



**STOLL
KEENON
OGDEN**
PLLC

DAMON R. TALLEY, PSC
PO BOX 150
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HODGENVILLE, KY 42748

April 21, 2016

RECEIVED

APR 21 2016

PUBLIC SERVICE
COMMISSION

DAMON R. TALLEY
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damon.talley@skofirm.com

Mr. Aaron D. Greenwell
Acting Executive Director
Public Service Commission
PO Box 615
Frankfort, KY 40602

RE: Case No. 2016-00148
Hardin County Water District No. 2
(Construct, Finance, Rates; 278.023)

Dear Mr. Greenwell:

Enclosed for filing, pursuant to 807 KAR 5:069, Section 2(5), on behalf of Hardin County Water District No. 2, is a compact disk in portable document format containing the Specifications and Bidding Documents for Contracts 26 and 27. The Plans are contained in the compact disk which was included as Exhibit 6 to the Application which was tendered to the Commission on April 8, 2016.

The Specifications have been prepared, signed, sealed, and dated by an engineer registered in Kentucky as required by KRS 322.340.

The compact disk should cure the filing deficiencies noted in the letter from Linda Faulkner dated April 20, 2016.

Yours truly,

STOLL KEENON OGDEN PLLC

Damon R. Talley, Attorney for
Hardin County Water District No. 2

SPECIFICATIONS AND CONTRACT DOCUMENTS

FOR

HARDIN COUNTY WATER DISTRICT NO. 2

**LOUISVILLE WATER COMPANY
SUPPLEMENTARY SUPPLY**

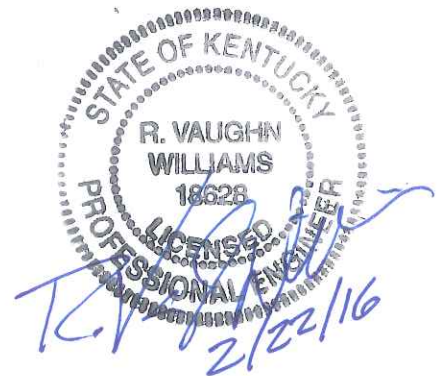
CONTRACT 26 – COLESBURG PUMP STATION

Prepared By:

**KENVIRONS, INC.
452 VERSAILLES ROAD
FRANKFORT, KENTUCKY 40601**

PROJECT No. 2007107

JANUARY, 2014





ADDENDUM NO. 1

March 4, 2016

HARDIN COUNTY WATER DISTRICT NO. 2 HARDIN COUNTY, KENTUCKY

CONTRACT 26: COLESBURG PUMP STATION

BID OPENING: MARCH 9, 2016 AT 1:00 P.M. LOCAL TIME

The following clarifications, additions and/or revisions are hereby made a part of the contract documents for this project:

1. The construction days are calendar days. Weekend work will not be restricted. However, a minimum of three (3) days notice will be required for scheduling construction inspectors for work on weekends.
2. The Bid Advertisement and Specification Section 0101 Special Conditions, Sub-Section 3.0, Time of Completion and Sub-Section 4.0, Liquidated Damages indicate respectively that the Time of Completion is 270 days and Liquidated Damages is \$800 per day. The Time of Completion and Liquidated Damages as contained in the Form of Agreement between Owner and Contractor shall be corrected to conform with Specification Section 0101.
3. Attached herewith is a drawing labeled Sheet 1A - Site Plan Revisions. The following changes, revisions, or additions are shown on the drawing;
 - a. A power pole is shown on the drawing to indicate the location of the new power source for the pump station. Contractor to furnish and install conduits as required by the local power company for primary service to the transformer. Owner shall be responsible for the new pole and the primary service to the new pole.
 - b. Contractor shall furnished and installed two (2) headwalls on the 18" storm piping located at the pump station's access road entrance.
 - c. Pump Station Contractor will be responsible for connecting the two (2) 24" lines to, and from, the pump station to the stub-outs, or butterfly valves, furnished and installed by the Contract 27 Pipeline Contractor.
 - d. The cattle fence to be furnished and installed to close-off the adjacent farm's pasture shall meet the following specifications;
 - i. 48" tall galvanized wire fencing with 9" vertical mesh
 - ii. 9 gauge top and bottom wire
 - iii. 11 gauge filler wire
 - iv. Single stand of galvanized barbed wire at the top
 - v. Pressure treated wood posts.
 - vi. 5" diameter x 8 ft. long line posts spaced on 8 ft. centers
 - vii. 6" diameter x 8 ft. long end & corner posts with diagonal bracing



4. The Chain Link Fence surrounding the pump station shall be furnished and installed in accordance with the detail on Sheet D-1.
5. The "Hach Analyzer" and "Telemetry" Panel shown on Sheet 2 are included in Bid Item 9, Equipment Allowance. The "Hach Analyzer" and "Chloramination Analyzer" are the same.
6. Contractor shall not route any conduits, pipes, etc. across the openings to access the attic space.
7. The building and piping shall be constructed according to the Civil and Structural plans. The electrical drawings reflect an earlier building revision and shall not be used for establishing the dimensions and layout of the building or piping.
8. Heat Pump 4 (HP-4) shall be furnished and installed as part of this project.
9. Stripped topsoil shall be stockpiled onsite at a location mutually agreed by the Contractor and Owner's representative. All construction activities shall be limited to the project site. Stockpiles and equipment may be placed offsite only if the Contractor has written permission from the property owner.
10. Contractor is encouraged to use American made products but the contract does not have a mandatory "Buy American" clause.
11. The pipe supports as shown on the drawings are sufficient. No additional supports are required.
12. The Water District will be responsible for providing the water needed to initially fill and flush the pipeline. Additional filling and flushing of the lines shall be at the Contractors expense at a rate of \$2.50 per 1,000 gallons.
13. All pressurized piping, fittings, and valves shall be rated for 350 psi.
14. Flange piping will require special gaskets rated for 350 psi.
15. Attached herewith is the KYTC Permit. Contractor shall comply with all permit requirements.
16. Contractor to include an exit sign at the east side door. Exit sign shall be an LF-8 fixture.
17. Attached herewith is specification Section 08331 for the Overhead Coiling Door.


