits. Unsupported free spans are not acceptable.

Provide nonmetallic schedule 40 PVC conduit underground and under slabs on-grade; all conduits turning up from below grade shall have galvanized rigid steel elbows.

#### SEALS AROUND RACEWAYS

Fire Rated Construction: All penetrations through fire rated construction shall be sealed to maintain fire rating of construction penetrated.

#### MOISTURE AND HAZARDOUS GASES SEALS

Provide seals against water entry at all entries. Provide conduit seals at boundary of hazardous area or before equipment entries. Used only bolted, break-apart, reusable conduit seals.

In cored openings in manholes or concrete structures, use multi-link bolted seals to seal the opening.

#### SEISMIC REQUIREMENTS

Raceway installation for the work shall meet all applicable code seismic requirements.

### 4. WIRES AND CONNECTORS

#### GENERAL

#### DESCRIPTION OF WORK

Extent of electrical wire and cable work is indicated by the project drawings.

Types of wire, cable and connectors specified in this section include the following:

- A. 600-volt insulated Copper conductors.
- B. Fixture wires.
- C. Tap-type connectors.
- D. Mechanical and compression connectors.
- E. Twist-on insulated metal spring connectors.

Signal, instrumentation, and control type wire and cable products are not part of this Section.

Applications of electrical wire, cable, and connectors required for project are as follows:

- A. For power distribution circuitry.

B. For branch-circuit appliances and equipment.

C. For control circuits, except analog and instrument cables.

#### QUALITY ASSURANCE

**Manufacturers:** Firms regularly engaged in manufacture of electrical wire and cable products of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than three (3) years.

**Installer's Qualifications:** Firm with at least three (3) years of successful installation experience with projects utilizing electrical wiring and cabling work similar to those required for project.

**NEC Compliance:** Comply with NEC requirements as applicable to construction, installation; and color coding of electrical wires and cable.

**UL Compliance:** Comply with applicable requirements of UL Std. 83, "Thermoplastic-Insulated Wires and Cables", and Std 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors," except where manufacturer's torque-tightening requirements are more stringent.

**UL Labels:** Provide wiring/cabling and connector products that are UL listed and labeled.

**NEMA/ICEA Compliance:** Comply with NEMA/ICEA Std Pub/No.'s WC 5, "Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy," and WC-30, "Color Coding of Wires and Cables," pertaining to electrical-power-type wires and cables.

**IEEE Compliance:** Comply with applicable requirements of Std 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to wiring systems.

**ASTM Compliance:** Comply with applicable requirements of ASTM B1, 2, 3, 8 and D-753. Provide copper conductors with conductivity of not less than 98% at 20 Deg.C. (68 Deg. F.).

#### STANDARDS

All materials shall be new, manufactured in accordance with latest edition of UL, NEMA, ANSI, and IPCEA.

All cables furnished shall be of same type and by same manufacturer. All accessories of a particular type shall be by the same manufacturer.

#### SUBMITTALS

Not required.

#### DELIVERY, STORAGE, AND HANDLING

Deliver wire and cable properly packaged in factory-fabricated type containers, or wound on NEMA-specified type non-returnable wire and cable reels.

Store wire and cable in clean, dry space in original containers. Protect products from weather, damaging fumes, construction debris and traffic.

Handle wire and cable carefully to avoid abrading, puncturing, or tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.

#### MANUFACTURERS

Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

##### A. Wire and Cable:

1. American Insulated Wire Corp.
2. Brand-Rex Div; Pyle National Co.
3. Cerro Wire and Cable Co.
4. Hitemp Wires, Inc.
5. Phelps Dodge Cable and Wire Co.
6. Pirelli Cable Corp.
7. Rome Cable Corp.
8. Southwire Company.

##### B. Connectors:

1. AMP, Inc.
2. Burndy Corporation
3. Brand-Rex Div., Pyle National Co.
4. General Electric Co.
5. 3M Company
6. 0-Z/Gedney Co.
7. Square D Company
8. Thomas and Betts Corp.

## PRODUCTS

### WIRES, CABLES AND CONNECTORS

General: Provide electrical wires, cables and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, for a complete installation, and for application indicated.

Except as otherwise indicated, provide copper conductors with conductivity of not less than 98% at 20 Deg. C (68 Deg. F).

General Purpose Wires: Provide factory-fabricated wire of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper selection as determined by Installer to comply with project requirements, NEC and NEMA standards. Select from the following UL types, those wires with construction features which fulfill project requirements. Conductors shall be annealed copper.

Type THWN-THHN: For dry and wet locations; max dry location operating temperature 90 Deg. C. Insulation shall be flame-retardant, moisture-resistant and heat-resistant thermoplastic; outer covering shall be nylon jacket.

Apply conductors at 75 deg. C. ampere rating for circuits greater than 100 amperes. Use 60 deg. C. ampere rating for circuits 100A or less.

## CONNECTORS

General: Provide UL-type factory-fabricated, metal connectors of sizes, ampacity ratings, material, types and classes for applications and for services indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements, NEC and NEMA standards. Ensure connector materials mate and match and are compatible with conductor materials and cables. Select from the following types:

- A. Type: Insulated mechanical-bolted parallel or compression type for conductors #8 AWG and larger; twist-on insulated metal spring connectors for #12 and #10 awg miscellaneous branch circuit wiring, including equipment ground conductors.
- B. Material: Copper (for Cu to Cu connection).
- C. Insulation: All connectors shall be fully insulated to match insulation type and rating of conductors being spliced.

## EXECUTION

### INSTALLATION OF WIRES AND CABLES

Install electrical cables, wires and wiring connectors as indicated, in compliance with applicable requirements of NEC, NEMA, UL, and NECA's "Standard of Installation," and in accordance with recognized industry practices.

Coordinate wire/cable installation with electrical raceway and equipment installation work, as necessary.

Pull conductors together where more than one is being installed in a raceway.

Use pulling compound or lubricant, where necessary. Compound must not deteriorate conductor or insulation. Use of soap is not permitted as a pulling lubricant.

Use pulling means, including fish tape, cable, rope and basket-weave wire/cable grips that will not damage cables or raceway.

Keep conductor splices to a minimum.

Install splices and tapes that possess equivalent-or-better mechanical strength, electrical ampacity, and insulation ratings than conductor being spliced.

Use heat-shrink or cold-shrink splice kits for feeder circuit splices.

Use splice and tap connectors that are compatible with conductor material.

Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A.

Use twist-on insulated metal spring connectors for branch circuit wiring, including equipment ground conductors.

#### FIELD QUALITY CONTROL

Prior to energizing circuitry, check installed service and feeder wires and cables with megohm meter to determine insulation resistance levels, to ensure insulation integrity.

Prior to energizing, test wires and cables for electrical continuity and for short-circuit. Test branch circuit wiring with ohmmeter.

Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements. Where necessary, replace faulty conductors and retest to demonstrate compliance.

Ensure correct rotation of all motors.

Ensure correct sequence of phases at all switchgear and panelboards. Phase-sequence testing shall be performed in the presence of the Owner and Engineer, on both high-voltage and low-voltage systems, on both existing and new equipment. Ensure all phases of all circuits are identified. Ensure proper rotation of all motors. Ensure phase sequence of tie circuit(s) and both sides of secondary unit substation are exactly the same (as applicable). Provide A-B-C phase arrangement, left-to-right, top-to-bottom.

### 5. WIRING DEVICES

#### GENERAL

#### DESCRIPTION OF WORK

The extent of wiring device work is indicated by drawings. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.

Types of electrical wiring devices in this section include the following:

- A. Receptacles and GFCI type receptacles.
- B. Lighting toggle switches.
- C. Cover plates.

#### QUALITY ASSURANCE

NEC Compliance: Comply with NEC as applicable to installation and wiring devices.

UL Compliance: Comply with applicable requirements of UL 20, "General-Use Snap Switches"; 486A "Wire Connectors and Soldering Lugs for Use with Copper Conductors"; 498, "Electrical Attachment Plugs and Receptacles"; and 943, "Ground Fault Circuit Interrupters" pertaining to installation of wiring devices. Provide wiring devices which are UL-listed and labeled.

NEMA Compliance: Comply with applicable portions of NEMA Stds Pub/ No. WD 1, General-Purpose Wiring Devices", WD 2, "Semiconductor Dimmers for Incandescent Lamps", and WD 5, "Specific-Purpose Wiring Devices".

## MANUFACTURERS

Subject to compliance with requirements, manufacturers offering wiring devices which may be incorporated in the work include, but are not limited to, the following:

- A. Harvey Hubbell Inc.
- B. Arrow-Hart.
- C. Dimmer switches: Lutron, 'Nova T' Series (White).
- D. Pass & Seymour.
- E. Leviton.
- F. Eagle.

## PRODUCTS

### FABRICATED WIRING DEVICES

General: Provide factory-fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and which comply with NEMA Stds. Pub No. WD 1.

Device and Coverplates Colors: All coverplates shall be stainless steel.

### RECEPTACLES

Heavy-Duty Duplex: Provide heavy-duty, Hubbell #5362 (or equal) receptacles, 2-pole, 3-wire grounding, 20-amperes, 125 volts, with metal plaster ears, design for side and back wiring with spring loaded, screw activated pressure plate, with NEMA configuration 5-20R unless otherwise indicated; side screw wiring terminals.

Ground-Fault Interrupters: Provide "feed-through" type ground-fault circuit interrupters, with heavy-duty duplex receptacles, capable of protecting connected downstream receptacles on single circuit, and of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20-amperes, 120 volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 milliamperes ground-fault trip level; equip with NEMA 5-20R configuration; side screw wiring terminals.

Class 1 Division 2 Groups B,C,D: Provide heavy duty classified receptacles (with appropriate conduit seals) where classified areas appear on the drawing. In addition, provide (1) matching plug for each receptacle.

All receptacles shall be installed with the ground in the DOWN position.

#### SWITCHES

Toggle: Provide heavy-duty flush single-pole toggle switches, 20-amperes, 125-277 volts AC, white color for normal circuits, quiet type, with mounting yoke insulated from mechanism, equipped with plaster ears, switch handle, silver/cadmium alloy contacts and side and back wired terminals.

and 4-way AC switches, 20 amperes, 125-277 volts, with mounting yoke insulated from mechanism, equipped with plaster ears, insulated type switch handles, side-wired screw terminals, with break-off tab features, which allows wiring with separate or common feed.

#### WIRING DEVICE ACCESSORIES

Coverplates: Provide coverplates for single and combination wiring devices, of types, sizes, and with ganging and cutouts as indicated. Select plates which mate and match wiring devices to which attached. Construct with metal screws for securing plates to devices; screw heads colored to match finish of plates. Provide plates possessing the following additional construction features:

Material and finish: Stainless steel.

Outdoor area (weatherproof): Polycarbonate, stainless steel mounting screws, in-use type.

Surface mounted device boxes: Cast device covers.

#### EXECUTION

##### INSTALLATION OF WIRING DEVICES

Install wiring devices as indicated, in accordance with manufacturer's written instruction, applicable requirements of NEC and NECA's "Standard of Installation" and in accordance with recognized industry practices to fulfill project requirements.

Coordinate with other work, including painting, electrical boxes and wiring work, as necessary to interface installation of wiring devices with other work.

Install wiring devices only in electrical boxes, which are clean; free from excess building material, dirt, and debris.

Install wiring devices after wiring pull-in work is completed.

Install coverplates after painting work is completed.

Replace any and all coverplates or devices damaged prior to final acceptance of work by the Owner with new units.

Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A. Use properly scaled torque indicating hand tool.

Surface mounted device boxes shall be cast copper free aluminum/aluminum enamel boxes.

#### PROTECTION OF WALL PLATES AND RECEPTACLES

At time of Substantial Completion, replace those items which have been damaged, including those burned and scored by faulty plugs.

#### GROUNDING

Provide equipment grounding conductor and connection for wiring devices, unless otherwise indicated. Tighten connection to comply with tightening torques specified in US Std 486A to assure permanent and effective grounds. Grounding continuity shall be maintained between devices and metallic raceway system.

#### TESTING

Prior to energizing circuitry, test wiring devices for electrical continuity and short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energization, test wiring devices to demonstrate compliance with requirements, by use of a Woodhead or equal continuity testing device.

#### IDENTIFICATION

Mark the panelboard name and circuit # to which the device is connected, on each circuit wire, using vinyl/cloth wire tags.

### 6. GROUNDING SYSTEM

#### GENERAL

#### DESCRIPTION OF WORK

Extent of electrical grounding and bonding work is indicated by drawings as specified herein. Grounding and bonding work is defined to encompass systems, circuits, and equipment.

Types of electrical grounding and bonding work in this section includes the following:

- A. Solidly grounded.
- B. Dry-type transformers shall be separately derived systems.
- C. Ground electrode system for new service.
- D. Bonding and ground rods for lightning protection of radio telemetry antenna mast.

Refer to other sections for wires/cables, electrical raceways, boxes and fittings, and wiring devices which are required in conjunction with electrical grounding and bonding work; not work of this section.

## MANUFACTURERS

Subject to compliance with requirements, provide grounding and bonding products of one of the following (for each type of product):

- A. Burndy Corporation.
- B. Cadweld Div.; Erico Products Inc.
- C. Crouse-Hinds Div.; Cooper Industries.
- D. Ideal Industries, Inc.
- E. Joslyn Corporation.
- F. Okonite Company.
- G. OZ Gedney Div.; General Signal Corp.
- H. Thomas and Betts Corp.

## PRODUCTS

### GROUNDING AND BONDING

General: Except as otherwise indicated, provide electrical grounding and bonding systems; with assembly of materials, including, but not limited to, wires, connectors, solderless lug terminals, grounding electrodes bonding jumper braid, and additional accessories needed for a complete installation. Where more than one type component product meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products which comply with NEC, UL, NEMA, IEEE requirements, and with established industry standards for those applications indicated.

Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding system connections that match building wiring materials and are sized according to NEC.

Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type service indicated.

Field Welding: Comply with AWS Code for procedures, appearance, and quality of welds; and for methods used in correcting welding work. Provide exothermic type or equal welded connections where grounding conductors connect to underground grounding electrodes and underground or underslab or encased metal structural components.

## **EXECUTION**

### **INSTALLATION OF ELECTRICAL GROUNDING AND BONDING SYSTEMS**

General: Install electrical grounding and bonding systems as indicated, in accordance with manufacturer's instructions and applicable portions of NEC, NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that installations comply with requirements.

Coordinate with other work as necessary to interface installation of electrical grounding and bonding system.

Weld grounding conductors to underground grounding electrodes.

For this project, ground emergency electrical system neutral to utility system neutral at grounding electrode system neutral bonding point. Provide a solid neutral at the automatic transfer switch such that the generator does not comprise a separately derived system. Do not ground the neutral at the generator.

Connect together by equipment ground conductors and bonding, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, equipment frames, structural steel, reinforcing steel of generator pad, and major piping.

Terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug.

All feeder, branch circuits, and control circuits shall have a green insulated equipment ground conductor. (Ground conductors may not be indicated on plans, but shall be provided).

Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque values for connectors and bolts. Where manufacturer's torqueing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A to ensure permanent and effective grounding.

Route grounding connections and conductors to ground and protective devices in shortest and straightest paths as possible to minimize transient voltage rises. Solidly ground drain wires from TVSS devices.

Apply corrosion-resistant finish to field-connections, buried metallic grounding and bonding products, and places where factory applied protective coatings have been destroyed, which are subjected to corrosive action.

Provide ground conductor and bonding to ground rod(s), structural steel, or rebar, equipment mounting racks, and major metal mechanical piping. Provide ground rod and #6 ground wire for each pole mounted lighting fixture.

### **FIELD QUALITY CONTROL:**

Use ohmmeter and test for continuity of all ground conductors, all metallic raceways and enclosures, metallic building structure, and metallic piping, and ground rod system.

Test resistance of ground rod system for NEC and industry compliance.

## 7. DRY-TYPE TRANSFORMERS

### GENERAL

#### INDUSTRY STANDARDS

Equipment specified herein shall be furnished and installed complete by the Contractor.

The equipment specified herein shall meet the applicable of the following agencies and associations:

- A. Underwriters Laboratories U.L.
- B. National Fire Protection Association, NFPA.
- C. National Electrical Manufactiures Association.
- D. American National Standards Institute, ANSI.
- E. Factory Mutual.

#### SUBMITTALS

Shop drawings shall be submitted showing KVA, temperature rating, voltage rating, dimensional and other data showing compliance with the electrical and physical requirements of the project.

#### MANUFACTURERS

Provide one of the following:

- A. Eaton/Cutler-Hammer
- B. Square-D Company
- C. Siemens
- D. General Electric

#### PRODUCTS

##### TYPE AND MOUNTING

All units shall be metal enclosed ventilated dry type for wall or floor mounting as indicated on the plans, or as dictated by physical size.

KVA, voltage and phase ratings shall be as shown on the drawings.

Floor mounted transformers shall be mounted on wire reinforced 3000 psi concrete pads.

## ENCLOSURES

Transformer enclosures shall be non-ventilated type for outdoor applications constructed from minimum 16 gauge steel and shall be designed in such a manner to prevent accidental access to electrically energized parts.

Conduit knockouts shall be provided in-line with the terminals and be of sufficient size and number to accommodate the necessary cables and conduit.

## CORE AND COIL

Core and coil shall be of the highest quality materials to minimize no-load losses and exciting current, and shall be mechanically braced to withstand short circuit stresses of 25 times normal load current for two seconds.

Coils shall be copper. All busbar shall be copper. All current carrying components shall be copper.

Core and coil assembly shall be internally isolated and shall be subjected to a double dip and bake process.

Coils shall be continuous from start to finish with no splices being allowed. Coils shall have a final wrap of insulating material designed to prevent injury to the magnet wire. Units having visible magnet wire are not acceptable.

Core and coil unit shall be completely isolated from the enclosure by means of vibration absorbing mounts.

Core and coil unit shall be adequately grounded to the enclosure by means of a flexible grounding strap.

Provide neutral ground strap and grounding to ground electrode system.

Terminals for line, load and ground connections shall be supplied. Terminals shall be located in an area of the unit where the temperature does not exceed 40 degrees C. All terminals, lugs, and connectors shall be copper.

## INSULATION AND TEMPERATURE RISE

Insulation and transformer core and coil shall be designed for a maximum 115 degrees C temperature rise above an ambient of 30 degrees C at rated full load; capable of operating at an overload for 150 degrees C rise.

## TAPS

Units thru 25 KVA shall have two 5% full capacity taps below normal rated primary voltage.

Units 30 KVA and larger shall have two 2-1/2% full capacity above and four 2-1/2% full capacity below normal primary voltage.

## SOUND LEVELS

Sound levels shall not exceed NEMA Standard.

Unless noted otherwise, sound levels shall not exceed 45 db on units thru 150 KVA, 50 db on units from 151 KVA thru 300 KVA and 55 db on units larger than 300 KVA.

## EFFICIENCY

Units shall have a 96% minimum efficiency at 75% load.

## CASE TEMPERATURE

The maximum case temperature at the warmest spot shall not exceed 35 degrees C above a 40 degrees C ambient, regardless of insulation system used.

## EXECUTION

### INSTALLATION

Transformers shall be installed where shown on the drawings. Units shall be set so as to allow easy access to at least three sides of the unit.

Ensure all units have adequate air space for self-cooling.

All hardware and accessories shall be furnished and installed by the Contractor.

Prior to energizing and during start-up, perform electrical tests to provide correct voltages and phase rotation.

## 8. PANELBOARDS

### GENERAL

#### DESCRIPTION OF WORK

Extent of panelboard, and enclosure work is indicated by drawings and schedules.

#### QUALITY ASSURANCE

NEC Compliance: Comply with NEC as applicable to installation of panelboards, cabinets, and cutout boxes, including NEC Article 384.

UL Compliance: Comply with applicable requirements of Std No. 67, "Electric Panelboards", and Std No.'s 50, 869, 486A, and 1053 pertaining to panelboards, accessories and enclosures. Provide units which are UL-listed and labeled.

NEMA Compliance: Comply with NEMA Stds. Pub/No, 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)", Pub/No. PB 1, "Panelboards", and Pub/No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less." Comply with NEMA Pub/No. PB 1.2, "Application Guide for Ground-fault Protective Devices for Equipment", where applicable.

#### SUBMITTALS

Product Data: Submit manufacturer's data on panelboards.

#### MANUFACTURERS

Subject to compliance with requirements, manufacturers offering electrical panelboard products which may be incorporated in the work include the following:

- A. Eaton/Cutler-Hammer
- B. Square D Company
- C. Siemens
- D. General Electric

#### PRODUCTS

##### PANELBOARDS

General: Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials, except copper busbars, copper neutral bar, copper ground bar, and copper cable lugs shall be provided.; design and construct in accordance with published product information; equip with proper number of unit branch devices as required for complete installation. Refer to panelboard schedules or one-line on the drawings.

NEMA Compliance: Comply with NEMA Stds. Pub/No, 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)", Pub/No. PB 1, "Panelboards", and Pub/No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less." Comply with NEMA Pub/No. PB 1.2, "Application Guide for Ground-fault Protective Devices for Equipment", where applicable.

Panelboards: Provide dead-front safety type lighting and appliance branch circuit panelboards as indicated, with branch devices in quantities, ratings, types and arrangement shown; with copper anti-burn solderless pressure type lug connectors approved for copper conductors; equip with copper bus bars, full-sized copper neutral bar insulated from ground, copper ground bar, and bolt-in type molded case circuit-breakers, with toggle handles that indicate when tripped. Where multiple pole breakers are indicated, provide with common trip so that all poles trip simultaneously. Provide suitable copper lugs on neutral bus for each outgoing circuit required; provide bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate properly with panelboards.

Provide short circuit rating not less than 10,000 AIC if not indicated.

Circuit breakers shall be thermal magnetic type unless noted otherwise. Voltage and poles shall be as indicated on the drawings.

Panelboard Enclosures: Provide NEMA sheet steel cabinet type enclosures, in sizes required and NEMA types as indicated, code-gage, minimum 16-gage thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with adjustable trim clamps, and doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed door hinges and door swings as indicated. Equip with interior circuit-directory frame, and card with clear plastic covering. Design enclosures for recessed or surface mounting, as applicable. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate properly with panelboards to be enclosed.

## **EXECUTION**

### **INSTALLATION OF PANELBOARDS**

General: Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards.

and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.

Coordinate installation of panelboards and enclosures with wire and raceway installation work. Coordinate exact locations with other trades to ensure no space conflicts and no transgressions of dedicated panelboard space by piping and ductwork.

Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A. Where manufacturer's torque requirements are more stringent, manufacturer's requirements shall be followed.

Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secure. All panelboards shall use unistrut type channels for mounting to walls.

Provide properly wired electrical connection within enclosures. Wiring must be neatly routed.

Fill out panelboard's circuit directory card upon completion of installation work. Directory cards shall be typed.

Adjust and set adjustable circuit breaker trip and time delay settings where applicable.

### **GROUNDING**

Provide equipment grounding connection for panelboards as indicated. All panelboard feeders and branch circuits shall have green insulated equipment ground conductors. Tighten connections to comply with tightening torques specified in UL Stds. 486A to assure permanent and effective grounds.

## FIELD QUALITY CONTROL

Prior to energization of circuitry, check tightness of all accessible connections for compliance with manufacturer's tightening torque specifications.

Prior to energizing panelboards, check panelboard busbar and feeder phase-to-phase and phase-to-ground insulation resistance levels to ensure no ground faults and no short circuits.

Prior to energization, check branch circuit panelboards for electrical continuity of circuits, and check for short-circuits and ground faults.

Subsequent to wire and cable hook-ups, energize panelboards and demonstrate compliance with requirements. Where necessary, correct malfunctions and replace faulty components in field, and then retest to demonstrate compliance.

Provide wire tags to identify all circuits.

Check for proper phase arrangement and rotation; A-B-C left to-right and top-to-bottom.

## 9. LIGHTING

### GENERAL

#### RELATED DOCUMENTS

Basic Electrical Materials and Methods sections and drawings apply to work specified in this section.

#### SUMMARY

Extent of lighting fixture work is indicated by drawings and schedules.

#### SUBMITTALS

Product Data: Submit manufacturer's product data and installation instructions on each type lighting fixture.

#### QUALITY ASSURANCE

##### Codes and Standards:

Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC Articles 225, 250, 410, and 501 as applicable to installation and construction of building lighting fixtures.

NEMA Compliance: Comply with applicable requirements of NEMA Stds. Pub/No. LE 2 pertaining to lighting equipment.

UL compliance: Comply with requirements of UL standards, including Stds. 486A and B, pertaining to exterior lighting fixtures. Provide lighting fixtures and components which are UL-listed and labeled.

#### DELIVERY, STORAGE AND HANDLING

Deliver lighting fixtures in factory-fabricated containers or wrappings, which properly protect fixtures from construction debris and physical damage.

Store lighting fixtures in original wrappings in a clean dry space. Protect from weather, dirt, fumes, water, construction debris and damage.

Handle lighting fixtures carefully to prevent damage, breaking, and scoring. Do not install damaged fixtures or components; remove units from site and replace with new.

#### SEQUENCING AND SCHEDULING

Coordinate with other electrical work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of lighting fixtures with other work.

Sequence lighting installation with other work to reduce possibility of damage and soiling of fixtures during remainder of construction period.

#### MAINTENANCE

Maintenance Data: Submit maintenance data and parts list for each lighting fixture and accessory; including "trouble-shooting" maintenance guide. Include that data, product data, and shop drawings in a maintenance manual.

Extra Stock: Furnish stock or replacement lamps amounting to 10 percent (but not less than one lamp in each case) of each type and size lamp used in each type fixture. Deliver replacement stock as directed to Owner's storage space.

#### MANUFACTURERS

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work are listed on the fixture schedule.

#### PRODUCTS

##### LIGHTING FIXTURES

General: provide lighting fixtures, of sizes, types and ratings indicated; complete with, but not limited to, housings, poles, energy efficient ballasts, starters, lamps and wiring.

Wiring: Provide electrical wiring within fixtures which is suitable for connection to branch circuit wiring as follows:

- A. NEC Type AF for 120-volts, minimum no. 18 AWG.; NEC Type SF-2 for 208-volts, minimum No. 18 AWG.

High-Intensity-Discharge Lamp Ballasts: Provide HID lamp ballasts, of ratings, types and makes as recommended by lamp manufacturer, which properly mates and matches lamps to electrical supply by providing appropriate voltages and impedances for which lamps are designed. Design ballasts to operate lamp within the lamp's power trapezoid requirements. Ballasts shall be high power factor type and primary shall be fused.

Lamps: Provide clear metal halide in wattage indicated.  
Fusing: Provide Primary Fusing in all phase conductors.

#### PHOTOCELL CONTROLLERS

2000 watt, 120 VAC rated, conduit pedestal mounted, used to control an individual circuit or a lighting contactor; Tork Model #2101 or approved equal.

#### HAND-OFF-AUTO CONTROLS

Provide hand-off-auto selector switch. In hand position, fixtures shall be energized. In auto position, fixtures shall be controlled by photocell.

#### EXECUTION

##### EXAMINATION

Examine areas and conditions under which lighting fixtures are to be installed, and substrate which will support lighting fixtures. Notify Contractor in writing of conditions detrimental to proper completion of the Work. Do not proceed with the Work until satisfactory conditions have been corrected in a manner acceptable to Installer.

##### INSTALLATION OF LIGHTING FIXTURES

Install lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA standards, and with recognized industry requirements.

Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B, and the National Electrical Code.

Fasten electrical lighting fixtures and brackets securely to structural supports, and ensure that installed fixtures are plumb and level.

Construct reinforced concrete bases flush with grade, with conduits, anchor bolts and ground wire. Refer to detail on drawings for additional information. Provide six foot minimum ground rod located six foot distant from pole, 24" below finished grade to top of ground rod; provide #6 ground wire.

Install poles on bases and adjust to provide plumb installation.

##### GROUNDING

Provide equipment grounding connections for lighting fixtures. Tighten connections to comply with tightening torques specified in UL Std. 486A to assure permanent and effective grounds.

#### FIELD QUALITY CONTROL

At the Date of Substantial Completion, replace lamps in lighting fixtures which are observed to be noticeably dimmed as judged by the Engineer.

#### ADJUSTING AND CLEANING

Aim adjustable lighting fixtures and lamps in night test of system.  
Clean lighting fixtures of dirt and debris upon completion of installation.  
Protect installed fixtures from damage during construction period.

#### DEMONSTRATION

Upon completion of installation of lighting fixtures, and associated electrical supply circuitry, apply electrical energy to circuitry to demonstrate compliance with requirements. Where possible correct any malfunctions at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

### **Mechanical Requirements**

#### **DESCRIPTION**

This work shall consist of furnishing materials, installation, and all necessary incidentals associated with the HVAC equipment as indicated on the plans. Contractor shall provide and install a complete and working single package HVAC system as described on the plans. Contractor shall install according to all manufacturer's recommendations and requirements as described in the documentation of their system. Mechanical work shall comply with all drawing requirements and general provisions of the Contract.

## **WORK ITEM W-1 - PUMP WELL HOUSE**

### **DESCRIPTION**

The work shall include the furnishing of all materials, labor and equipment necessary to complete the construction of a Pump Well House for the new water well and pump as shown on the Plans. Any references made to Specifications, or other published standards, shall be to the standards in effect at the date of Bid.

### **Concrete**

All concrete used in the work develop a minimum compressive strength of 4,000 pounds per square inch in 28 days in accordance with ASTM C39.

### **Cement**

All cement used in concrete shall be air-entraining Portland Cement, conforming to ASTM C150, Type IA or IIIA.

### **Proportions and Consistency**

All concrete shall be proportioned by the water-cement ratio, except for small batches when permission is granted to deviate from this method. The water-cement ratio shall be interpreted as the ratio of the total quantity of water, including surface water contained in the aggregate, expressed in U.S. gallons, per pound of cement.

Water- Cement <u>Ratio</u>	28-Day Compressive <u>Strength (PSI)</u>
0.45	4,000

The amount of entrained air in the concrete shall be greater than 4% and less than 7%.

All concrete placed in the work shall show slumps within the limits of 2" and 4". In all cases, the slump shall be the minimum consistent with good workmanship.

### **Mixing of Concrete**

All concrete incorporated in the work shall be transit-mixed in accordance with ASTM C94 for ready-mixed concrete. Small batches of concrete may be job-mixed by the Contractor when approved by the Engineer.

Concrete which for any reasons is poorly mixed and is not of uniform consistency, will be rejected. Re-tempering and remixing will not be permitted.

When placed, concrete shall have a temperature of not less than 60°F, nor more than 90°F.

### **Forms**

The Contractor shall provide forms with smooth surfaces of ample strength and rigidly braced to prevent deviations from the correct lines. Forms shall be substantially watertight and securely anchored against flotation. All exposed corners shall be formed with 1" chamfer strips, unless otherwise directed. Forms shall remain in place until the concrete is adequately set and capable of bearing, without damage, any load which may be imposed.

### **Placing of Concrete**

Forms shall be cleaned and treated to prevent adherence of mortar to the forms. All debris shall be completely removed from between the forms. Concrete shall not be placed under water, on muddy, frozen, or insufficiently compacted soil. The concrete shall be deposited in the forms in a manner which will prevent segregation. The method of placing concrete in the forms shall be subject to the approval of the Engineer. Concrete shall not be permitted to drop freely more than 4 feet. Concrete shall be hand-spaced or vibrated with approved mechanical vibrators for a period of time sufficient to make a dense mass but not so long that segregation occurs.

### **Placing Concrete in Cold Weather**

When the air temperature is below 45°F, the Contractor shall use special means in mixing and placing concrete to prevent its freezing in compliance with ACI 306 and as herein specified. Water and aggregates shall be heated to a temperature of not less than 70°F, nor more than 150°F, by means of steam or by heat, prior to being placed in the mixer, provided uniform results are obtained. Salt, antifreeze solution, or other chemicals shall not be used.

### **Placing Concrete in Hot Weather**

When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified. Cool ingredients before mixing to maintain concrete temperatures at time of placement below 90°F. Mixing water may be chilled or chopped ice may be used to control the concrete temperature providing the water equivalent of the ice is considered for the calculation of the total amount of mixing water. Cover reinforcing steel with water soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete. Do not use retarding admixtures unless otherwise accepted in mix design.

### **Concrete Curing and Protection**

**General:** Protect freshly placed concrete from premature drying and excessive cold or hot temperature for a period of time necessary for hydration of cement and proper hardening.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 72 hours.
2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days and in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

**Curing Methods:** Perform curing of concrete by moist curing, by moisture-retaining cover curing, membrane curing and by combinations thereof, as herein specified.

1. Provide moisture curing as follows:
  - a. Keep concrete surface continuously wet by covering with water.
  - b. Continuous water-fog spray.
  - c. Cover concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges with 4" lap over adjacent absorptive covers.
2. Provide moisture-cover curing as follows:
  - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Provide membrane curing to slabs as follows:
  - a. Apply membrane-forming curing compound to concrete surfaces as soon as final finishing operations are complete (Within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
  - b. Do not use membrane curing compounds on surfaces which are to be covered with a coating material applied directly to concrete, liquid floor hardener, waterproofing, damp proofing, membrane roofing, flooring, painting and other coatings and finish materials unless acceptable to the Engineer.

### **Finishing of Concrete**

Any defective work discovered after the forms have been removed shall be corrected immediately. All surfaces shall be reasonably free from "honey-combing", bulging, aggregate pockets, and excessive depressions or projections. If any defects cannot be repaired satisfactorily in the opinion of the Engineer, the entire defective section shall be removed and replaced by the Contractor at his expense.

Immediately after the forms have been removed, all minor depressions resulting from the removal of metal ties, or from other causes, shall be carefully pointed with mortar consisting of one (1) part cement and three (3) parts sand. The surface film of all such filled areas shall be carefully removed before setting occurs.

All exposed concrete surface except floors, landings, stairs, entrance slabs and walks, shall be given a rubbed finish. Fins and other projections shall be carefully removed, offsets leveled and damaged places repaired. The surfaces shall then be rubbed with a carborundum brick and water, without the addition of cement, mortar or grout. The finished surface shall be true to line, level and contour, and shall be free of form marks or other blemishes.

Concrete floors, landing and stair treads shall receive a steel trowel finish, unless otherwise directed by the Engineer.

Entrance slabs and walks shall receive a wood float finish.

Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete the work.

### **Reinforcing Steel**

Metal reinforcement shall conform to the applicable specifications of the American Society for Testing Materials, as follows:

<u>Standard Specifications for:</u>	<u>Serial Designation</u>
Deformed Steel Bars for Concrete Reinforcement	A615 Grade 60
Welded Steel Wire Fabric for Concrete Reinforcement	A185
Steel Wire for Concrete Reinforcement	A82
Welded deformed Steel Bar or Mats for Concrete Reinforcement	A184

All reinforcing bars, unless otherwise specified, shall be deformed in accordance with ASTM A615.

### **Placing Reinforcing Steel**

All reinforcement shall be accurately placed in accordance with the Plans or as specified, and shall be adequately secured in position by concrete or metal chairs and spacers and by wire tags. Adjoining bars at splices shall overlap the length as shown on the Plans. All bent bars shall be accurately bent to the required shape before being placed in the forms.