R. Vaughn Williams, P.E.

March 4, 2016

IMPORTANT NOTICE

The contractor must contact the KYTC district office to review permit details prior to beginning work on the right-of-way.

The applicant is responsible for ensuring that the contractor is aware of this requirement and that contact is made prior to construction.

KYTC Contact – Kevin Dixon
(270)766-5066.



Kentucky Transportation Cabinet
 Department of Highways
 Permits Branch

TC 99-1 (B)
 1/2012
 Page 1 of 1

ENCROACHMENT PERMIT

KEPTS No.: A04-2013-00367

Permittee: Hardin County Water District #2

Latitude: 37.790877

Longitude: -85.761902

Completion Date: 4/3/2014

Coordinates provided on the TC 99-1(B) are the approved location for this permit

Indemnities		
Type	Amount Required	Tracking Number
Performance Bond	0	
Payment Bond	0	
Liability Insurance	0	

This permit has been: **APPROVED**

APPROVED

DENIED

Patty Dunaway Chief District Engineer

NAME **TITLE**

Patty Dunaway 10/4/2013

SIGNATURE **DATE**

The TC 99-1(B), including the application TC-99 1(A) and all related and accompanying documents and drawings make up the permit. It is not a permit unless both the TC 99-1(A) and TC 99-1(B) are both present.



Kentucky Transportation Cabinet
 Department of Highways
 Permits Branch

TC 99-1 (A)
 1/2012
 Page 1 of 3

APPLICATION FOR ENCROACHMENT PERMIT

Applicant/Permittee		KEPTS No. 04-2613-00367	
Name HARDIN COUNTY WATER DISTRICT #2			
Address 360 RING ROAD		Permit Location	
POC - SHAUN YOURAVICH		Address KY HWY 434 - BATTLE TRAINING ROAD	
City ELIZABETHTOWN			
State KY	Zip 42702-0970	City LEBANON JUNCTION	
Phone 270-737-1056		State KY	Zip 40150
Cell Phone 270-268-1255		County HARDIN	
Work Phone 270-737-1056			
Email Address youravich@hardincountywater2.org		Route No. KY HWY 434 - BATTLE TRAINING ROAD	

Access Control	Mile Point 8.800 Left
<input type="checkbox"/> Fully Controlled Access	GPS Coordinates
<input type="checkbox"/> Partially Controlled Access	Long -85.761902
<input checked="" type="checkbox"/> Control of Access by Permit	Lat 37.790877

Type of Encroachment (KYTC)

Description of Work:
 CONSTRUCT ASPHALT SERVICE ENTRANCE FOR PROPOSED POTABLE WATER PUMP STATION FACILITY. PROPOSED ENTRANCE INCLUDES A 15' WIDE THROAT WITH 15' RADII AT EDGE OF PAVEMENT. SEE ATTACHED PLANS.



APPLICATION FOR ENCROACHMENT PERMIT

Applicant/Permittee agrees to the following terms and conditions:

1. The permit, including this application and all related and accompanying documents and drawings making up the permit, remains in effect and is binding upon the Applicant/Permittee, its successors and assigns, as long as the encroachment(s) exists and also until the permittee is finally relieved by the Department of Highways from all its obligations.
2. Applicant shall meet all requirements of the Clean Water Act if the project will disturb one acre or more, the applicant shall obtain a KPDES KYR10 Permit from the Kentucky Division of Water. All disturbed areas shall meet the requirements of the Department of Highway's Standard Specifications, Sections 212 and 213, as amended.
3. **INDEMNITY:**
 - A. **PERFORMANCE BOND:** The permittee shall provide to the Department a performance bond, when required, in the amount of \$50,00 (an amount equal to the estimated project cost as prepared and submitted by the applicant and approved by the Department) as a guarantee of conformance with the Department's Encroachment Permit requirements.
 - B. **PAYMENT BOND:** At the discretion of the department, a payment bond will be required of the permittee to ensure payment of liquidated damages assessed to the permittee.
 - C. **LIABILITY INSURANCE:** Liability insurance will be required of the permittee (in an amount approved by the department) to cover all liabilities associated with the encroachment.
 - D. It shall be the responsibility of the permittee, its successors and assigns, to maintain all indemnities in full force and effect until the permittee is authorized to release the indemnity by the Department.
4. A copy of this application and all related documents making up the approved permit will be given to the applicant and shall be made readily available for review at the work site at all times.
5. Perpetual maintenance of the encroachment is the responsibility of the permittee, its successors and assigns, with the approval of the Department as required, unless otherwise stated.
6. Permittee, its successors and assigns, shall comply with and agrees to be bound by the requirements and terms of (a) this application and all related documents making up the approved permit, (b) by the Department's Permits Manual, and (c) by the Manual on Uniform Traffic Control Devices, both manuals as revised to and in effect on the date of issuance of the permit, all of which documents are made a part thereof by this reference. Compliance by the permittee, its successors and assigns, with subsequent revisions to applicable provisions of either manual or other policy of the Department may be made a condition of allowing the encroachment to persist under the permit.
7. Permittee agrees that this and any encroachment may be ordered removed by the Department at any time, and for any reason, upon thirty days written notice to the last known address of the applicant or to the address at the location of the encroachment. The permittee agrees that the cost of removing and of restoring the associated right-of-way is the responsibility of the permittee, its successors and assigns.
8. Permittee, its successors and assigns, agree that if the Department determines that motor vehicular safety deficiencies develop as a result of the installation or use of the encroachment, the permittee, its successors and assigns, shall provide and bear the expenses to adjust, relocate, or reconstruct the facilities, and/or add signs, auxiliary lanes, or other corrective measures reasonably deemed necessary by the Department within a reasonable time after receipt of a written notice of such deficiency. The period within which such adjustments, relocations, additions, modifications, and/or other corrective measures must be completed will be specified in the notice.
9. Where traffic signals are required as a condition of granting the requested permit or are thereafter required to correct motor vehicular safety deficiencies, as determined by the Department, the costs for signal equipment and installation(s) shall be borne by the permittee, its successors and assigns, and/or the Department in its reasonable discretion and only in accordance with the Department's current policy set forth in the Traffic Operations Manual and Permits Manual. Any modifications to the permittee's entrance necessary to accommodate signalization (including necessary easement(s) on private property) shall be the responsibility of the permittee, its successors and assigns, at no expense to the Department.
10. The requested encroachment shall not infringe on the frontage rights of an abutting owner without their written consent as hereinafter described. Each abutting owner shall express their consent, which shall be binding on their successors and assigns, by the submission of a notarized statement as follows, "I (we), _____, hereby consent to the granting of the permit requested by the applicant along Route _____, which permit does affect frontage rights along my (our) adjacent real property." By signature(s) _____, subscribed and sworn by _____, on this date _____. (This requirement does not apply to utility encroachments which serve the general public).
11. The permit, if approved, is subject to the agreement that it shall not interfere with any similar rights or permit(s) previously granted to any other party, except as otherwise provided by law.