### **Ordering Reinforcement**

Before ordering reinforcement which is to be bent, the Contractor shall submit to the Engineer, diagrams and lists showing the number, size, length and arrangement of the reinforcement he proposes to finish and place. The Contractor shall furnish a sufficient number of such diagrams and lists to permit three (3) copies to be retained by the Engineer. At least two weeks shall be allowed for the Engineer to check said lists and diagrams and these may be changed or revised to meet the approval of the Engineer.

Reinforcement, if shop bent, shall be tied in bundles and shall be identified with a metal tag on which shall be plainly stenciled or stamped the designation of the bars shown on the reinforcement drawings as approved by the Engineer.

### **MASONRY (General)**

#### **Compliance with Standard and Industry Specifications**

For all conflicts between the referenced specifications and the project specifications, the project specifications shall govern.

The Contractor, if requested, shall furnish an affidavit from the manufacturer, certifying that the materials or products delivered to the job meet the requirements specified. However, such certification shall not relieve the Contractor from the responsibility of complying with any added requirements specified herein.

### **Precautions and General Requirements**

**Cold Weather Protective Methods:** No masonry work shall be permitted in cold weather when the temperature is below 32°F on a rising thermometer or below 40°F on a falling thermometer unless adequate protection against freezing is provided as follows:

1) **Below 40°F, but above 32°F**

Heat mortar mixing water, but not above 160°F. Mortar when placed shall be between 70°F and 100°F. Plastic sheets or tarpaulins shall be placed over newly laid walls.

2) **Below 32°F, but above 0°F**

In addition to preceding requirements, sand shall be heated but not scorched. The working area shall be protected. When the temperature falls below 20°F, all concrete masonry units shall be heated to at least 50°F at the job site.

3) **Below 0°F**

Construction shall be stopped unless the enclosure is complete and tight. Observe all preceding requirements.

4) Masonry shall be protected against freezing for at least 48 hours.

5) No masonry shall be laid with or on frozen materials.

6) No antifreeze ingredient shall be used in the mortar.

Protect facing material against staining, and keep tops of walls covered with non-staining waterproof coverings when work is not in progress. When work is resumed, top surface of work shall be cleaned of all loose mortar and in drying weather, thoroughly wet except for concrete masonry units.

Before closing up any pipe, duct or similar inaccessible spaces or shafts with masonry, remove all rubbish and sweep out the area to be enclosed.

Provide level and solid bearing in masonry walls directly under bond beams and lintels.

The open space at expansion joints shall be kept free of mortar by using a continuous wood or metal strip temporarily set on the wall.

Where fresh masonry joins masonry that is partially set or totally set, clean the exposed surface of the set masonry and wet it lightly so as to obtain the best possible bond with the new work. Remove all loose brick and mortar. If it is necessary to "stop-off" of horizontal run of masonry, this shall be done by racking back one-half (1/2) unit length in each course. Tothing will not be permitted.

Consult other trades and make provisions that will permit the installation of their work in a manner to avoid cutting and patching. Build in work specified under other Sections, as necessary, and as the work progresses. Set steel lintels in beds of mortar. Fill spaces around jambs and heads of metal door bucks and frames solidly with mortar. Build in anchors and clips for windows.

### **Building in Work**

Build in all anchors, flashings, sleeves, frames, structural steel, loose lintels and miscellaneous iron and all other items required to be built into masonry during the course of the work.

Contractor shall fully familiarize himself with the Mechanical and Electrical Drawings and Specifications, in order that there may be no misunderstanding as to what items are to be installed by other Contractors and what items he shall install.

### **Cutting and Patching**

The Contractor shall be responsible for all cutting and patching of masonry work, including any cutting and patching required for the work of the mechanical, electrical and other trades. Actual cutting may be left to each trade with material and equipment to install, but such cutting shall be done under the supervision of the General Contractor.

Patching shall be done by the Contractor, and unless otherwise directed, be done at the conclusion of the general work. Patching shall be done in such a manner that the patching will be indistinguishable from surrounding or adjoining work.

### **Material Handling and Storage**

- 1) Store any masonry material on the job so as to prevent the inclusion of any foreign materials in the work and any damage from weather and ground.
- 2) In cold weather all masonry units and mortar materials shall be thoroughly covered with tarpaulins or felt paper. Masonry units shall be stored on a high, dry location on platforms of sufficient thickness and height to prevent absorption of moisture from the ground. Masonry units and mortar materials shall never be permitted to become covered with ice and snow.
- 3) Manufactured materials, such as cement and lime, shall be delivered and stored in original packages plainly marked with the brand and manufacturer's name. Material in broken containers or in packages showing water marks or other evidence of damage will be wholly rejected.

### **Accessories**

Anchors and ties shall be of zinc-coated steel. Except for steel wire, zinc-coating shall conform to ASTM Specifications A-153. Steel wire shall be zinc-coated in accordance with ASTM Specification A-116 for Class 2 coating. The extent and location of anchors and ties shall be as indicated on the drawings and as hereinafter specified under the laying requirements for the various items of masonry.

### **Joint Reinforcement**

Steel reinforcement for use in horizontal bed joints of concrete masonry units and other locations as hereinafter specified shall be prefabricated type formed of zinc-coated cold drawn steel wire conforming to ASTM Specification A1064/A1064M. Side wires shall be formed of 3/16" gauge wire to be deformed, cross rods shall be 9 gauge or larger, smooth or deformed wire, butt welded to side wires in the same place at contact points and spaced not more than 16 inches apart. Provide special formed pieces at corners and intersections of walls or partitions. Reinforcing shall be of proper widths for the partitions and wall thickness shown. Reinforcing shall be "Block-Lok and Econo-Lok" as manufactured by A-A Wire Products or "Dur-O-Wall and Continuous Rectangular Ties" as manufactured by Dur-O-Wall Manufacturing Company, or approved equal.

Reinforcement for lintels and other reinforcement not specified otherwise, shall conform to ASTM Specification A-615.

### **Expansion or Control Joint Filler Strips**

Strips shall be of natural or synthetic rubber, wide flange type as manufactured by Dur-O-Wall Manufacturing Company, or approved equal; resistant to oils and solvents and meet the flexure test being exposed to a temperature of minus 40°F, as required by ASTM Specification D-736.

### **Pointing and Cleaning Masonry**

Point all holes in exposed masonry. Cut out defective joints and repoint them with mortar. All exposed masonry shall be cleaned thoroughly.

Concrete masonry units shall have all loose mortar cleaned off and all stains removed.

## **CONCRETE MASONRY**

### **Materials**

Concrete masonry units shall be hollow load bearing crushed stone, aggregate units conforming to ASTM Specification C-90, Grade "N-I".

The moisture content of all masonry concrete units at the time of delivery shall not exceed 25% of the total absorption. The maximum linear drying shrinkage of concrete masonry units shall not exceed 0.040 percent as tested by the procedure described in ASTM Specification C-426.

The unit manufacturer shall certify that the units delivered to the job meet the requirements specified herein and shall submit tests to the Engineer from each lot furnished. The reports shall give compressive strength in pounds per square inch; water absorption in pounds per cubic foot; moisture content in percent of total absorption; and the linear drying shrinkage in percent of total gauge length.

Selection of test specimens will be made by the Engineer from units delivered to the job site in accordance with ASTM C-140.

Units shall have face dimensions of 15-5/8" x 7-5/8". Corner units shall have square external corners. Provide jamb units at doors and windows, bond beam units and other special units as necessary for the conditions shown. The texture of units shall match the approved samples for the type of construction and locations designated. Units shall not contain iron spots or other substances that will stain plaster or paint.

Include all special shapes for jambs, bond beams, lintels and other items required for a complete job.

### **Workmanship**

Lay units plumb and true to line and grade with level, accurately spaced courses; in running bond unless otherwise indicated on Drawings or in Schedules. Keep corners plumb and true; chases and raked joints free of mortar and debris. Do not dampen units prior to laying.

Use and place mortar within 2 hours after mixing. Mortar that has stiffened may be re-tempered with the minimum of water necessary to obtain desired workability and proper water retention. (See ASTM C-270) Discard any mortar that has not been used in 2-1/2 hours.

Where electric conduit, outlet and switch boxes occur, grind and cut units before building in services. Coordinate with Electrical Work. Use power saw for cutting units exposed in finished work.

Reinforce all concrete masonry walls as follows:

Walls: The top course of all walls, the first two (2) courses above and below all openings (extend not less than 18 inches beyond each edge of openings), and in addition – every other course (32" o/c).

All joists and beams shall bear on concrete filled bond beams or solid units to a minimum depth of 8 inches; or a combination of both as detailed. In no case shall structural members bear directly on hollow masonry units unless the cores are filled.

At all windows and door openings: Fill cores of units with 3,000 psi concrete for three (3) courses below bearing of lintels and a distance of at least 16 inches each side of opening. Provide two (2) #4 rebars in each of two (2) cores.

Where any concentrated load occurs: Fill cores of units with 3,000 psi concrete from bearing area to foundation and a distance of not less than 8 inches each side of bearing area.

Bond each course at corners in a masonry bond and at intersections with metal ties, anchors, or joint reinforcement spaced vertically not exceeding 16 inches.

All walls shall be topped off with a bond beam. Cast-in-place lintels and bond beams are formed in place with special shaped units and reinforced with not less than two (2) #4 deformed bars. Run bars continuously in bond beams. Fill bond beams and lintels with 3,000 psi concrete. Lintels shall have a minimum of 8 inches bearing each end. Provide temporary support under lintels as necessary.

### **MORTAR**

#### **Mortar Materials**

Portland Cement shall conform to ASTM Specifications C-205. Type IS grey in color.

Masonry Cement shall conform to ASTM Specification C-91, Type II. Cement shall be grey except where other color is specified hereinafter. Universal-Atlas Masonry Cement is acceptable.

Non-Staining Portland Cement shall conform to the requirements specified for Type I Cement in ASTM Specification C-150 and shall not contain more than 0.03 percent of water soluble alkali and shall not stain other materials and surfaces with which it is in contact. Cement shall be grey except for locations where white is specified hereinafter.

Hydrated Lime shall be Type S conforming to ASTM Specification C-207. Quick-lime shall conform to ASTM Specification C-5; it shall be grey except for locations where white is specified hereinafter.

Lime Putty shall be a stiff mixture of lime and water. Keep putty moist until used. Putty made from quicklime shall be slaked and allowed to soak at least 24 hours before using. Putty made from Type S hydrated lime may be used immediately after mixing.

Sand shall conform to ASTM Specification C-144 except that sand for mortar in 1/4 inch wide joints shall pass a No. 16 sieve.

Mixing Water shall be clean and free from oil and acids, alkali or organic matter.

Mortar for all unit masonry not specified otherwise shall be mixed in the proportions of 1 part Portland or Portland Blast Furnace Slag Cement, 1/2 to 1-1/4 parts hydrated lime or lime putty and 4-1/2 to 6 parts of sand by volume. At the option of the Contractor, mortar may be mixed in the proportions of 1 part masonry cement and 2-1/4 to 3 parts of sand by volume. (ASTM C-270 – Type N – 750 PSI).

#### **Mixing Mortar**

Mix all cementitious materials and sand in a mechanical batch mixer for a minimum of 5 minutes. Adjust the consistency of the mortar to the satisfaction of the mason, but add only as much water as is compatible with convenience in using the mortar. If the mortar begins to stiffen from evaporation or from absorption of a part of the mixing water, retemper the mortar immediately by adding water, and remix the mortar. All mortar shall be used within 2 hours of the initial mixing. It shall not be used after it has begun to set.

Measuring of cement, lime and sand quantities shall be by means of an approved measuring container such as a cubic foot box, not by shovelful.

Once a mix has been established, it shall not be changed throughout the job except by approval of the Engineer.

#### **BLOCK VENTS**

Block vents shall be factory painted cast aluminum frame 16" wide x 8" high (nominal) with aluminum mesh screen on interior, 20 ga. damper on interior with exterior screw operator and continuous top and bottom drip.

Block vents shall be built into wall by mason.

## **HOLLOW METAL DOORS AND FRAMES**

### **Materials**

Except as otherwise specified herein, or specifically approved by the Engineer, all hollow metal doors and frames shall be products of a name-brand door manufacturer with a minimum of 10 years of door manufacturing experience.

Shop drawings for metal frames shall be submitted to Engineer for approval and shall indicate:

1. Elevations of each door type.
2. Details of each frame type (doors, sidelines, transoms and windows).
3. Location in the building for each item.
4. Conditions at openings with various wall thicknesses and materials.
5. Typical and special details of construction.
6. Methods of assembling sections.
7. Location and installation requirements for hardware.
8. Materials and finishes.
9. Size, shape and thickness of materials.

Metal for frames shall be cold-rolled or galvanized steel sheets with clean smooth surfaces. Steel frames for exterior doors shall be 14 gauge and shall be galvanized.

Provide concealed metal reinforcements for hardware as required. The gauges of metal for reinforcement shall be no lighter than those required by Commercial Standard CS 242-62.

The finished work shall be strong and rigid, neat in appearance and free from defects. Fabricated molded members straight and true with corner joints well formed, in true alignment. Where practical, conceal fastenings. Where exterior frames are set in masonry, provide a caulking groove, 1/4" wide by 5/8" deep, with a closed back, to receive the caulking compound.

Welded type frames shall be mitered or butted and continuously arc-welded for full depth and width of frame and trim. All contact edges shall be closed tight and all welds on exposed surfaces dressed smooth and flush.

Frames shall be prepared at the factory for the installation of hardware. Welding of hinges to frames will not be permitted. Frames shall be mortised, reinforced, drilled and tapped to templates to receive all mortised hardware; frames to receive surface applied hardware shall be provided with reinforcing plates only. For steel frames set in masonry, provide masonry wire tee anchors.

**Shop Painting:** Apply a primed finish to all ferrous metal surfaces. Clean and chemically treat metal surfaces to assure maximum paint adherence; follow with a dip or spray coat of rust-inhibitive metallic oxide, zinc chromate, or synthetic resin primer on all exposed surfaces. Finished surfaces shall be smooth and free from irregularities and rough spots.

Each coat of paint shall be separately baked or oven dried in accordance with manufacturer's recommendations.

**Weatherstrip Frames:** All exterior frames shall be provided with a flexible seal interlocked into the jambs and head by a tab and slot connection installed in factory; or provide neoprene weatherstripping as selected by the Engineer. Material shall be plastic and impervious to fatigue and withstand extreme temperatures.

**Door Sizes and Clearances:** Doors shall be of type, sizes and design indicated; 1-3/4" thick, unless designated otherwise. The clearances for doors shall be 1/8" at jambs and heads and 5/8" at bottom, unless indicated or specified otherwise.

Construct doors of two outer steel sheets not lighter than 18 gauge and with edges, finished flush. Seams or joints will not be permitted on door faces. Top, sides and bottom of door shall be welded flush with all welds ground smooth. The outer face sheets shall be reinforced with all welds ground smooth. The outer face sheets shall be reinforced with either 22 gauge interlocking vertical channels or z-shaped members spaced not more than 8-1/2" apart, and spot welded to outer sheets; or with 24 gauge horizontal U-shaped sections spaced in parallel rows not over 8-1/2" on center and welded in alternating sequence to the inside face of each outer sheet so that a horizontal stiffening occurs approximately 17" on each face sheet. Provide approved sound absorbing material on inside of door to eliminate the metallic sound. Exterior doors must be fully insulated with rockwool.

Louvers, if indicated for doors shall be stationary, siteproof type with the size indicated on the drawings, with watertight shutters.

Louvers shall be steel Barber-Coleman, 1/2" thick, "Gov. Site-Tite" with non-die formed fins. Size shall be as indicated on the drawings. All such grilles shall be primed with gray or beige primer.

### **Workmanship**

Set frames in position; plumb, align and brace securely under permanent anchors are set. Anchor bolt of frames to floors with expansion bolts or with power fasteners. Where frames require ceiling struts or other structural overhead bracing, they shall be anchored securely to ceilings or structural framing above, as indicated or specified.

The finished work shall be rigid, neat in appearance and free from defects. Form molded members straight and true with joints coped or mitered, well formed and in true alignment. All welded joints on exposed surfaces shall be dressed smooth so they are invisible after finishing.

### **FINISH DOOR HARDWARE**

#### **Materials**

Selection of the appropriate lockset shall be coordinated within the facility operators.

All finish hardware shall be in accordance with the applicable Indiana Building Codes.

## **HARDWARE**

### **Hardware Set – Exterior Door**

All finish hardware shall be furnished and installed by the Contractor. All doors shall be furnished with closers, hook to hold in open position and dead bolt locks. The deadbolt lock shall allow for a core provided by the Owner. The Owner currently uses locks supplied by "Best".

### **Shop Drawings**

Submit to Engineer for approval, Shop Drawings showing typical construction of all items. The Drawings shall show the conditions at doors with various wall thickness and materials and a schedule listing the location in the building for each item.

**NOTE:** All frames abutting masonry shall be completely filled with mortar.

### **Workmanship**

After installation, demonstrate to the Engineer that all components are in proper working order.

## **ROOFING**

Roofing components shall be as shown on the Plans.

### **General**

## **PAINTING**

### **Scope**

Work under this heading includes the painting and finishing work in accordance with the Plans and Specifications substantially as follows:

1. Painting of all new wood work.
2. Painting of all exposed steel items on exterior of building.
3. Painting of all exposed to view in interior of building, steel items such as metal door frames, metal doors, steel beams, columns, angles, headers, etc.
4. Painting of all exposed concrete block on interior of building.
5. Painting of all piping, valves, fittings, including all above the floor parts of the pump not having a factory applied finish.
6. Painting of items installed by Electrical Contractor and exposed to view such as: conduit and fittings and panelboards, etc. having only factory applied prime coat.

### **General Notes:**

1. Include all field painting necessary to complete work shown and specified.
2. Prime coats specified herein will not be required on items delivered with prime or shop coats already applied.
3. Field painting will not be required on items specified to be completely furnished at factory or on structural or miscellaneous steel items that will not be exposed to view in the completed structure.

### **Priming and Back-Priming**

Prime and back-prime all surfaces of millwork indicated to be varnished, also back-prime all unexposed faces of all millwork indicated, scheduled or specified to be stained. Parts inaccessible after assembly shall be primed or back-primed before assembly. Shellac all knots, streaks, etc., before priming. Do all priming and back-priming with approved primers. Priming colors as Engineer directs. Materials delivered at job without priming, back-priming and/or shop coats are not acceptable and will be rejected. Keep in contact with job; cooperate with Carpentry and Millwork Contractor.

### **Cleaning**

1. The Contractor shall be responsible for marring, spotting and/or staining of floors or other work and shall either entirely remove said stains, etc., or replace damaged materials with approved materials and make good any damage to other work in connection with said removal and replacement at this expense without extra cost to Owner.

### **Preparation**

1. Wood – Sandpaper to smooth and even surface and then dust off. After priming or stain coat has been applied, thoroughly fill nail and other holes and cracks; use plastic wood filler for stained work and putty for painted work.
2. Steel and Iron – Remove grease, rust scale and dust and touch up any chipped or abraided placed on items that have been shop coated.
3. Galvanized Metal – Thoroughly clean with gasoline and coat as specified.
4. Concrete Block – Remove all foreign material and wipe clean.
5. General – Before painting, remove hardware, accessories, plates, lighting fixtures and similar items or provide ample protection of such items. Upon completion of each space, replace above items. Remove doors if necessary to paint bottom edge. Use only skilled mechanics for removing and connecting above items.

### **Colors**

The Owner or Engineer will select all colors.

### **Paint Material**

All materials used under this heading shall be as manufactured by the O'Brien Paint Company, Glidden Company, Sherwin-Williams, Benjamin Moore, Pittsburgh Paint, Pratt & Lambert, National Chemical Manufacturing Company, or an approved equal.

All paint shall be ready-mixed and delivered to the site in manufacturer's sealed containers. Each container shall be labeled by the manufacturer. Labels shall give manufacturer's name, type of paint, color of paint and instructions for reducing. Thinning shall be done only in accordance with directions of manufacturer. Job mixing or job tinting may be done when approved by the Engineer.

All mixing required shall be done on premises and materials shall be thoroughly stirred. No materials shall be reduced or changed in any way, except as specified.

### **Schedule of Paint**

The kind and number of coats required on the various surfaces shall be as follows:

1. Exterior Exposed Steel

First Coat – Approved rust inhibitive paint  
Second Coat – Approved Alkyd Semi Gloss Enamel  
Third Coat – Approved Alkyd Semi Gloss Enamel

Use this finish on all new exposed steel work such as pipe railings, exposed surfaces of steel angle lintels, hollow metal doors and frame.

### **Backfilling of Structures**

Prior to any backfilling around poured-in-place structures, adequate provisions shall be made to prevent any displacement of the walls, footings, or other elements of the structures, and the Engineer shall inspect the structure and approve the placing of the backfill. All footings, foundations, below ground drainage systems, all concrete and masonry walls, all waterproofing, damp-proofing, or surface treatment of the walls shall be complete. The backfill shall not be placed for one (1) week against poured walls, or at such lesser or longer time as directed by the Engineer in writing.

Unstable materials such as frozen earth, clay lumps, and other materials which will not compact properly, and foreign material such as wood, rock, broken masonry, brick, old concrete, metal, stones, etc. shall not be used in the backfill, or for fill around the site.

Backfilling around foundations, footings and pipes shall be done with acceptable granular material, and in eight (8) inch layers, each compacted to a 95% maximum density by approved tamping or vibrating equipment prior to the placing of the following layer of material.

During backfilling operations the material shall not be dropped on the pipe or on or against the structure walls, and during the compacting process the Contractor shall be careful that the new work is not displaced during the operation.

The Contractor shall remove all excess or surplus material from the site after completion of the project.

### **Compaction and Tests**

Compaction to 95% maximum density is a requirement for all backfill in excavations which will support floor slabs, foundations, footings, etc., and in trenches which will support pavements, slabs, foundations, etc. the 95% maximum density shall be determined by ASTM D698 of the latest issue, based on the moisture-density of soils, Method C, using a 5.5 pound rammer and a 12-inch drop.

An approved testing laboratory shall make the density-compaction tests with results sent directly to the Engineer.

Two tests will be required for each structure and two tests will be required for every 400 feet of trench, unless otherwise ordered by the Engineer.

## **WORK ITEM W-2 – INTAKE STRUCTURE AND CATWALK**

### **DESCRIPTION**

The Contractor shall furnish all necessary equipment, labor and materials to construct the Intake Structure with catwalk as shown on the project drawings. The work shall include the concrete foundation slab, catwalk with support, metal frame and screen, piping, valves, fittings, piping screen, appurtenances and all other work required to complete the work as shown on the project plans.

### **MATERIALS**

All materials shall conform to current codes.

Refer to Plans and Work Item W-1 Pump Well House for concrete and cement reinforcing steel requirements. Refer to Plans for structural steel requirements.

### **CONSTRUCTION REQUIREMENTS**

All equipment, construction methods and materials shall conform to the current and applicable provisions of local, State and National Codes, and as detailed in the design drawings.

**APPENDIX A**  
**ORTMAN DRILLING**  
**TEST BORING AND SIEVE ANALYSIS REPORT**



**RTMAN**  
**Drilling & Water Services**

Research - Design - Construction - Maintenance  
 241 N. 300 W. • Kokomo, IN 46901 • 705-459-4125 FAX 705-469-0760

June 20, 2014

PB13066

Dennis Zebell, PE  
 Lawson-Fisher Associates  
 525 West Washington Avenue  
 South Bend, IN 46601

Re: DNR - Fawn River Fish Hatchery  
 Test Boring and Sieve Analysis

Dennis,

Ortman Drilling & Water Services is pleased to provide you with this report on the recently completed test boring and sieve analysis from Fawn River Hatchery.

The attached well log shows formation available from 60-99 feet below grade. This material is coarse, with some fines, but sufficient for construction of a well with the following basic design:

Total depth	97'
Total screen length	20'
Well & screen diameter	12"
Well screen slot size	0.080" (80 thousandths) assuming wire wound stainless steel screen
Potential production capacity	650gpm (assuming approx. 50% plugging of screen by fines)

Based on the construction of the existing well on the west side of SR327 the 100year flood elevation will need to be considered for final elevation and design of the well head.

Pump system design will require a flow test on a completed test well. Test well may be constructed to permanent well specifications but based on the existing well and the formation, the design flow rate for bidding purposes may be based on 650gpm at a pumping level of 77' with design head calculated by Lawson Fisher at the well head for total head determination. Some variation in these numbers should be expected but this may serve as the basis for initial bid.

Sieve analysis and well log should be included with bid materials.

Location of the permanent well should be within approximately 5-10' of the test boring so that sieve analysis and depth estimates can be used in the bidding process. To move further from this test boring would require a second test boring to evaluate potential formation changes.

If you have any questions or need additional information, please call anytime.

Sincerely,

Ortman Drilling & Water Services

Phil Bonneau, L.P.G.  
 Hydrogeologist

**RECEIVED**

JUN 26 2014

LAWSON - FISHER ASSOCIATES, P.C.

PB13066



**RECORD OF WATER WELL**  
State Form 35680 (R5/9-04)

Driller - Mail complete record in 30 days to:  
**INDIANA DEPT. OF NATURAL RESOURCES**  
Division of Water  
402 W. Washington St./ Rm. W264  
Indianapolis, IN 46204-2644  
(877) 928-3748 (toll free) or (317) 232-4160

County Permit Number   
DNR Variance Number

Fill in completely

Include if applicable

<b>WELL LOCATION</b>	
County where drilled <b>Steuben</b>	City/Township name <b>Millgrove</b>
Township number (N-S) <b>38n</b>	Range number (E-W) <b>12e</b>
Section <b>20</b>	
Drilling direction to the well location (including origin, street & road names, intersecting roads, and compass directions) Show well address and subdivision in box at lower right. <b>Approx 1181 ft. south of co. rd 700 n. on east side of St.Rd. 327. (about 60 ft. south of drive and 75 ft. east of st.rd. 327)</b>	
UTM Northing <b>4622578</b>	
UTM Easting <b>652070</b>	
Datum <input checked="" type="checkbox"/> NAD 27 <input type="checkbox"/> NAD 83	
<input type="checkbox"/> GPS used	
Subdivision name & lot number (if applicable)	

If drilled for water supply, this well is:  first well on property  Replacement well  Additional well on property  Dry hole

**OWNER-ADDITIONAL INFORMATION**

**Owner-Fawn River**

Building contractor-name	Address (number and street, city, state, ZIP code)	Telephone Number
Drilling contractor-name	Address (number and street, city, state, ZIP code)	Telephone number
<b>Ortman Drilling</b>	<b>241 N. 300 W. Kokomo, Indiana 46901</b>	<b>765-459-4125</b>
Equipment operator-name	License number	Date of well completion
<b>Clint Barker-Rick Ortman-Brad Hodges</b>	<b>1964-330</b>	<b>6/11/2014</b>

**CONSTRUCTION DETAILS**

Use of well <input type="checkbox"/> Home <input type="checkbox"/> Public supply <input type="checkbox"/> Industrial / commercial <input checked="" type="checkbox"/> Livestock <input type="checkbox"/> Irrigation <input type="checkbox"/> Monitoring / environ. <input checked="" type="checkbox"/> Test boring <input type="checkbox"/> other	Drilling method <input checked="" type="checkbox"/> Rotary <input type="checkbox"/> Reverse rotary <input type="checkbox"/> Cable tool <input type="checkbox"/> Jet <input type="checkbox"/> Bucket / bore Auger (including HAS) <input type="checkbox"/> Direct push <input type="checkbox"/> Other:	Type of pump Submersible <input type="checkbox"/> Shallow-well jet <input type="checkbox"/> Deep-well jet <input type="checkbox"/> No pump installed Other: _____ Pump depth setting (feet)	FORMATIONS: Type of material		From (feet)	To (feet)
			fine to coarse sand and gravel and cobbles	0	49	
		gray clay	49	60		
		fine to coarse sand and gravel and cobbles	60	99		
		brown clay	99	122		
Total depth of well (feet) <b>122</b>	Borehole diameter (in.) <b>6 1/4</b>	Gravel pack inserted <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
Casing length (feet) <b>n/a</b>	Casing diameter (in.) <b>n/a</b>	Casing material <b>PVC</b>				
Screen length (feet) <b>n/a</b>	Screen diameter (in.) <b>n/a</b>	Screen material <b>PVC</b>				
Screen slot size <b>n/a</b>	Water quality (clear, odor, etc.) <b>n/a</b>					

Test method <input type="checkbox"/> Air <input checked="" type="checkbox"/> Bailing.	Static level below surface <b>n/a</b>	Gallons per min. <b>n/a</b>	Hours tested <b>n/a</b>	Drawdown (change in level) feet
				<b>used 9 bags drilling mud and 2000 gal. water</b>

<b>ABANDONMENT</b>			
Grout material	Grout depth from to	Material <b>Ben-seal</b>	Depth filled from to <b>122</b>
Installation method	No. of bags used	Installation method <b>Pumped with tremie</b>	quantity <b>11</b>

I hereby swear or affirm, under the penalties for perjury, that the information submitted herewith is, to the best of my knowledge and belief, true, accurate, and complete.

Signature of drilling contractor or authorized representative: **bobroberts**

MUST BE SIGNED OR STAMPED:

Date: **6/13/2014**

Ortman Drilling & Water Services  
 241 North 300 West  
 Kokomo, Indiana 46901  
 (765) 459-4125

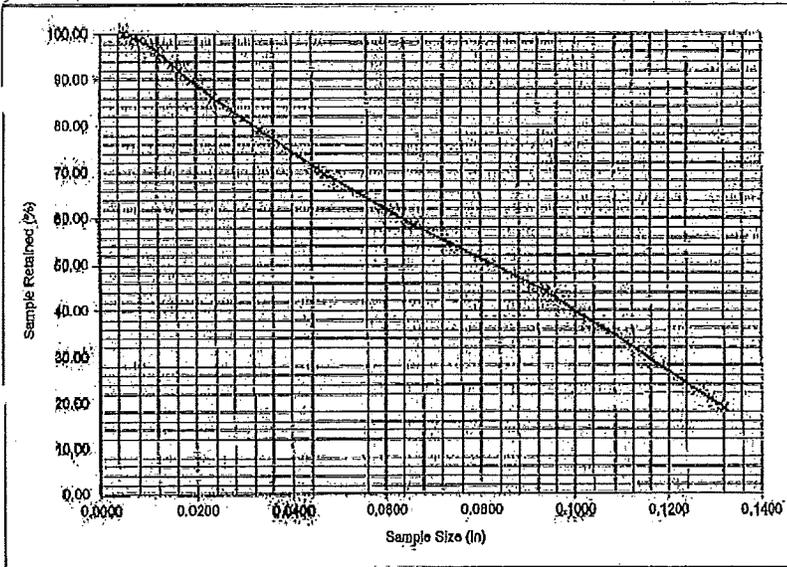


Well: P-1000  
 Location: Fawn River Fish Hatchery  
 Date sieved: 01/20/14  
 By: TBR

Sieved Interval (feet): 60-67

Sieve No. (U.S.A.S.E.)	Mesh Size (inches)	Sample Retained (grams per sieve)	Sample Retained (% per sieve)	Sample Retained (cumulative %)
4	0.1875	40.0		
6	0.2500	190.0	18.89	18.89
8	0.0937	254.0	25.25	44.14
12	0.0661	145.0	14.31	58.45
18	0.0488	112.0	11.13	69.58
24	0.0331	97.0	9.64	79.22
30	0.0234	70.0	6.88	86.10
40	0.0165	58.0	5.77	91.87
60	0.0117	43.0	4.27	96.14
75	0.0083	24.0	2.39	98.53
80	0.0075	6.0	0.60	99.13
100	0.0060	0.0	0.00	100.00

Total Sample Processed (g/475) 1000



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 241 North 300 West  
 Kokomo, Indiana 46901  
 (765) 459-4125

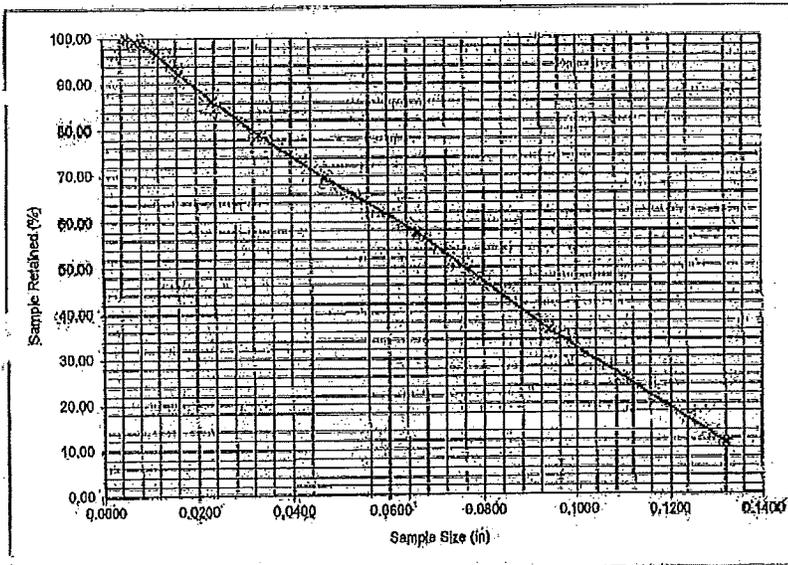


Well: H-11004  
 Location: Fava River Fish Hatchery  
 Date sieved: 01/27/04  
 By: TAP

Sieved Interval (feet): 97-72

Blaze No. (U.S.A.S.E.)	Mesh Size (inches)	Sample Retained (grams per sieve)	Sample Retained (% per sieve)	Sample Retained (cumulative %)
4	0.1875	43.0		
6	0.1328	116.0	11.28	11.28
8	0.0937	256.0	24.90	36.19
12	0.0661	220.0	21.40	57.59
18	0.0469	123.0	11.86	69.45
20	0.0331	97.0	9.44	78.89
30	0.0294	76.0	7.39	86.28
40	0.0195	60.0	5.84	92.12
60	0.0117	45.0	4.38	96.50
70	0.0083	25.0	2.43	98.93
80	0.007	6.0	0.58	99.51
100	0.0050	7.0	0.68	100.00

Total Sample Processed (grams) 1028



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 241 North 300 West  
 Kokomo, Indiana 46901  
 (765) 459-4125