Kentucky Transportation Cabinet
 Department of Highways
 Permits Branch

APPLICATION FOR ENCROACHMENT PERMIT

12. Permittee shall include documentation which describes the facilities to be constructed. Permittee, its successors and assigns, agrees as a condition of the granting of the permit to construct and maintain any and all permitted facilities or other encroachments in strict accordance with the submitted and approved permit documentation and the policies and procedures of the Department. Permittee, its successors and assigns, shall not use facilities authorized herein in any manner contrary to that prescribed by the approved permit. Only normal usage as contemplated by the parties and by this application and routine maintenance are authorized by the permit.

13. Permittee, its successors and assigns, at all times from the date permitted work is commenced until such time as all permitted facilities or other encroachments are removed from the right-of-way and the right-of-way restored, shall defend, protect, indemnify and save harmless the Department from any and all liability claims and demands arising out of the work, encroachment, maintenance, or other undertaking by the permittee, its successors and assigns, related or undertaken pursuant to the granted permit, due to any claimed act or omission by the permittee, its servants, agents, employees, or contractors. This provision shall not inure to the benefit of any third party nor operate to enlarge any liability of the Department beyond that existing at common law or otherwise if this right to indemnity did not exist.

14. Upon a violation of any provision of the permit, or otherwise in its reasonable discretion, the Department may require additional action by the permittee, its successors and assigns, up to and including the removal of the encroachment and restoration of the right-of-way. In the event additional actions required by the Department under the permit are not undertaken as ordered and within a reasonable time, the Department may in its discretion cause those or other additional corrective actions to be undertaken and the Department may and shall recover the reasonable costs of those corrective actions from the permittee, its successors and assigns.

15. Permittee, its successors and assigns, shall use the encroachment premises in compliance with all requirements of federal law and regulation, including those imposed pursuant to Title VI of the Civil Right Act of 1964 (42 U.S.C. § 2000d et seq.) and the related regulations of the U.S. Department of Transportation in Title 49 C.F.R. Part 21, all as amended.

16. Permittee, its successors and assigns, agree that if the Department determines it is necessary for the facilities or other encroachment authorized by the permit to be removed, relocated or reconstructed in connection with the reconstruction, relocation or improvement of a highway, the Department may revoke permission for the encroachment to remain under the permit and may order its removal, relocation or reconstruction by the permittee, its successors and assigns, at the expense of the permittee, except where the Department is required by law to pay any or all of those costs.

17. Permittee agrees that the authorized permit is personal to the permittee and shall remain in effect until such time as (a) the permittee's rights to the adjoining real property to have benefitted from the requested encroachment have been relinquished, (b) until all permit obligations have been assumed by appropriate successors and assigns, and (c) unless and until a written release from permit obligations has been granted by the Department. The permit and its requirements shall also bind the real property to have benefitted from the requested encroachment to the extent permitted by law. The permit and the related encroachment become the responsibility of the successors and assigns of the permittee and the successors and assigns of each property owner benefitting from the encroachment, or the encroachment may not otherwise permissibly continue to be maintained on the right-of-way. (Does not apply to utility encroachments serving the general public.)

18. If work authorized by the permit is within a highway construction project in the construction phase, it shall be the responsibility of the permittee to make personal contact with the Department's Engineer on the project in order to coordinate all permitted work with the Department's prime contractor on the project.

19. This permit is not intended to, nor shall it, affect, alter or alleviate any requirement imposed upon the permittee, its successors and assigns, by any other agency.

20. Permittee, its successors and assigns, agrees to contain and maintain all dirt, mud, and other debris emanating from the encroachment away from the surrounding right-of-way and the travel way of the highway hereafter and at all times that its obligations under the permit remain in effect.

THE UNDERSIGNED APPLICANT(s)/PERMITEE(s) (being duly authorized representative(s)/owner(s)) DO AGREE TO ALL TERMS AND CONDITIONS SET FORTH HEREIN.

Signature (of Applicant/Permittee)	Date
	8-29-13



ENCROACHMENT PERMIT GENERAL NOTES & SPECIFICATIONS

Permit No. _____

I. SAFETY

A. General Provisions

- All signs and control of traffic shall be in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways, latest edition, Part VI, and safety requirements shall comply with the Permits Manual.
- All work necessary in shoulder or ditch line areas of a state highway shall be scheduled to be promptly completed so that hazards adjacent to the traveled way are kept to an absolute minimum.
- No more than one (1) traveled-lane shall be blocked or obstructed during normal working hours. All signs and flaggers during lane closure shall conform to the Manual on Uniform Traffic Control Devices.
- When necessary to block one (1) traveled-lane of a state highway, the normal working hours shall be as directed by the Department. No lanes shall be blocked or obstructed during adverse weather conditions (rain, snow, fog, etc.) without specific permission from the Department. Working hours shall be between 3:00 PM and 9:00 AM
- The traveled-way and shoulders shall be kept clear of mud and other construction debris at all times during construction of the permitted facility.
- No nonconstruction equipment or vehicles or office trailers shall be allowed on the right of way during working hours.
- The right of way shall be left free and clear of equipment, material, and vehicles during non-working hours.