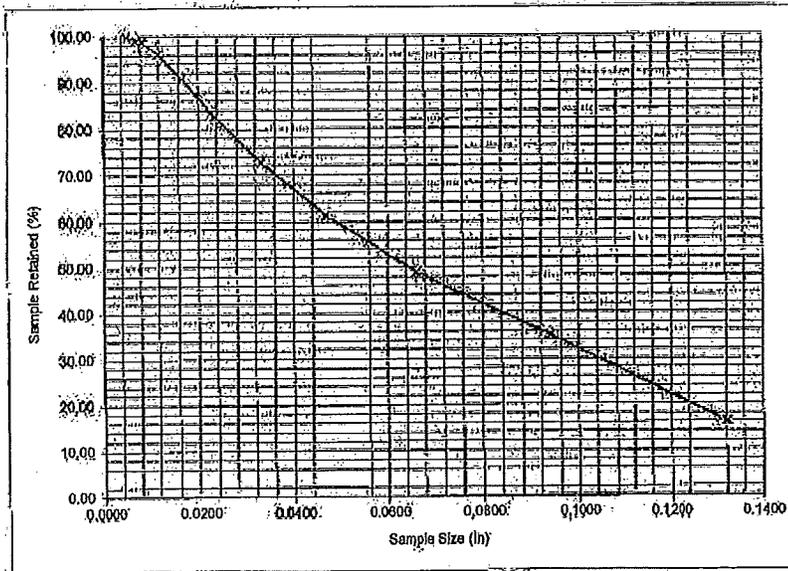


Well: 05130681  
 Location: Fawn River Fish Hatchery  
 Date sieved: 5/11/04  
 By: TEB

Sieved Interval (feet): 72-77

Sieve No. (U.S.A.S.E.)	Mesh Size (Inches)	Sample Retained (grams per sieve)	Sample Retained (% per sieve)	Sample Retained (cumulative %)
4	0.1875	63.0		
6	0.1320	184.0	18.11	18.11
8	0.0937	194.0	19.06	35.17
12	0.0681	140.0	13.75	48.92
16	0.0489	128.0	12.35	61.30
20	0.0331	117.0	11.49	72.79
28	0.0234	101.0	9.92	82.71
40	0.0185	84.0	8.25	90.96
60	0.0117	54.0	5.30	96.27
70	0.0083	27.0	2.65	98.92
80	0.007	3.0	0.29	99.21
100	0.0050	0.0	0.79	100.00

Total Sample Processed (grams) 1000



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 241 North 300 West  
 Kokomo, Indiana 46901  
 (765) 459-4125

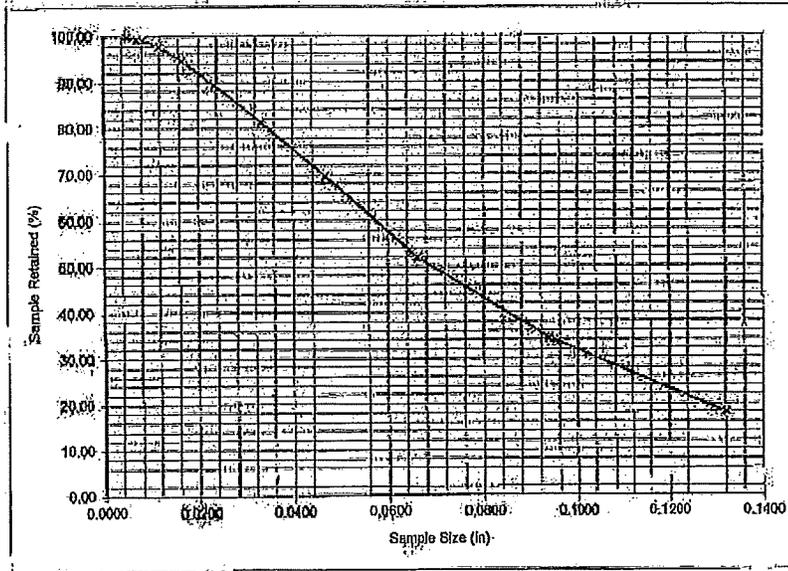


Well: P&H006  
 Location: Fawn River Fish Hatchery  
 Date sieved: 6/17/04  
 By: [Signature]

Sieved Interval (feet): 77-72

Sieve No. (U.S.A.S.E.)	Mesh Size (Inches)	Sample Retained (grams per sieve)	Sample Retained (% per sieve)	Sample Retained (cumulative %)
4	0.1875	273.0		
6	0.1320	140.0	18.09	18.09
8	0.0937	128.0	16.28	34.37
12	0.0661	138.0	17.67	51.94
16	0.0469	137.0	17.70	69.64
20	0.0333	80.0	11.83	81.27
30	0.0234	83.0	8.14	89.41
40	0.0165	41.0	5.39	94.70
50	0.0117	24.0	3.18	97.80
70	0.0083	11.0	1.42	99.22
80	0.007	1.0	0.13	99.35
100	0.0050	0.0	0.00	100.00

Total Sample Processed (grams): 774



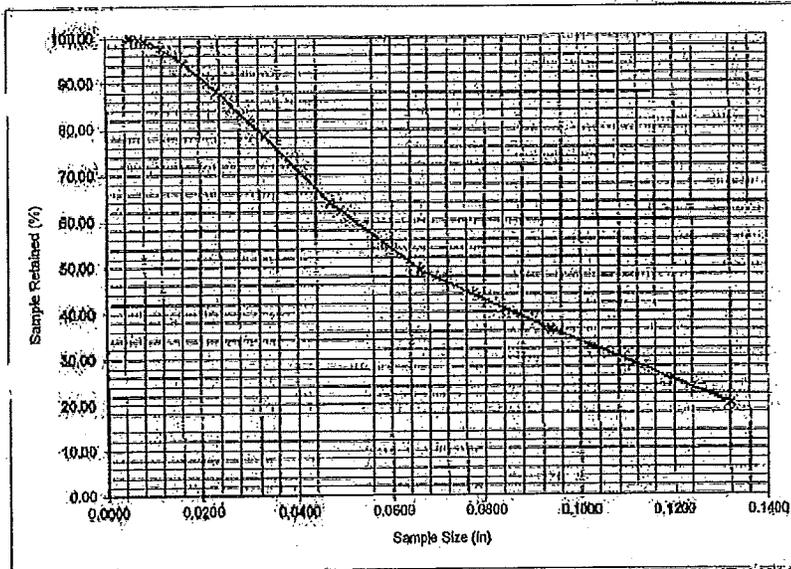
Ortman Drilling & Water Services  
 241 North 300 West  
 Kokomo, Indiana 46901  
 (765) 459-4125

Well: P813086  
 Location: Fawn River Fish Hatchery  
 Date sieved: 6/17/2014  
 By: TBB

Sieved Interval (feet): 82-87

Sieve No. (U.S.A.S.E.)	MESH SIZE (Inches)	Sample Retained (grams per sieve)	Sample Retained (% per sieve)	Sample Retained (Cumulative %)
4	0.1875	130.0		
6	0.1320	180.0	49.98	19.98
8	0.0937	155.0	16.30	36.28
12	0.0661	124.0	13.04	49.32
16	0.0469	140.0	14.72	64.04
20	0.0331	138.0	14.51	78.55
25	0.0224	93.0	9.78	88.33
30	0.0165	59.0	8.10	94.43
40	0.0117	31.0	3.26	97.69
50	0.0083	15.0	1.58	99.26
60	0.007	2.0	0.21	99.47
80	0.0050	5.0	0.53	100.00

Total Sample Processed (grams): 951



Oriman Drilling & Water Services  
 241 North 300 West  
 Kokomo, Indiana 46801  
 (765) 488-4125

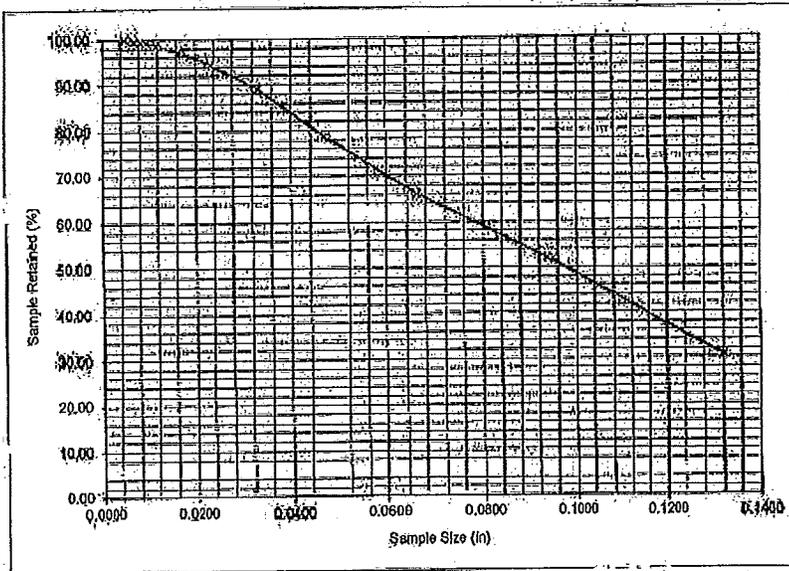


Well:  
 Location:  
 Date sieved:  
 By:

PD306  
 Fawn Run Fish Hatchery  
 6/7/2014  
 JAL

Sieved Interval (feet): 6Y-02

Sieve No. (U.S.A.S.E.)	Mesh Size (Inches)	Sample Retained (grams per sieve)	Sample Retained (% per sieve)	Sample Retained (cumulative %)
4	0.1875	281.0		
5	0.1320	247.0	30.88	30.88
8	0.0937	172.0	21.37	52.05
12	0.0691	113.0	14.04	66.09
16	0.0499	102.0	12.87	78.78
20	0.0331	85.0	10.31	89.07
25	0.0234	43.0	5.34	94.41
30	0.0165	22.0	2.73	97.14
40	0.0117	12.0	1.49	98.63
50	0.0083	6.0	0.76	99.39
60	0.007	1.0	0.12	99.50
80	0.0050	4.0	0.50	100.00
Total Sample Processed (grams)		308		



Ortman Drilling & Water Services  
 241 North 300 West  
 Kokomo, Indiana 46901  
 (765) 459-4125

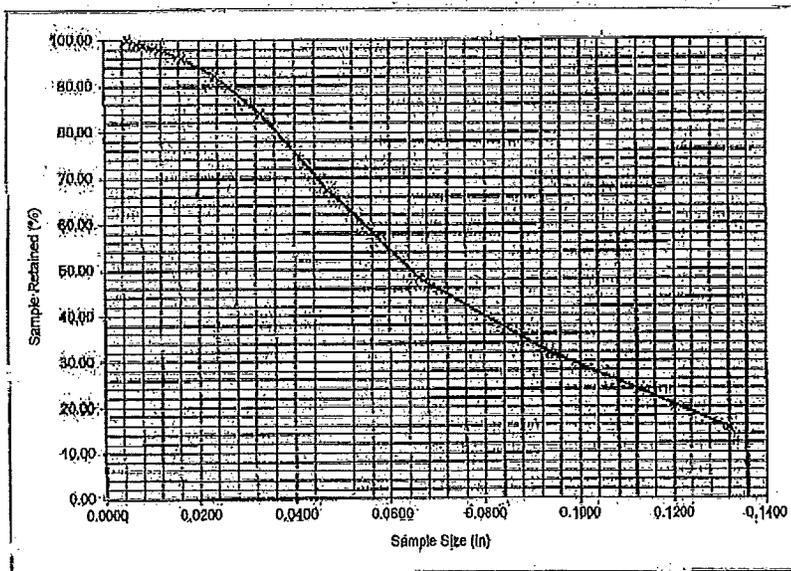


Well: 21394  
 Location: Fawn River Fish Hatchery  
 Date sieved: 8/17/04  
 By: JBB

Sieved Interval (feet): 92-99

Sieve No. (U.S.A.S.E.)	Sieve Size (inches)	Sample Retained (grams per sieve)	Sample Retained (% per sieve)	Sample Retained (cumulative %)
4	0.4250	98.0		
8	0.1875	122.0	15.40	15.40
16	0.0937	130.0	16.41	31.82
30	0.0625	130.0	16.41	48.23
40	0.0476	152.0	19.19	67.42
60	0.0331	131.0	16.54	83.96
80	0.0250	65.0	8.21	92.17
100	0.0165	30.0	3.79	95.96
150	0.0117	15.0	1.89	97.85
200	0.0083	6.0	0.76	98.61
250	0.007	2.0	0.25	98.86
300	0.0050	7.0	0.88	99.74

Total Sample Processed (grams): 792



***APPENDIX C***

***PERMITS***

STATE OF INDIANA  
DEPARTMENT OF NATURAL RESOURCES

CERTIFICATE OF APPROVAL  
CONSTRUCTION IN A FLOODWAY

MAILED: August 31, 2015

APPLICATION # : FW-28040

STREAM : Fawn River

APPLICANT : Indiana Department Natural Resources  
Michael Mathias, PE  
Division of Engineering  
402 West Washington Street, Room W299  
Indianapolis, IN 46204

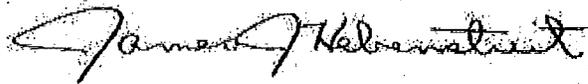
AGENT : Lawson-Fisher Associates PC  
Christopher J Jeter, PE  
525 West Washington Avenue  
South Bend, IN 46601-0000

AUTHORITY : IC 14-28-1 with 312 IAC 10

DESCRIPTION : To accommodate a new water supply system for the Fawn River Fish Hatchery, new water supply lines, a new water supply intake structure pipe, and a 4" diameter outfall structure will be installed. The ground elevations will be returned to existing grade after construction. In addition, a new 11'-4" by 13'-4" pump building will be constructed to house a new water supply pump. The existing water supply system will be abandoned via installation of a 12" ductile iron cap. Details of the project are contained in information and plans received at the Division of Water on July 6, 2015 and August 11, 2015.

LOCATION : DOWNSTREAM: At the Fawn River Fish Hatchery, extending immediately upstream and downstream of the State Road 327 stream crossing near Orland, Millgrove Township, Steuben County  
Section 20, T 38N, R 12E, Orland Quadr angle  
UTM Coordinates: Downstream 4622669 North, 651741 East  
UPSTREAM:  
UTM Coordinates: Upstream 4622568 North, 652106 East

APPROVED BY :



James J. Hebenstreit, PE, Assistant Director  
Division of Water

APPROVED ON : August 31, 2015

Included: Notice Of Right To Administrative Review - General Conditions - Special Conditions - Service List

STATE OF INDIANA  
DEPARTMENT OF NATURAL RESOURCES

**NOTICE OF RIGHT TO ADMINISTRATIVE REVIEW**

**APPLICATION #: FW- 28040**

This signed document constitutes the issuance of a permit by the Department of Natural Resources, subject to the conditions and limitations stated on the pages entitled "General Conditions" and "Special Conditions".

The permit or any of the conditions or limitations which it contains may be appealed by applying for administrative review. Such review is governed by the Administrative Orders and Procedures Act, IC 4-21.5, and the Department's rules pertaining to adjudicative proceedings, 312 IAC 3-1.

In order to obtain a review, a written petition must be filed with the Division of Hearings within 18 days of the mailing date of this notice. The petition should be addressed to:

Director  
Division of Hearings  
Indiana Government Center North, Room N501A  
100 North Senate Avenue  
Indianapolis, Indiana 46204

The petition must contain specific reasons for the appeal and indicate the portion or portions of the permit to which the appeal pertains.

If an appeal is filed, the final agency determination will be made by the Natural Resources Commission following a legal proceeding conducted before an Administrative Law Judge. The Department of Natural Resources will be represented by legal counsel.

STATE OF INDIANA  
DEPARTMENT OF NATURAL RESOURCES

GENERAL CONDITIONS

APPLICATION #: FW- 28040

- (1) If any archaeological artifacts or human remains are uncovered during construction, federal law and regulations (16 USC 470, et seq.; 36 CFR 800.11, et al) and State Law (IC 14-21-1) require that work must stop and that the discovery must be reported to the Division of Historic Preservation and Archaeology within 2 business days.

Division of Historic Preservation and Archaeology  
Room W274  
402 West Washington Street  
Indianapolis, IN 46204

Telephone: (317) 232-1646, FAX: (317) 232-8036

- (2) This permit must be posted and maintained at the project site until the project is completed.
- (3) This permit does not relieve the permittee of the responsibility for obtaining additional permits, approvals, easements, etc. as required by other federal, state, or local regulatory agencies. These agencies include, but are not limited to:

<u>Agency</u>	<u>Telephone Number</u>
St. Joseph River Basin Commission	(260) 668-1000
Steuben County Drainage Board	(574) 252-1952
US Army Corps of Engineers	(317) 233-8488 or (800) 451-6027
Indiana Department of Environmental Management	
Local city or county planning or zoning commission	

- (4) This permit must not be construed as a waiver of any local ordinance or other state or federal law.
- (5) This permit does not relieve the permittee of any liability for the effects which the project may have upon the safety of the life or property of others.
- (6) This permit may be revoked by the Department of Natural Resources for violation of any condition, limitation or applicable statute or rule.
- (7) This permit shall not be assignable or transferable without the prior written approval of the Department of Natural Resources. To initiate a transfer contact:

Mr. Michael W. Neyer, PE, Director  
Division of Water  
Room W264  
402 West Washington Street  
Indianapolis, IN 46204

Telephone: (317) 232-4160, Toll Free: (877) 928-3755  
FAX: (317) 233-4579

- (8) The Department of Natural Resources shall have the right to enter upon the site of the permitted activity for the purpose of inspecting the authorized work,
- (9) The receipt and acceptance of this permit by the applicant or authorized agent shall be considered as acceptance of the conditions and limitations stated on the pages entitled "General Conditions" and "Special Conditions".

STATE OF INDIANA  
DEPARTMENT OF NATURAL RESOURCES

**SPECIAL CONDITIONS**

APPLICATION #: FW- 28040

**PERMIT VALIDITY** : This permit is valid for 24 months from the "Approved On" date shown on the first page. If construction work in the floodway has not been completed by August 31, 2017 the permit will become void. This permit may be renewed one (1) time for a period not to exceed two (2) additional years only if a written request for the two (2) year permit renewal is received by DNR, Division of Water prior to August 31, 2017. Thereafter the permit will become void and a new permit will be required in order to continue work on the project.