B. Explosives

- No explosive devices or explosive material shall be used within state right of way without proper license and approval of the Kentucky Department of Mines and Minerals, Explosive Division.

C. Other Safety Requirements

- BU D**
Before "U" Dig
CALL TOLL FREE
1-800-752-6007
For Buried Line / Cable Locations

II. UTILITIES - Applies to Fully Controlled Access Highways ONLY

- *All work necessary within the right of way shall be performed behind a temporary fence erected prior to a boring operation.
- *The temporary woven wire fence shall be removed immediately upon completion of work on the right of way, and the control of access immediately restored to original condition, in accordance with applicable Kentucky Department of Highways Standard Drawings.
- *All vents, valves, manholes, etc., shall be located outside of the right-of-way.
- *Encasement pipe shall extend from right-of-way line to right-of-way line and shall be one continuous run of pipe. The encasement pipe shall be welded at all joints.
- The boring pit and tail ditch shall extend past the existing toe of slope or bottom of ditch line and shall be a minimum of 42 inches deep.

Permit No. _____

II. UTILITIES (Continued)

- Encasement pipe shall conform to current standards for highway crossings in accordance with the Permits Manual.
- Parallel lines shall be constructed between back slope of ditch line and right-of-way line and shall have a minimum of 30-inch cover above top of pipe or conduit.
- All pavement cuts shall be restored per Kentucky Transportation Cabinet form TC 99-13.
- Aerial crossing of this utility line shall have a minimum clearance of _____ feet from the high point of the roadway to the low point of the line (calculated at the coefficient for expansion of 120 degrees Fahrenheit).
- The 30-foot clear zone requirement shall be met to the extent possible in accordance with the Permits Manual.
- Special requirements:

III. GENERAL

A. OSHA

Kentucky Occupational Safety and Health Standards for the construction industry, which has the effect of law, states in part: (Page 52, 1926.651, Specific Excavation Requirements) "Prior to opening an excavation, effort shall be made to determine whether underground installations, (sewer, telephone, water, fuel, electric lines, etc.) will be encountered, and if so, where such underground installations are located. When the excavation approaches the estimated location of such an installation, the exact location shall be determined, and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation."

B. Archaeological

Whenever materials of an archaeological nature are discovered during the course of construction work or maintenance operations, contact shall be made immediately with the Division of Environmental Analysis, which maintains an archaeologist on staff, or with the Office of the State Archaeologist located at the University of Kentucky. Following this consultation, further action shall be decided on a case-by-case basis by the State Highway Engineer or the Transportation Planning Engineer or their designated representative.

C. Utilities in the Work Areas

- The permittee shall be responsible for any damage to existing utilities, and any utility modifications or relocations within state right of way necessary, as determined by the Department or by the owner of the utility, shall be at the expense of the permittee and subject to the approval of the Department.
- All existing manholes and valve boxes shall be adjusted to be flush with finished grade.

D. Environmental

If the activity to which this permit relates disturbs one acre or more of land, you must obtain a KPDES KYR10 permit.

Websites

<http://www.water.ky.gov/permitting/wastewaterpermitting/KPDES/storm/>

Inspectors for KPDES KYR10 at www.KEPSC.org

Permit No. _____

VI. Paving

- No bituminous pavement shall be installed within the right of way between November 15 and April 1, nor when the temperature is below 40 degrees Fahrenheit, without the express consent of the Department. No bituminous pavement shall be installed when the underlying course is wet.
- Paving within the right of way shall be as follows:
 - Base (Type) _____ (Thickness) _____
 - Surface Base (Type) See Plans _____ (Thickness) See Plans _____
 - Finished Surface (Type) See Plans _____ (Thickness) See Plans _____
- Existing pavement and shoulder material shall be removed to accommodate the above paving specifications.
- The finished surface of all new pavement within the right of way shall be true to the required slope and grade, uniform in density and texture, free of irregularities, and equivalent in riding qualities to the adjacent highway pavement or as determined by the Department of Highways.
- All materials and methods of construction, including base and subgrade preparation, shall be in accordance with Kentucky Department of Highways Standard Specifications for Road and Bridge Construction (latest edition).
- 24 hours notice to the Department is required prior to beginning paving operations.
Phone: _____ Name: _____
- To ensure proper surface drainage, the new pavement shall be flush with the edge of existing highway pavement and shall slope away from the existing edge of the pavement as specified in drawings.
- Existing edge of pavement shall be saw-cut to provide a straight and uniform joint for new pavement. An approved joint sealer, in accordance with Kentucky Department of Highways Standard Specifications (latest edition), shall be applied between new and existing pavements.

VII. SIDEWALKS SPECIFICATIONS This dimension should be equal to the width of the sidewalk.

- A. New Sidewalks**
 - Sidewalks shall be constructed of Class A concrete (3,500 p.s.i. test), shall be * _____ feet in width, 6 inches in thickness across the bituminous entrance, and 4 inches in thickness across the remaining sections.
 - Sidewalks shall have tooled joints not less than 1 inch in depth at four foot intervals*, and 1/2 premolded expansion joints extending entirely through the sidewalk at intervals not to exceed 50 feet.
 - All materials and methods of construction, including curing, shall be in accordance with the Kentucky Department of Highways Standard Specifications for Road and Bridge Construction (latest edition).
- B. Existing Sidewalks**
 - (Applicable if existing sidewalks are being relocated) Use of the sidewalk shall not be blocked or obstructed, and a usable walkway shall be maintained across the construction area at all times.
 - All damaged sections of the sidewalks shall be entirely replaced to match existing sections.

Permit No. _____

VIII. DENSE GRADED SHOULDERS

- Any existing dense-graded aggregate shoulders in the entire frontage within the construction area, which have been disturbed or damaged or on which dirt has been placed or mud has been deposited or tracked, shall be restored to original condition by removal of all contaminated material and replaced to proper grade with new dense-graded aggregate.
- All new aggregate shoulders as specified in the plan shall consist of 5 inches of compacted dense-graded aggregate, 2^{1/2} pounds per square yard of calcium chloride.
- All dense-graded aggregate shoulders shall slope away from the new edge of pavement at the rate of 3/4 inch per foot.

IX. CURBING

A. Bituminous Curbs

- Bituminous concrete curbs shall be given a paint coat of asphalt emulsion.
- The surface under the bituminous concrete curb shall be tacked with asphalt emulsion.
- All bituminous concrete curbs shall be constructed of a Class 4 bituminous concrete mixture as specified by official Department of Highways specifications.
- All bituminous curbs shall be rolled curb, with a minimum base width of 8 inches and a minimum height of _____ inches. The top of the curb shall be constructed in such a manner as to guarantee a uniform rolled effect throughout the entire run.

B. Concrete Curbs

- All curbs or curb and gutter shall be constructed of Class A concrete (3,500 p.s.i. test) and shall be uniform in height, width, and alignment, true to grade, and satisfactory in finish and appearance as determined by the Department. All materials and methods of construction, including curing, shall be in accordance with Department of Highways Standard Specifications for Road and Bridge Construction (latest edition).
- All concrete curbs shall be 6 inches in width, extend _____ inches above finished grade and 12 inches below finished grade, with all visible edge rounded to 1/2 inch radii.
- All concrete curbs shall have expansion joints constructed at intervals of not more than 30 feet, and 1/2 inch premolded expansion joint material (cut to conform to the curb or to the curb and gutter section) shall be used in each expansion joint.
- The last _____ feet of all concrete curbs are to be tapered down to finished grade.

Permit No. _____

X RIGHT-OF-WAY FENCE REPLACEMENT

- The replacement fence shall be a height of at least 48 inches and shall be of sufficient density to contain all animals (if applicable).
- The replacement fence shall be a minimum of 1 foot and a maximum of 2 feet outside the right-of-way line.
- The fence materials and design shall meet accepted industry standards and be treated as paintable.
- The permittee shall be required to maintain the fence in a high state of repair.
- The existing fence shall be removed by permittee and stored at the Department's maintenance storage yard for future reuse by the Department.
- The control of access shall not be diminished as a result of replacement of the fence.
- Miscellaneous:

NOTICE TO PERMITTEE

THE PERMITTEE AGREES THAT ALL WORK WITHIN THE EXISTING RIGHT OF WAY SHALL BE DONE IN ACCORDANCE WITH THE PLANS AS APPROVED AND PERMITTED BY AN ENCROACHMENT PERMIT. ANY CHANGES OR VARIANCES MADE AT THE TIME OF CONSTRUCTION WITHOUT WRITTEN APPROVAL FROM THE DEPARTMENT OF HIGHWAYS SHALL BE REMOVED BY THE PERMITTEE AT NO EXPENSE TO THE DEPARTMENT OF HIGHWAYS AND SHALL BE REDONE BY THE PERMITTEE TO CONFORM WITH THE APPROVED PLANS.

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL GENERAL

Traffic shall be maintained in accordance with the 2000 Standard Specifications and the Standard Drawings, current editions (TTC-100 attached). Contrary to Section 106.01, traffic control devices used on this project may be new, or used in like new condition, at the beginning of the work and maintained in like new condition until completion of the work. Traffic control devices and technical assistance may be obtained from Saf-Ti-Co (502)772-2511, Highway Safety Systems (502)366-5602, or any qualified traffic safety contractor.

PROJECT PHASING & CONSTRUCTION PROCEDURES

At the discretion of the KDOH Chief District Engineer, days and hours may be specified when lane closures will not be allowed. **Lane closures will only be allowed between 8:30am and 3:30pm and must be pre-approved. Contact Kevin Blain, Permits Engineer, at 766-5066 a minimum of 48 hours prior to proposed lane closure for approval.**

The clear lane width shall be a minimum of 10 feet.

Temporary striping for centerline (solid double yellow) must be in place each day prior to removing traffic control. Do not leave lane closures in place during non-working hours. Shoulder closures may be left in place overnight, providing they are properly signed and in accordance with the 2000 Standard Specifications and the Standard Drawings.

PAVEMENT EDGE DROP-OFFS

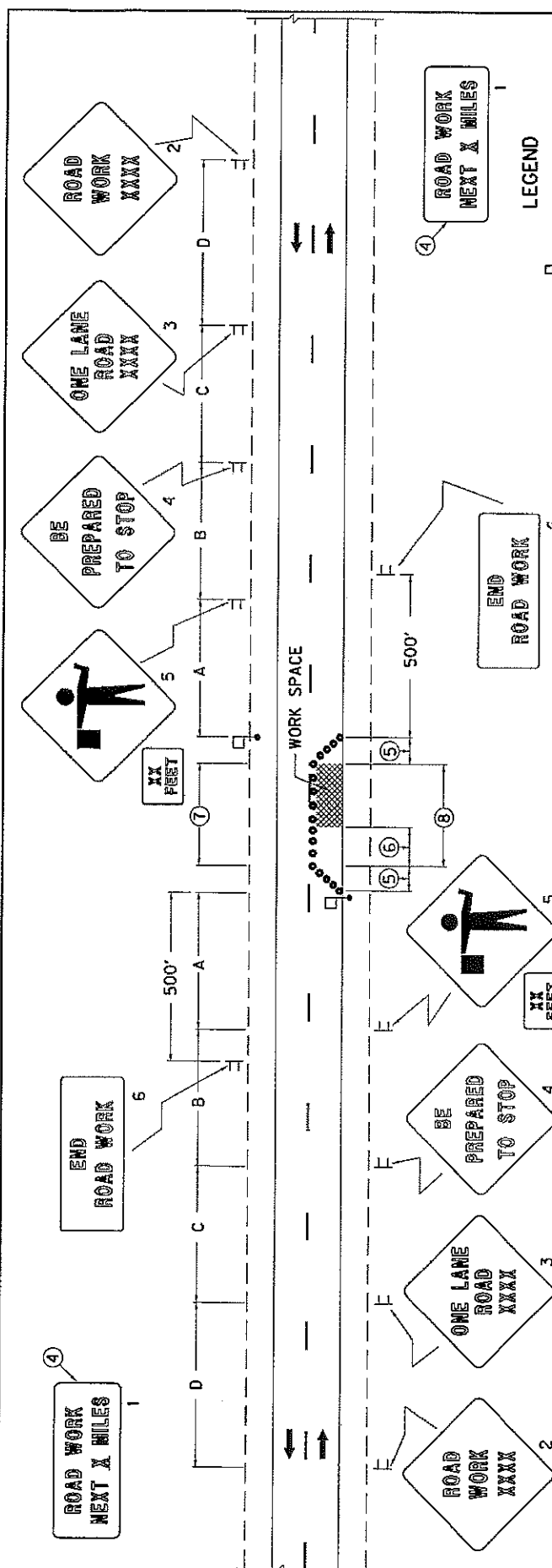
Warning signs (MUTCD W8-9A) shall be placed in advance of the drop-off area. Pavement edge shall be treated as follows:

Less than 2" - No protection required.