This permit becomes effective 18 days after the "MAILED" date shown on the first page. If both a petition for review and a petition for a stay of effectiveness are filed before this permit becomes effective, any part of the permit that is within the scope of the petition for stay is stayed for an additional 15 days.

**CONFORMANCE** : Other than those measures necessary to satisfy the "General Conditions" and "Special Conditions", the project must conform to the information received by the Department of Natural Resources on: July 6, 2015 and August 11, 2015. Any deviation from the information must receive the prior written approval of the Department.

<u>Number</u>	<u>Special Condition</u>
(1)	revegetate all bare and disturbed areas with a mixture of grasses (excluding all varieties of tall fescue) and legumes as soon as possible upon completion; low endophyte tall fescue may be used in the ditch bottom and side slopes only
(2)	all excavated material must be properly spread or completely removed from the project site such that erosion and off-site sedimentation of the material is prevented
(3)	minimize the movement of resuspended bottom sediment from the immediate project area
(4)	appropriately designed measures for controlling erosion and sediment must be implemented to prevent sediment from entering the stream or leaving the construction site; maintain these measures until construction is complete and all disturbed areas are stabilized
(5)	inspect structural erosion and sediment control practices daily and repair as necessary until all construction is complete and disturbed areas are permanently stabilized
(6)	install erosion control measures such as silt fence or other appropriate devices around directional drilling pits in order to prevent drilling mud from leaving the immediate area of the pit or entering the stream
(7)	except for the material used as backfill as shown on the above referenced project plans on file at the Division of Water, place all excavated material landward of the floodway *
(8)	do not leave felled trees, brush, or other debris in the floodway *
(9)	the outfall structure must conform to the bank
(10)	backfill all trenches and/or bore pits to existing ground elevations
(11)	upon completion of the project, remove all construction debris from the floodway *

STATE OF INDIANA  
DEPARTMENT OF NATURAL RESOURCES

**SPECIAL CONDITIONS**

**APPLICATION #: FW- 28040**

- (12) the well and pumping equipment must be installed by a water well driller and water well pump installer, respectively, that are licensed in the State of Indiana and the well and pumping equipment must be constructed in accordance with IC 25-39 and Rule 312 IAC 13
- (13) contact the Division of Water at (317) 232-4160 or toll free at (877) 928-3755, if the project involves any water withdrawals (including permanent and/or temporary dewatering) having an aggregate withdrawal capacity of 70 gpm or more
- (14) \* Note: for regulatory purposes, the floodway is defined as the area inundated by the base flood as shown on Panel 110 of the Steuben County Flood Insurance Rate Map dated December 17, 2013

STATE OF INDIANA  
DEPARTMENT OF NATURAL RESOURCES

SERVICE LIST

APPLICATION #: FW- 28040

Indiana Department Natural Resources  
Michael Mathias, PE  
Division of Engineering  
402 West Washington Street, Room W299  
Indianapolis, IN 46204

Lawson-Fisher Associates PC  
Christopher J Jeter, PE  
525 West Washington Avenue  
South Bend, IN 46601-0000

Mr. Jack E Carpenter  
3460 North 1100 East  
Howe, IN 46746

Dale E Croghan  
6570 North State Road 327  
Orland, IN 46776

Ms. Rhonda Engle  
9487 West State Road 120  
PO Box 445  
Orland, IN 46776

Ideale and Sonya Gambera  
130 Greenwood Avenue  
San Rafael, CA 94901

Angela A Hochstetter  
11585 East 565 North  
Orland, IN 46776

Indiana Department of Natural Resources  
Division of Law Enforcement  
District 2 Headquarters  
1353 South Governors Drive  
Columbia City, IN 46725

Mark Larimer  
6825 North 375 East  
Howe, IN 46746

Eric C and Brenda J Lewis  
7606 South Nelson Road  
Chase, MI 49623

Lords Inc  
3420 East 700 North  
Howe, IN 46746

Gregory E Parr  
6885 North State Road 327  
Orland, IN 46776

Jackson and Nancy Sperry  
6865 North State Road 327  
Orland, IN 46776

St. Joseph River Basin Commission  
227 West Jefferson Boulevard, #1120  
South Bend, IN 46601-1830

Steuben County Drainage Board  
County Surveyor  
317 South Wayne Street, Suite 3K  
Angola, IN 46703-1958

Steuben County Lakes Council Inc  
Sue Myers  
317 South Wayne Street, Suite 2A  
Angola, IN 46703

Steuben County Plan Commission  
Frank Charlton  
317 South Wayne Street, Suite 3 L  
Angola, IN 46703-1966

Steuben County SWCD  
Janel Meyer  
Peachtree Plaza 200  
1220 North 200 West  
Angola, IN 46703

John and Amber Kathleen Storer  
495 North Washington Avenue  
Titusville, FL 32796-2802

US Army Corps of Engineers  
Detroit District, Michiana Branch  
2422 Viridian Drive, Suite 200  
South Bend, IN 46628

Staff Assignment:

Administrative  
Technical  
Environmental  
Fish and Wildlife

: Larissa Muellner, CFM  
: Larissa Muellner, CFM  
: J. Matthew Buffington  
: Nathan D. Thomas



**RIGHT OF WAY PERMIT**

State Form 41769 (R5 / 3-00)

Approved by State Board of Accounts, 2000

Approved by Auditor of State, 2000

**STATE OF INDIANA  
INDIANA DEPARTMENT OF TRANSPORTATION**

<b>Type of Permit:</b>		
<input checked="" type="checkbox"/> Excavation	<input type="checkbox"/> Pole Line	<input type="checkbox"/> Bridge Attachment
<input type="checkbox"/> Miscellaneous		
District <b>Fort Wayne</b>	Subdistrict <b>Fort Wayne</b>	Telephone number <b>260-969-8265</b>
Project locations: <b>SR 327, 0.68 MILES NORTH OF SR 120, STEUBEN COUNTY</b>		Reference pt. number <b>30.56</b>
Project description: <b>INSTALLATION OF 8" WATER SUPPLY PIPE BY THE TRENCHLESS EXCAVATION/BORE AND JACK WITH AN 18" STEEL CASING PIPE FROM THE WEST SIDE TO THE EAST SIDE OF SR 327</b>		
Project purpose: <b>PURPOSE OF THE PROJECT TO INSTALL WATER SUPPLY PIPE FOR THE FAWN RIVER HATCHERY</b>		
Bond required: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If Yes, Penal Sum \$ ---	Bond number --
PERMIT FEE: (Make check or bank draft payable to "Indiana Department of Transportation") \$ <b>0</b>		
SPECIAL PROVISIONS: <b>SEE ATTACHED ADDITIONAL SPECIAL PROVISIONS</b>		
<p>THE APPLICANT AGREES TO INDEMNIFY, DEFEND, EXCULPATE, AND HOLD HARMLESS THE STATE OF INDIANA, ITS OFFICIALS AND EMPLOYEES FROM ANY LIABILITY DUE TO LOSS, DAMAGE, INJURIES, OR OTHER CASUALTIES OF WHATSOEVER KIND, OR BY WHOMSOEVER CAUSED, TO THE PERSON OR PROPERTY OF ANYONE ON OR OFF THE RIGHT-OF-WAY ARISING OUT OF, OR RESULTING FROM THE ISSUANCE OF THIS PERMIT OR THE WORK CONNECTED THEREWITH, OR FROM THE INSTALLATION, EXISTENCE, USE, MAINTENANCE, CONDITIONS, REPAIRS, ALTERATION, OR REMOVAL OF ANY EQUIPMENT OR MATERIAL, WHETHER DUE IN WHOLE OR IN PART TO THE NEGLIGENT ACTS OR OMISSIONS (1) OF THE STATE, ITS OFFICIALS, AGENTS, OR EMPLOYEES; OR (2) OF THE APPLICANT, HIS AGENTS, OR EMPLOYEES, OR OTHER PERSONS ENGAGED IN THE PERFORMANCE OF THE WORK, OR (3) THE JOINT NEGLIGENCE OF ANY OF THEM; INCLUDING ANY CLAIMS ARISING OUT OF THE WORKMEN'S COMPENSATION ACT OR ANY OTHER LAW, ORDINANCE, ORDER, OR DECREE. THE APPLICANT ALSO AGREES TO PAY ALL REASONABLE EXPENSES AND ATTORNEY'S FEES INCURRED BY OR IMPOSED ON THE STATE IN CONNECTION HEREWITH IN THE EVENT THAT THE APPLICANT SHALL DEFAULT UNDER THE PROVISIONS OF THIS PARAGRAPH.</p>		
Signature of permit applicant	Printed name of permit applicant <b>MICHAEL MATHIAS</b>	
Name of company organization <b>IDNR</b>	Telephone number <b>317-232-4155</b>	
Address (number and street, city, state, ZIP code) <b>402 WEST WASHINGTON ST ROOM W299 INDIANAPOLIS, IN 46204</b>		
Inspector <b>Mike Carrier</b>		
District Regulatory Supervisor <b>Jason Hanaway</b>		
District Director		

Application number  
**T0000092284**

Road number  
**SR-327**

County number  
**76**

Expiration date  
**7/31/2016**

Issue date  
**7/31/2015**

Permit number  
**M15F3CR0025**

Approved INDOT Permit Number **M15F3CR0025**

State of Indiana  
Department of Transportation  
**GENERAL PROVISIONS**

1. All work described in the permit shall be subject to the inspection of the Department of Transportation and the permittee shall adjust or stop operations upon direction of any police officer or Department of Transportation employee.
2. The permit may be rescinded at any time by the Department of Transportation at its discretion or for noncompliance with any and/or all provisions of said permit.
3. The permittee shall notify the Department of Transportation Subdistrict five (5) working days preceding the beginning of any work activity.
4. The permittee shall notify the Department of Transportation Subdistrict that the work is complete and this notice is to be provided within seven (7) days from completion of all work on this permit.
5. The permittee shall have the permit complete with drawings and special provisions in their possession during work operations and will show said permit on demand, to any police officer or authorized Department of Transportation employee.
6. The permittee shall pay the Department of Transportation for any inspection costs where it is necessary to assign a Department of Transportation employee to inspect the work. The permittee shall immediately reimburse the State upon receipt of an itemized statement.
7. The permit is valid through the stated expiration date. If work is not completed within the allotted time, the permit is automatically cancelled unless an extension is requested prior to the expiration date and said request is approved by the Department of Transportation. If a permit is cancelled, a new application must be submitted and approved before the proposed work can be accomplished.
8. The permittee shall erect and maintain all necessary signs, barricades, detour signs, and warning devices required to safely direct traffic over or around the part of the highway where permitted operations are to be done so long as the work does not interfere with traffic, in accordance with Section "VI" of the Indiana Manual of Uniform Traffic Control Devices.
9. All construction and materials used within the highway right-of-way must conform to the current Department of Transportation "Standard Specifications" with the permittee being considered in the same status as the contractor.
10. The permitted operations shall not interfere with any existing structure on the Department of Transportation right-of-way without specific permission in writing from the Department of Transportation. In the event that any buildings, railings, traffic control devices, or other structures are damaged, said cost of the removal and/or damage shall be borne by the permittee.
11. This permit does not apply to any State roads or bridges that are closed for construction purposes, or to any county roads or city streets.
12. Approval of the permit application shall be subject to the permittee obtaining all necessary authorizations from local authorities and complying with all applicable laws. The issuance of the permit shall in no way imply Department of Transportation approval of, or be intended to influence any action pending before a local board, commission, or agency.
13. The permitted operations shall be allowed on state highway right-of-way only between sunrise and sunset and shall not be performed on Saturdays, Sundays, or during the period beginning at 12:00 Noon on the last weekday (Monday through Friday) preceding and continuing until Sunrise on the day following: New Years Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas.
14. In accordance with the notice requirements of Indiana Code 4-22-1-25, any objection to the conditions and provisions of an approved permit must be submitted in writing to the Department of Transportation within fifteen (15) days from the issue date.
15. The permittee does hereby agree that (1) no person on the ground of race, color, sex or national origin shall be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of its facilities, (2) that in the event facilities are constructed, maintained or otherwise operated on the said property described in this permit for a purpose for which a Department of Transportation program or activity is extended or for another purpose involving the provision of similar services or benefits, the permittee shall maintain and operate such facilities and services in compliance with all other

requirements imposed pursuant to Title 49, Code of federal Regulations, Department of Transportation, Subtitle A, Office of the secretary, part 21 Nondiscrimination in Federally-assisted programs of the Department of Transportation – Effectuation of title VI of the Civil Rights Act of 1964, and as said Regulations may be amended.

Approved INDOT Permit Number M15F3CR0025



RIGHT OF WAY PERMIT

ADDITIONAL SPECIAL PROVISIONS

STATE OF INDIANA  
INDIANA DEPARTMENT OF TRANSPORTATION

The attached Additional Special Provisions List is hereby incorporated into the permit and is fully binding upon the permittee.~

Application number  
T0000092284

Road number  
SR-327

County number  
76

Expiration date  
7/31/2016

Issue date  
7/31/2015

Permit number  
M15F3CR0025

Approved INDOT Permit Number M15F3CR0025



**RIGHT-OF-WAY PERMIT  
SPECIAL PROVISIONS**

State Form 3321 (R6 / 11-11)

STATE OF INDIANA  
INDIANA DEPARTMENT OF TRANSPORTATION

1. All existing utilities and other underground facilities such as traffic signal appurtenances must be located prior to commencing excavation.
2. The permittee shall not disturb nor manipulate any existing traffic control devices. Any damages to a traffic control device shall be repaired immediately at the permittee's expense by a State prequalified contractor. Contact the Signal Technician at the appropriate District Office (see telephone numbers on page 3) five days prior to doing work in the right-of-way that will affect any existing traffic control devices.
3. All cuts and trenches in and across the right-of-way of the Interstate, Federal, or State Highway shall be made by the permittee. After the work of installation of the project, the permittee shall restore all pavement surfaces and right-of-way according to requirements and specification and have it inspected by the Department of Transportation.
4. If private drives or commercial drives with a paved surface are to be open cut, a letter of approval must be obtained from the drive owner.

**5. Pavement Removal**

- a. Bituminous Pavement – The trench or area to be removed shall be sawed to a minimum depth of 2 inches. Breakage shall be confined to required lines. The edge of the area after removal shall be such that the maximum variation from the vertical will not exceed 1 ½ inches. In trimming and straightening these edges it may be necessary to use hand methods. Methods and equipment used in cutting, breaking, and removal shall not cause undue breakage, excessive shattering or spalling of the bituminous pavement to be left in place.
- b. Concrete Pavement – The trench or area to be removed shall be sawed to the bottom of the steel mesh with a minimum depth of 2 inches. Breakage shall be confined to required lines. The edge of the area after removal shall be such that the maximum variation from the vertical will not exceed 1 ½ inches. In trimming and straightening these edges it may be necessary to use hand methods. Methods and equipment used in cutting, breaking, and removal shall not cause undue breakage, excessive shattering or spalling of the concrete to be left in place and shall be such that will prevent excessive vibration and shock from being transmitted along reinforcing steel to the adjacent pavement.

**6. Pavement Replacement**

A "T" section should be used to bridge excavated areas to alleviate future settlement.

- a. Bituminous Pavement – Pavement replacement shall not be less than 12 inches of bituminous base mixture, thoroughly compacted in lifts of not more than 3 inches and a top lift of 1 inch shall be bituminous surface mixture properly compacted. All exposed bituminous edges shall be treated with bituminous tack. A "Wacker Rammer" compactor or equivalent shall be used for compacting the bituminous mixtures. The surface course shall meet Department of Transportation specifications for smoothness.
- b. Concrete Pavement – The depth of the concrete pavement shall be the same as the removed pavement except it shall be a minimum of 9 inches. Anchor bolts shall be placed along all sides of the removed area. The spacing shall be 3 feet center to center on the transverse side and 5 feet center to center on the longitudinal side with a minimum of 2 anchor bolts on a side. The anchor bolts and steel reinforcing shall be the same type and shall be placed as specified in the Department of Transportation's Standard Sheets. The concrete used shall be high early strength as set out in the Indiana Standard Specifications, except test beams will not be required.

Application number T0000092284
Road number SR-327
County 76
Expiration date (month, day, year) 7/31/2016
Issue date (month, day, year) 7/31/2015
Permit number M15F3CR0025

Approved INDOT Permit Number M15F3CR0025

## SUB-GRADE

The sub-grade on which the concrete or bituminous mixture is to be placed shall be compacted thoroughly prior to the placing of the pavement.