2" to 4" - Place plastic drums, vertical panels, or barricades every 50 feet. Cones may be used in place of plastic drums, panels, and barricades during daylight working hours.

Greater than 4" - Wedge with 3:1 or flatter slope. If there is 8' or more distance between the edge of pavement and drop-off, drums, panels or barricades may be used.

For temporary conditions, drop-offs greater than 4" may be protected with plastic drums, vertical panels or barricades for short distances during daylight hours while work is being done in the drop-off area.



- LEGEND**
- FLAGGER
 - ▭ SIGN
 - CHANNELIZING DEVICES
 - CONES
 - DRUMS
 - TYPE II BARRICADES
 - TUBULAR MARKERS

DRAWING NOT TO SCALE
 USE WITH CURRENT
 STD. DWG TTD-110

KENTUCKY
 DEPARTMENT OF HIGHWAYS
LANE CLOSURE
TWO-LANE HIGHWAY

STANDARD DRAWING NO. TTC-100-03
 SUBMITTED BY: *R. G. ...*
 APPROVED BY: *R. G. ...*
 DATE: 12-2-11

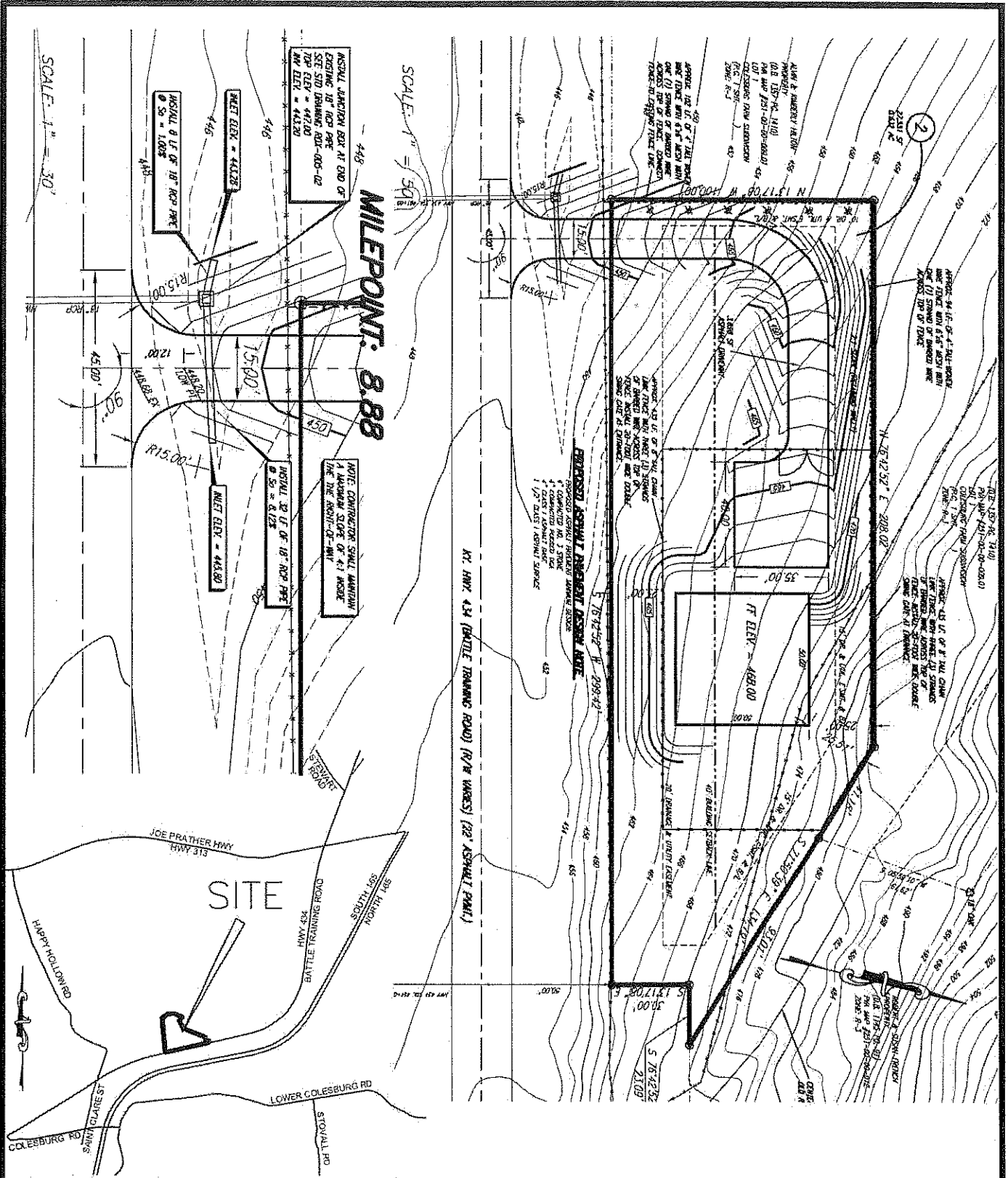
1. THE SIZE OF SIGNS 2 THRU 5 SHALL BE 48" X 48" (SUPPLEMENTAL PLAQUES SHALL BE 30" X 24") IF THE NORMAL POSTED SPEED LIMIT IS 45 MPH OR GREATER. OTHERWISE, 36" X 36" SIGNS (WITH 24" X 18" SUPPLEMENTAL PLAQUES) MAY BE USED. SIGN NOS. 1 AND 6 SHALL BE 48" X 24" IF THE NORMAL POSTED SPEED LIMIT IS 45 MPH OR GREATER, OTHERWISE 36" X 18" SIGNS MAY BE USED.
2. THE FLAGGERS SHALL BE IN SIGHT OF EACH OTHER OR IN DIRECT COMMUNICATION AT ALL TIMES. FLAGGER STATIONS SHALL BE LOCATED FAR ENOUGH IN ADVANCE OF THE ACTIVITY AREA SO THAT APPROACHING ROAD USERS WILL HAVE SUFFICIENT DISTANCE TO STOP BEFORE ENTERING THE WORK SPACE (REFER TO TABLE 6C-2 OF THE MUTCD). ILLUMINATION SHALL BE PROVIDED TO MARK FLAGGER STATIONS AT NIGHT.
3. DRUMS OR TYPE II BARRICADES SHALL BE USED IN LIEU OF CONES OR TUBULAR MARKERS IF CLOSURE EXTENDS INTO NIGHTTIME HOURS.
4. SIGN NO. 1 SHALL BE INSTALLED AT THE LIMITS OF THE PROJECT WHEN THE CONSTRUCTION ZONE IS LONGER THAN TWO MILES IN LENGTH. THE DISTANCE SHOWN SHALL BE STATED TO THE NEAREST WHOLE MILE.
5. TAPERS SHALL BE 50' (MIN) TO 100' (MAX) IN LENGTH. SPACING OF CHANNELIZING DEVICES SHOULD BE 20' THRU THE TAPER AREAS.
6. BUFFER SPACE (OPTIONAL). IF USED, THE BUFFER SPACE SHOULD BE EXTENDED SO THAT THE TWO-WAY TRAFFIC TAPER IS PLACED BEFORE A HORIZONTAL (OR CREST VERTICAL) CURVE TO PROVIDE ADEQUATE SIGHT DISTANCE FOR THE FLAGGER AND A QUEUE OF STOPPED VEHICLES.
7. SPACING OF CHANNELIZING DEVICES THRU THE ACTIVITY AREA SHOULD BE 80'.
8. FOR LANE CLOSURES DURING DAYLIGHT HOURS WITH ROADWAY WIDTHS FROM 16 TO 20 FEET, CONES SHALL BE USED. IF CHANNELIZING DEVICES CANNOT BE PROVIDED THROUGH THE WORK SPACE AND STILL ACHIEVE A USEABLE PAVEMENT WIDTH IN THE ADJACENT LANE FOR MOTORISTS TO SAFELY TRAVERSE THE WORK ZONE OR WHERE ROAD WIDTHS ARE LESS THAN 16 FEET, THE ROAD SHOULD BE CLOSED TO THROUGH TRAFFIC. LOCAL TRAFFIC SHALL BE MAINTAINED.
9. WHEN NIGHTTIME WORK IS BEING PERFORMED, FLOODLIGHTS SHOULD BE USED TO ILLUMINATE THE WORK AREA.