7. All cuts in the pavement shall be opened to traffic at all times except when the permittee is working at the site. If the cut in the pavement cannot be completed in the working day, it shall be temporarily backfilled, with the top 3 inches consisting of a temporary bituminous mixture, or the cut can be covered with a steel plate of sufficient size and thickness to satisfactorily carry the traffic. The steel plate shall be properly fastened down so as not to create a hazard. A steel plate shall also be used to cover any concrete area during the curing period. All steel plates must be labeled for emergency notification. Utility company name and 24 hour notification telephone number shall be visible at all times.
8. a) All excavation from cuts in the pavement and shoulder area shall be removed from the right-of-way. The backfilling of this area shall be Compacted Aggregate Base or "B" Borrow. The compacted aggregate base or "B" Borrow shall extend beyond the shoulder line at a slope of 1 to 1. This backfill shall meet Department of Transportation Standard Specifications.  
  
b) Backfilling of all trenches outside of the shoulder lines on State Highway right-of-way shall be made with pit run sand and gravel mixture or with material acceptable to the Department of Transportation, except for the top 12 inches which must be filled with top soil and compacted. Grass seed and fertilizer shall then be placed on the top soil which has been prepared in accordance with Department of Transportation Specifications on seed bed preparation.
  1. When the trench is excavated or plowed in a lawn area that is mowed, the applicant shall replace all disturbed areas with sod. The sod shall be placed and maintained according to Department of Transportation Standards.
  2. Sod may be required at other areas where erosion may be a problem.
9. The permittee shall at all times protect the pavement surface and right-of-way from damage due to the use of heavy equipment, and shall provide and use approved pads, planks, or dirt cushion to protect against other damage. Immediately before any section of the highway is to be placed back in use for traffic, the permittee shall remove all excess dirt and sweep the pavement surface to eliminate unnecessary dust hazards.
10. The Permit Inspector in the local sub-district or district office shall be notified 24 hours in advance of the pouring of concrete or the placing of bituminous mixture. (See telephone numbers on page 2.)
11. Tunneling under Interstate, Federal, or State Highway pavements will be allowed when approved by the Department of Transportation. Pipe for such tunnels shall be approved pipe as specified on the plans, inserted in the tunnel lining and the excess space filled with concrete as specified in the plans. Tunneling methods, supports and operations shall be subject to the approval of the representative of the Department of Transportation assigned to inspect the work. Proper backfilling must be done around the tunnel lining in order to prevent any settling of the pavement and right-of-way.
12. The top elevation of all manholes shall be held to ground or road surface level.
13. The permittee shall be responsible for the proper replacement of any driveways, driveway pipes or sidewalks that are disturbed during the permit work.
14. Drainage on shoulders, ditches, or otherwise on the right-of-way shall not be obstructed. Appropriate control measures shall be followed to protect the right-of-way from erosion.
15. All permits shall conform to the current INDOT Utility Accommodation Policy.
16. Within seven (7) days after a new installation or repair to an existing installation is performed, all excess dirt or obstructions caused by the installation or repair must be removed and the area must be restored to a condition by the permittee so as not to interfere with mowing the highway right-of-way.
17. Upon completion of all pavement cuts and before the work crew leaves the work area, the permittee shall furnish and place the appropriate color spot on the existing road surface next to the side of cut nearest the edge of highway pavement.
18. The permittee agrees, as a condition of approval of this permit, to move or remove any structures installed under this permit, at the permittee's own expense should future traffic conditions or road improvement necessitate; or when

requested to do so by INDOT except for on the National System of Interstate and Defense Highways as outlined in the Indiana Code.

19. Work shall be performed in accordance with the attached plans.
20. If at any time in the future, this installation should become damaged due to normal maintenance or roadwork by INDOT, the permittee shall be responsible for all repairs, and cost of repairs that may arise from such damage.
21. Any poles installed under this permit, including brace poles and guy poles should be placed within 1 ½ feet of the right-of-way line. Exceptions to this placement policy will be granted only for special conditions and must be explained in the application.
22. Any pole line installed under this permit will comply with all regulations outlined in the National Electrical Safety Code, and any other handbook issued by the Department of Commerce Bureau of Standards, which refers to the installation and maintenance of communications lines.
23. No trees or plants on the right-of-way of any Interstate, Federal, or State Highway will be trimmed or removed without written permission from the Department of Transportation.
24. Work performed under this permit will not interfere in any way with any pole line or other existing structure along or across the Interstate, Federal, or State Highway.
25. Work within the sodded areas of the right-of-way is not to be performed during wet periods. Any damage to the sodded areas of the right-of-way must be repaired and properly seeded.
26. If traffic is to be stopped on the highway the applicant must notify the Indiana State Police for assistance in traffic control within five (5) days prior to construction. Traffic will not be stopped longer than five (5) minutes.

#### INDOT DISTRICT OFFICES

##### *Crawfordsville District*

41 W 300 North  
Crawfordsville, IN 47933  
(888) 882-8330

##### *Fort Wayne District*

5333 Hatfield Road  
Fort Wayne, IN 46808  
(260) 969-8254

##### *Greenfield District*

32 S Broadway  
Greenfield, IN 46140  
(855) 463-6848

##### *LaPorte District*

315 E. Boyd Blvd.  
LaPorte, IN 46350  
(855) 464-6368

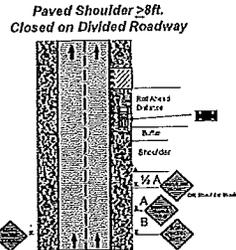
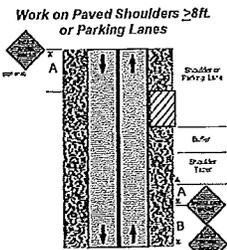
##### *Seymour District*

185 Agrico Lane  
Seymour, IN 47274  
(812) 522-5649

##### *Vincennes District*

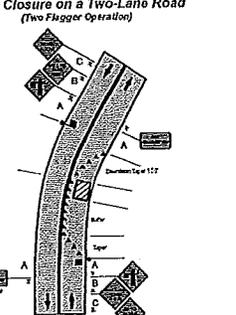
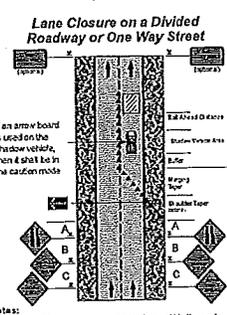
3650 US 41 South  
Vincennes, IN 47591  
(812) 895-7300

# Indiana Department Of Transportation Permit Section Traffic Control Quick Reference Guide



- Notes:**
- SHOULDER CLOSED signs should be used on limited-access highways when there is no opportunity for disabled vehicles to pull off the traveled way
  - UTILITY WORK AHEAD or WORKERS signs may be used instead of the ROAD WORK AHEAD sign
  - Use of an arrow display is optional. If used, it shall be operated in the caution mode
  - ≤40mph speed limit, shadow vehicle optional

**Shadow Vehicles CANNOT be used as work vehicles**



- Notes:**
- When a side road intersects the roadway within the work zone, additional devices shall be erected to channelize traffic from the side road, and a ROAD WORK AHEAD sign shall be placed on each side road approach
  - On non-freeway multi-lane roads in urban areas, the sign spacing may be reduced
  - ≤40mph speed limit, shadow vehicle optional

**Legend**

- Channelizing Device
- Arrow Board Display
- Flagger Symbol
- Portable Sign Support
- Arrow Board Display Symbol
- Shadow Vehicle With Flashing Light
- Work Area
- Warning Sign

**Flagger Standards and Procedures**

If flaggers are used they must be properly trained and equipped at all times.

Only 24" Diameter Stop/Slow paddles are allowed while flagging on State Right-Of-Way

**Acceptable Channelizing Devices**

- Stripes on barricade rails slope downward at an angle of 45 degrees toward the direction traffic is to pass.
- Barricade rail stripe widths shall be 6 inches except where rail lengths are less than 36 inches, then 4 inch wide stripes may be used.
- The sides of barricades facing traffic shall have retroreflective rail faces.
- All channelizing devices shall meet AASHTO Manual for Assessing Safety Hardware (MASH) Requirements.

**Spacing**  
On Tapers: The distance in feet equal to the speed limit in mph, alongside the work area: The distance in feet equal to 2.0 times the speed limit in mph.

Alternatively, the spacing for straight-a-ways may be as follows:

- 20 to 40 mph: 1 cone for every 80' (every other skip)
- 40 to 55 mph: 1 cone for every 80' (every other skip)
- 60 mph & above: 1 cone for every 120' (every 3 skips)

Sign Spacing (feet)					
Speed (mph)	25-30 mph	35-40 mph	45-55 mph	Multilane Divided 60 mph or higher	Expressway/Freeway
A	100	150	200	250	300
B	100	350	600	1600	1600
C	100	350	600	2400	2400

Distances shown are approximate. Sign spacing should be adjusted for curves, hills, intersections, driveways, etc., to improve sign visibility.

Speed (MPH)	OPTIONAL BUFFER LENGTHS (ft) (MUTCD)											
	Shoulder Tapers		SMITING Tapers		Merging Tapers							
	L	AS	CS	BC	L	AS	CS	BC				
25	80	2	20	5	80	2	20	6	160	4	20	9
35	120	3	20	7	160	4	20	8	250	7	20	19
45	200	5	40	8	250	7	40	8	560	14	40	16
55	210	6	40	7	360	9	40	10	600	17	40	19
65	250	7	60	8	400	10	60	8	800	20	60	15

2-Way & Downstream Tapers are always 100/2.5/20/7

L = Length (ft)    AS = Number of Skips    CS = Cone Spacing (ft)    BC = Number of Cones

**Guidelines for Buffer Lengths and Distance of Flagger Station in Advance of the Workspace**

Speed (mph)	MUTCD Based Buffer Length (ft)	Optional Skips Based	
		Buffer Length (ft)	Number of Skips
20	150	120	4
25	185	160	4
30	200	200	6
35	260	280	7
40	305	320	8
45	360	360	9
50	425	440	10
55	495	520	13
60	570	600	15
65	645	680	17
70	740	760	19

**Roll-ahead Distances**

Speed	Stationary		Mobile
	65 mph	70 mph	
60-65 mph	160 ft	160 ft	200 ft
60-65 mph	200 ft	200 ft	275 ft
70 mph	225 ft	225 ft	325 ft

INDOT Permit # Number: M15F5CR0025

**DISCLAIMER...** The purpose of this document is to present guidelines for work zone traffic control. This covers the basic requirements set forth in Part VI of the Indiana Manual on Uniform Traffic Control Devices (MUTCD) as it pertains to Right-Of-Way Permit work. Any changes or additions of traffic control of protection can be requested per the INDOT District Permit Sections. This document MUST accompany the Right-Of-Way Permit Application.





### Title VI Assurances

The permittee for himself, his heirs, personal representatives, successors in interest, and assigns, as part of the consideration hereof, does hereby covenant and agree that in the event facilities are constructed, maintained, or otherwise operated on the said property described in this permit for a purpose for which a Department of Transportation program or activity is extended or for another purpose involving the provision of similar services or benefits, the permittee shall maintain and operate such facilities and services in compliance with all other requirements imposed pursuant to Title 49, code of Federal Regulations, Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the Department of Transportation – Effectuation of Title VI of the Civil Rights Act of 1964, and as said regulations may be amended.

That in the event of breach of any of the above nondiscrimination covenants, Indiana Department of Transportation shall, have the right to terminate the permit and to re-enter and repossess said land and the facilities thereon, then hold the same as if said permit had never been made or issued.

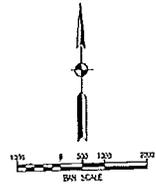
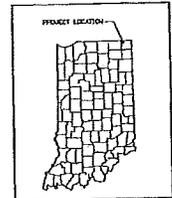
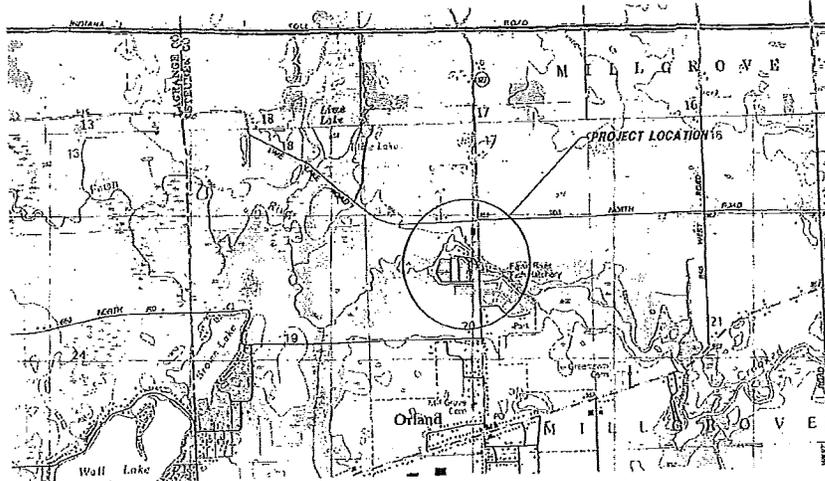
INDIANA DEPARTMENT OF ADMINISTRATION (IDOA)  
 INDIANA DEPARTMENT OF NATURAL RESOURCES (IDNR)  
 DIVISION OF ENGINEERING

PROJECT No. E020096  
 FAWN RIVER FISH HATCHERY  
 NEW WELL AND WATER DISTRIBUTION IMPROVEMENTS  
 MILLGROVE CIVIL TWP, STEUBEN COUNTY, INDIANA

NW 1/4 AND NE 1/4, SECTION 20, T. 38 N., R. 12 E.  
 JULY, 2015

**INDEX OF SHEETS**

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND AND REVISIONS
3	OVERALL SITE PLAN
4	SITE PLAN - EAST
5	SITE PLAN - NEW WELL
6	SITE PLAN - NORTHWEST
7	WELL POND DETAILS
8-9	WELL BUILDING DETAILS
10	DETAILS
11	SECTIONS
12-11	WELL STRUCTURE DETAILS
15	EROSION CONTROL DETAILS
16-17	ELECTRIC



INDOT R/W PERMIT  
 SUBMITTAL PLAN SET  
 JULY 14, 2015

LOCATION MAP  
 STEUBEN COUNTY

INDIANA DEPARTMENT OF NATURAL RESOURCES  
 STATE OF INDIANA DEPARTMENT OF ADMINISTRATION  
 CONTRACT DOCUMENTS TO BE USED WITH THESE PLANS.

**LEAWA**  
 LAWSON-FISHER ASSOCIATES P.C.  
 6225 W. WASHINGTON AVENUE  
 SOUTH BEND, INDIANA 46601



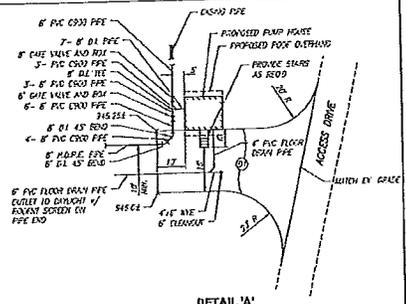
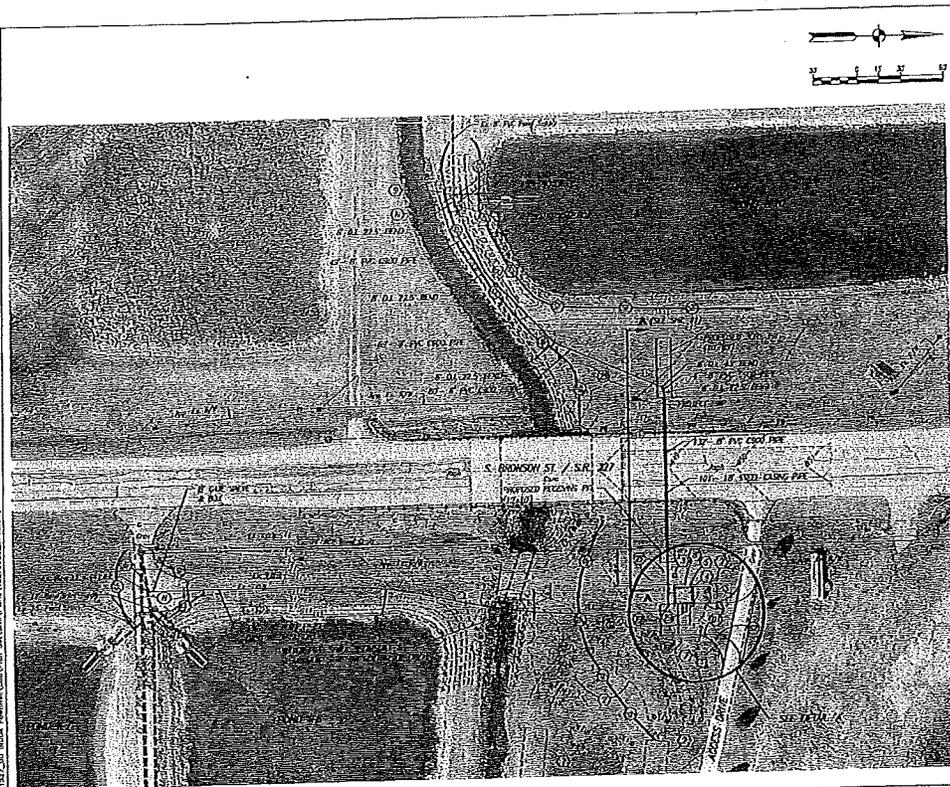
Jeffrey L. Fisher 01/11/15  
 ENGINEER

INDIANA DEPARTMENT OF  
 NATURAL RESOURCES  
 FAWN RIVER FISH HATCHERY

TITLE SHEET

REVISIONS	HORIZONTAL SCALE	PROJECT NUMBER
	1" = 100'	201527.00
	VERTICAL SCALE	
	1" = 10'	
	DRAWN BY	DATE
	JAN	1 of 17
	CHECKED BY	DATE
	JAY TOBI	

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

- LEGEND:**
- ① ACCESS DRIVE
  - ② 6" COMPACTED AGGREGATE SURFACE, #23 ON
  - ③ 6" UNCOMPACTED AGGREGATE BASE, #31
  - ④ 6" UNCOMPACTED AGGREGATE SURFACE, #33
  - ⑤ WELDED REINFORCING
  - ⑥ REINFORCE AND REST PAVING SIGN. PROVIDE NEW POSTS AND CONCRETE BARS. PAINT POSTS TO MATCH EXISTING COLOR.
  - ⑦ EX. CONCRETE PAVES PREVIOUSLY BUILT AND FILL TO SOL.
  - ⑧ TEST REPORT BY CIVILIAN TESTING AND WATER SERVICES JUNE 13, 2014
  - ⑨ NEW WELL (REFER TO DETAILS AND SPECIFICATIONS)
  - ⑩ 1/2" DIA. REBAR
  - ⑪ 1/2" DIA. REBAR (SEE DETAIL AND SPECIFICATIONS)
  - ⑫ 1/2" DIA. REBAR (SEE DETAIL AND SPECIFICATIONS)
  - ⑬ 1/2" DIA. REBAR (SEE DETAIL AND SPECIFICATIONS)
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- NOTES:**
1. EXISTING UTILITIES AND BURIED STRUCTURES SHOWN ARE FROM FILE DRAWINGS PROVIDED BY THE OWNER. ENCLOSURES MAY EXIST. CONTRACTOR SHALL VERIFY EXISTING BURIED STRUCTURES, EXISTING UNDERGROUND UTILITIES AND SITE FEATURES.
  2. FRESH CONCRETE WORKSHOPS IN LOCATIONS NOT ARE CONTRACTOR AND IN CLOSE PROXIMITY TO WELLS AND IN SUFFICIENT NUMBER TO ACCOMMODATE THE REMOVAL OF WELLS CONCRETE FROM WELLS AND PUMP HOUSES.
  3. 100'-10" ROAD ELEV. AT WELL BUILDING = 916.42
  4. CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE AROUND WELL BUILDING AND FOR ACCESS DRIVE.
  5. WATER SUPPLY PIPING SHALL BE INSTALLED WITH A MINIMUM OF 5'-FEET OF COVER.