SIGNING AND SPACING TABLE

ROAD TYPE	A	B	C	D	SIGNS REQUIRED
EXPRESSWAY/ FREEWAY	1000'	500'	1100'	2600'	1 THRU 5
SP. LT. ≥ 45 MPH*	500'	500'	500'	1100'	1 THRU 5
SP. LT. ≤ 40 MPH*	250'	250'	250'	250'	1, 3 THRU 5

*NOTE: USE NORMAL POSTED SPEED LIMIT

APPLICATION
 THIS DRAWING APPLIES TO LANE CLOSURES ON TWO-LANE, TWO DIRECTION HIGHWAYS.



OWNER/DEVELOPER:
 HARDIN COUNTY WATER DISTRICT #2
 360 RING ROAD
 ELIZABETHTOWN KY 42701
 270-737-1056 (POC JAMES JEFFRIES)

SURVEYOR/ENGINEER:
 ENGINEERING DESIGN GROUP, INC.
 315 S. MULBERRY STREET
 P.O. BOX 2484
 ELIZABETHTOWN, KY. 42702-2484
 (270) 769-1436

COLESBURG PUMP STATION

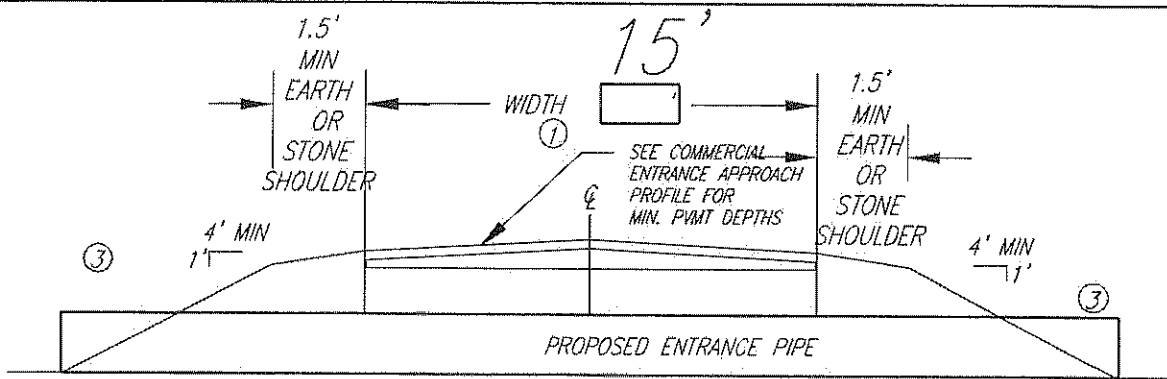
KY STATE HWY 434

BATTLE TRAINING ROAD



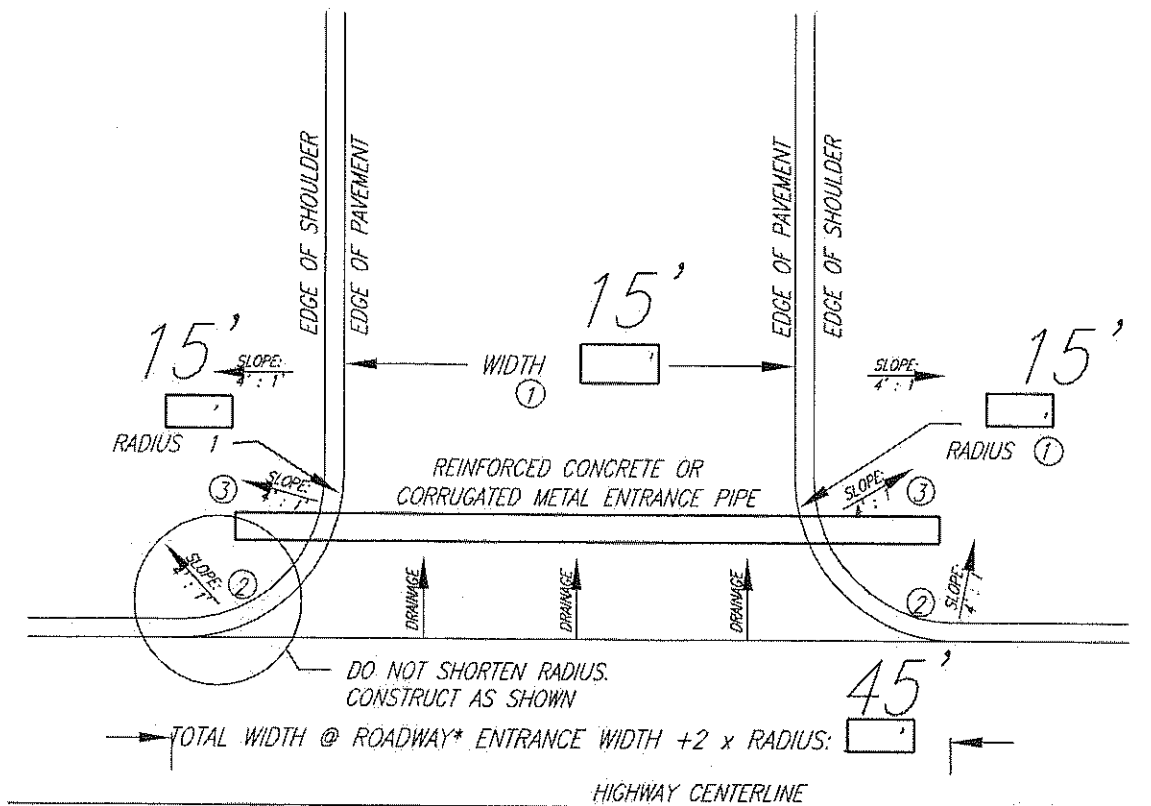
SCALE: 1" = 50' DATE: AUGUST 9, 2013

Z:/PROJECTS/HCWO-2/COLESBURG-PUMPSTATION/PUMPSTATION.DWG