INDOT R/W PERMIT  
SUBMITTAL PLAN SET  
JULY 14, 2015

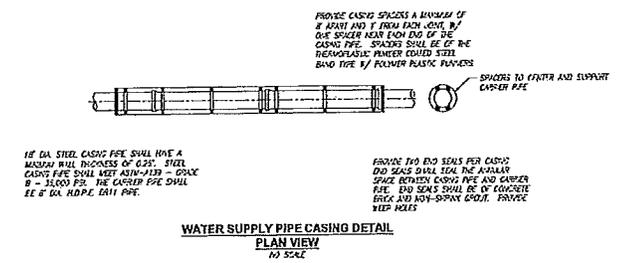
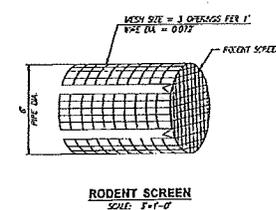
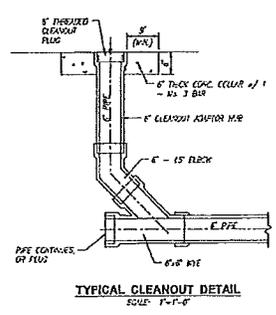
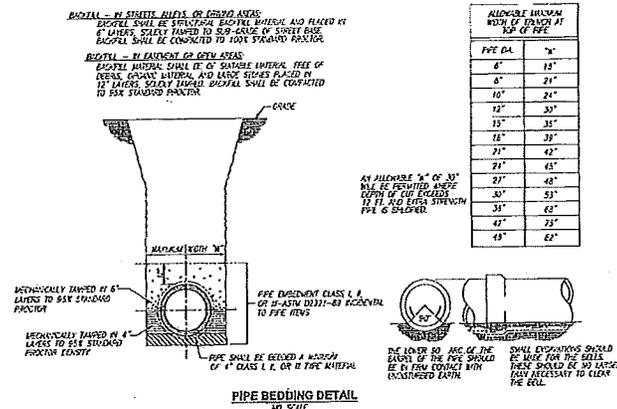
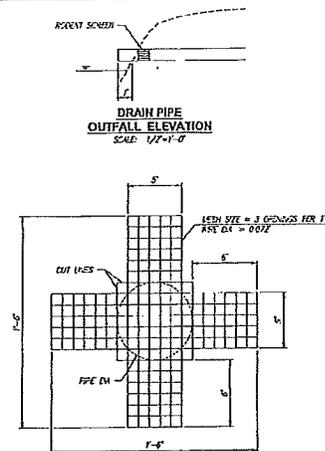
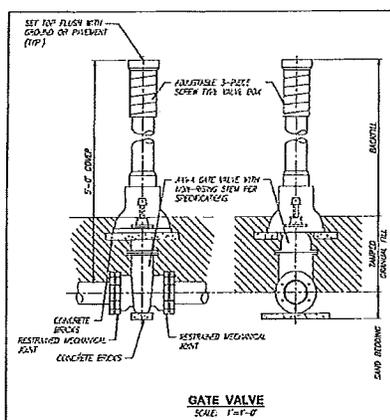
**LFA**  
LAWSON-FISHER ASSOCIATES P.C.  
525 W. WASHINGTON AVENUE  
SOUTH BEND, INDIANA 46601  
PH. (574) 234-2167

INDIANA DEPARTMENT OF  
NATURAL RESOURCES  
FAWN RIVER FISH HATCHERY

Site Plan  
NEW WELL

REVISIONS	PROJECT NUMBER	201527.00
DATE	DATE	DATE
BY	BY	BY
CHECKED BY	DATE	DATE
DATE	JULY 2015	JULY 2015
SHEET		5 OF 17

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NOTE:  
1. IF FLAG OUT IS LOCATED WITHIN THE SCREEN OR IN AN AREA SUBJECT TO EROSION, THE TOP OF THE CLEANOUT SHALL BE CAST FROM WITH A REINFORCED 18" DIA. HD.P.C. LATH PIPE.

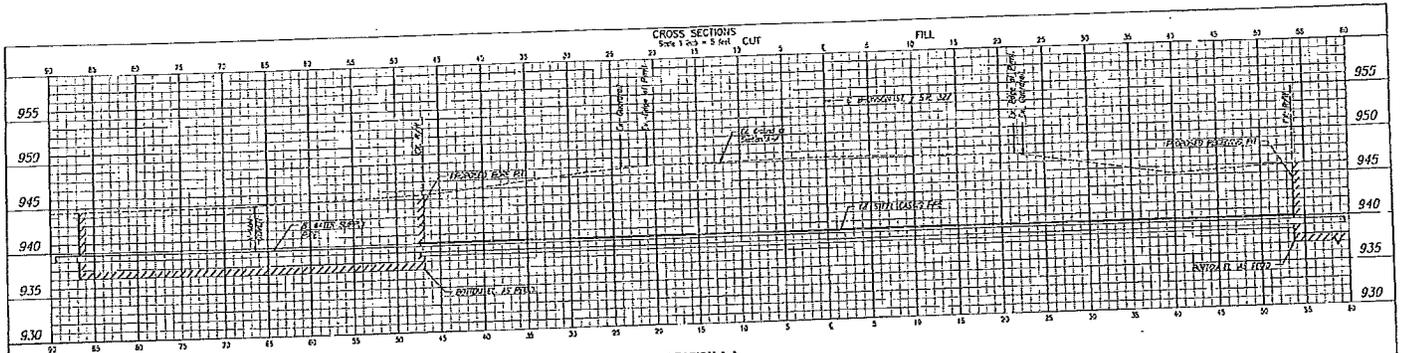
INDOT R/W PERMIT  
SUBMITTAL PLAN SET  
JULY 14, 2015

**LF**  
LAWSON-FISHER ASSOCIATES P.C.  
525 W WASHINGTON AVENUE  
SOUTH BEND, INDIANA 46601  
PH. 765.281.9242 FAX 765.281.9243

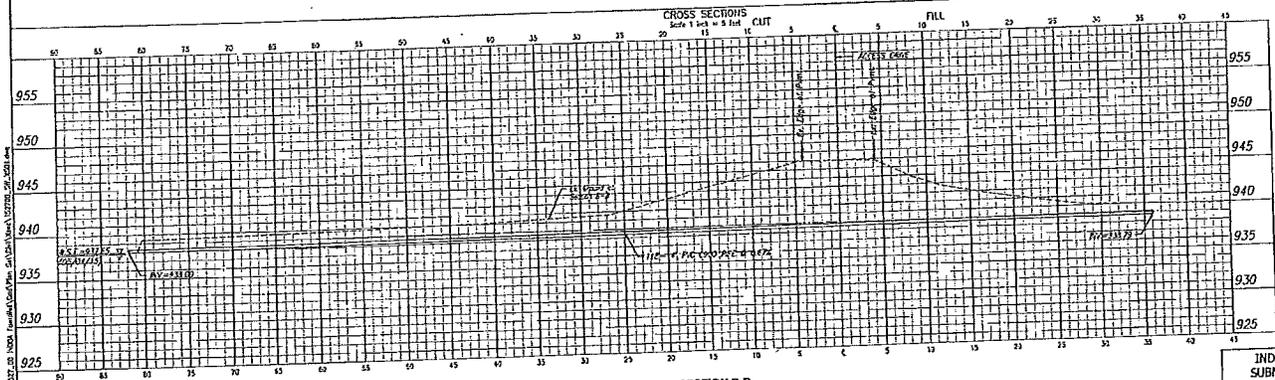
Professional Engineer Seal for **Jeffrey J. Lawson**, License No. 198200332, State of Indiana, dated 07/11/13.

INDIANA DEPARTMENT OF  
NATURAL RESOURCES  
FAWN RIVER FISH HATCHERY  
DETAILS 5200R0203

PROJECT NUMBER	201527.00
DATE	07/14/15
SCALE	AS SHOWN
PROJECT NAME	INDOT R/W PERMIT
PROJECT LOCATION	INDOT R/W PERMIT



**SECTION A-A**  
BORE & JACK CROSSING AT S.R. 327



**SECTION B-B**  
INTAKE STRUCTURE WATER SUPPLY DRAIN PIPE

INDOT R/W PERMIT  
SUBMITTAL PLAN SET  
JULY 14, 2015

**LFA**  
LAWSON-FISHER ASSOCIATES P.C.  
325 W. WASHINGTON AVENUE  
SOUTH BEND, INDIANA 46601  
PH. (574) 236-3167



*Jeffrey L. Wagner* 07/11/15  
REGISTERED PROFESSIONAL ENGINEER

INDIANA DEPARTMENT OF  
NATURAL RESOURCES  
FAWRIVER FISH HATCHERY

REVISIONS	DESCRIPTION, SCALE	DATE	BY	CHKD	APP'D	PERMIT NUMBER
1	VERTICAL SCALE	7/15				201527.00
2	HORIZONTAL SCALE	7/15				
3	SURVEY REVISION					
4	DATE					
5	DATE					

Approved INDOT Permit Number: M15P3C90025

**INDOT Fort Wayne District: Cut Road – Underground Water/Sewer Lines and Drainage**  
**Additional Special Provisions**

INDOT is not responsible for determining whether or not the work you are proposing will require permits from another regulatory agency. These agencies include, but are not limited to IDEM, INDR, and the USACE. Any work in Waters of the US, in wetlands, and land disturbing activities greater than 1 acre are all examples of work that will require consultation with these agencies. If you have questions about whether or not your project will need additional permits, please contact these agencies directly.

Traffic must be maintained at all times as set out in the Indiana Department of Highways Uniform Traffic Control Manual and as shown in the permit drawings. If a route detour is included in the permit, then the permittee shall provide, erect and maintain all necessary signs and barricades for the proposed detour and road closure beyond the detour point. Detours along non-INDOT highways will require approval from the jurisdiction/authority of the detour route used and a completed "Hold Harmless" form must be provided and approved by INDOT.

Driving lanes must not be closed when work is not in progress.

No lane restrictions will be allowed from 1 December through 31 March of the following without approval from INDOT.

No lane restrictions will be allowed when snow fall is predicted or snow removal equipment is present on the roadway.

The permit work will need to be coordinated with any and all INDOT projects that are scheduled for this section of the State Highway, if applicable. The INDOT Contact for this will be the INDOT Area Engineer. Permit work described in this permit must be completed first and the INDOT contract and resurfacing will follow. Notes to this effect should be included in the plans and bid documents. The work allowed in this permit will need to be completed before the beginning of the scheduled contract work, if applicable.

All Indiana Department of Transportation equipment in the State right-of-way, such as underground conduits and signal control devices, must be located prior to the start of work. Contact Mark Bonar, District Signal Supervisor, #260-969-8235, at least three (3) work days in advance. If highway signal equipment is damaged or removed in any manner, it must be repaired or replaced by a pre-qualified signal contractor.

All trenches and excavations must be closed or properly barricaded when work is not in progress.

All highway pavements must be kept clean and free of debris at all times.

Please contact the Fort Wayne District Paint/Sign Supervisor, Troy Patterson, #260-969-8249, three (3) days in advance of the start of work, to receive instructions for the proper removal and resetting of all affected traffic control signs and equipment.

The permittee shall protect all Road Reference System (RRS) signs. The location of the signs (4" X 12" blue) shall be referenced before they are temporarily relocated to allow the permitted work. The signs shall be reset in the original location or as directed by INDOT.

Aggregates and excavated materials must not be stored on or loaded from existing shoulders and pavements.

The existing asphalt pavements must be protected. Any contamination of and/or damage to existing asphalt or concrete pavements, shoulders or right-of-way facilities created by any excavation work and/or a boring operation shall be repaired at the permittee's expense to INDOT minimum standards.

Equipment must not be stored on State right-of-way when work is not in progress. Highway pavements must be kept clean and free of debris at all times.

If damaged beyond reuse, existing driveway pipes must be replaced with minimum 15" CMP with metal end sections. Concrete headwalls must not be reused and must be replaced with metal end sections.

Manholes and hydrants shall not be set in ditch bottoms or any other area that would prohibit normal maintenance of the State right-of-way.

All disturbed areas shall be mulch seeded to the appropriate INDOT standards. Side ditch grades 1% to 3% shall be sodded in accordance with 2012 Standard Specifications Section 621.09. Required uniform rip-rap shall be placed on side ditch grades 3% or greater in accordance with 2010 INDOT Standard Specifications Sections 616.06 and 616.11.

Any proposed drainage that is included and planned with this permit shall be done as per the approved plans and drawings and as per the current version of the INDOT Design Manual, INDOT Standard Specifications and INDOT Standard Drawings, unless approved otherwise. Drainage of shoulder ditches or otherwise on the right-of-way shall not be obstructed outside the area that is being filled or excavated. Appropriate control measures shall be followed to protect the right-of-way from erosion. Excavation of spoil and restoration of existing ditch profiles shall maintain and perpetuate existing drainage patterns to the original or better condition on or before the expiration date of this permit.

Any and all trenchless pipe/conduit, required casing and materials installed within INDOT right-of-way shall be installed by approved boring and jacking methods in accordance with Section 716 of the current version of INDOT Standard Specifications and must be from the INDOT Approved Materials List. All water/sanitary lines under pressure within the effective pavement area shall be encased. Where a carrier pipe is placed inside a casing pipe, the carrier pipe shall be shimmed to proper line, elevation and grade and then the void between the two pipes shall be grouted/sealed at both ends as per Section 716 of the current version of INDOT Standard Specifications.

A Highway Settlement Monitoring Plan is required for the trenchless installation of any pipe or casing greater than six (6) inches in outside diameter and must be submitted and approved by INDOT before any work can begin.

All crossings for service lines greater than 2" shall be encased unless noted otherwise. Where non-metallic lines are installed without a metal casing, a durable metal wire shall be installed concurrently or other means provided for detection purposes.

Underground pipe installations depth of cover: Minimum cover is 36 inches. Minimum Cover under Ditch Flow Line is 48 inches. Minimum Cover under or within 5 feet of the pavement surface is 48 inches. All permitted longitudinal underground installations shall be located on uniform alignment within five (5) feet of the R/W line, unless noted otherwise (u.n.o.).

Installation Pits (Bore/Push/Jack/Receive) shall be a minimum of 20 feet from edge of pavement and within 5 feet of the R/W, u.n.o. No installation pits, manholes, hand holes or any other installation points are allowed within the Limited Access R/W unless noted otherwise.

Any directional bore and/or jacking/pushing installation that might be used shall be stopped immediately if any surface deformation is detected in the public right-of-way. The Fort Wayne District Permit Supervisor shall be contacted immediately at #260-969-8254, for instructions. Any damage to pavements, shoulders or right-of-way facility created by the boring operation shall be repaired at the permittee's expense to INDOT minimum standards.

All abandoned sewer or water lines shall be properly plugged and capped as required by INDOT at an adequate number of locations to prevent storm or ground water flow.

All State Road underground trenchless pipe installation crossings shall be monitored for a minimum of one (1) year after installation to detect any right-of-way damage. The permittee shall repair any damaged areas found by INDOT that were caused by work carried out in the permit.

Any and all excavated trenches shall be backfilled and finished in accordance with the attached typical trench details. Any pavement cuts shall be patched in accordance with the applicable attached asphalt and/or concrete T-section. INDOT will monitor the concrete and/or asphalt patch areas for any settlement for one year after completion.

The permittee shall place the required asphalt pavements in accordance with Section 400 and/or Section 600 of the Indiana Standard Specifications dated September 2012 for Bituminous Items (a copy of these sections will be provided upon request).

A Certified Volumetric Hot Mix Producer shall be used for the paving operations.

HMA weather limitations as per section 402.12 must be strictly followed. No differences in pavement elevations between the mainline pavement and new pavement sections can be left in place over the winter. If conditions do not allow the placement of the surface course or any other courses, the Permittee must contact INDOT for approval and direction. If intermediate or base courses are used in place of any surface courses for the winter period, they will need to be milled and an acceptable surface course be placed in the spring, weather permitting and as per section 402.12.

All mix designs shall be submitted for approval by the District Materials and Testing Engineer two (2) weeks prior to producing the mix, if requested and required.

All other applicable Standards shall apply from the sections noted.

Testing, when necessary, will be performed by INDOT forces. Testing by INDOT shall require 48 hours notice to the District Materials and Testing Engineer, #260-969-8238.

Other testing shall be the responsibility of the Certified Volumetric Hot Mix Producer. Test results shall be provided to the District Materials and Testing Engineer.

Failure to follow these Standards shall be cause for the revocation of the permit and/or all pavement items associated with said permit. All failed material shall be removed and replaced to INDOT minimum standards. ~