SPECIAL NOTES:

- ① ALLOWABLE ENTRANCE WIDTHS 20'-50'. HOWEVER, ENTRANCE MUST BE CONSTRUCTED AS DRAWN OR HAVE CHANGES APPROVED BY KDOH
- ② ENTIRE RADIUS MUST BE CORRECTLY CONSTRUCTED BEFORE INDEMNITY WILL BE RELEASED.
- ③ CONSTRUCT ALL SIDE SLOPES TO A 4' (HORZ) BY 1' (VERT) SLOPE OR FLATTER AS SHOWN ABOVE. SAFETY HEADWALLS MAY BE REQUIRED ON PIPES GREATER THAN 18".
4. DRESS & SEED IN ACCORDANCE WITH KDOH STANDARDS.



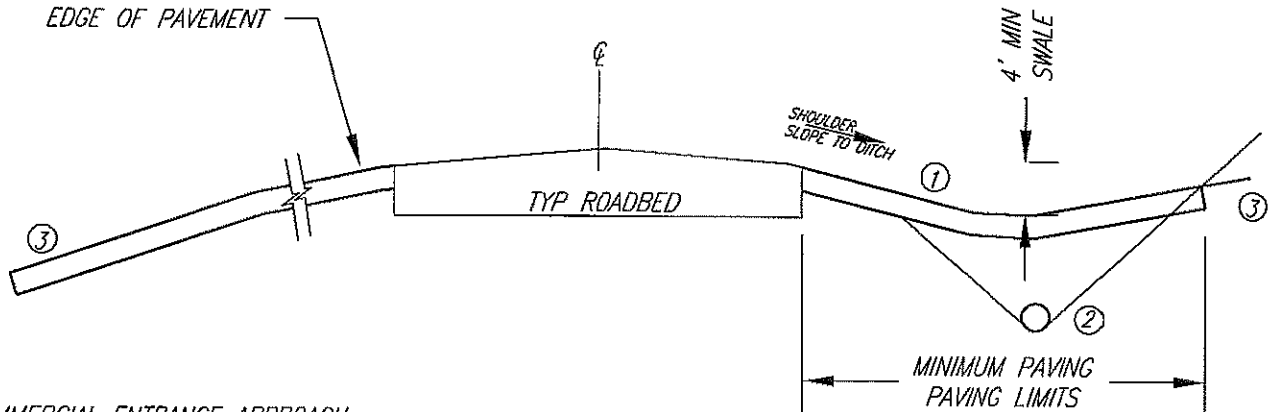
COMMERCIAL ENTRANCE
TYPICAL PIPE SECTION

CE TYPICAL.DGN 10/18/2007
DIST 4
REV 12/06

ROADWAY DRAINAGE DETAIL

EXTEND SHOULDER SLOPE
@ $\frac{1}{2}":1'$ TO 15'
MINIMUM FROM
EDGE OF PAVEMENT

EXTEND SHOULDER SLOPE @ $\frac{1}{2}":1'$
TO DITCH & CONSTRUCT SWALE OR LOW
POINT OVER PIPE



COMMERCIAL ENTRANCE APPROACH

ALL COMMERCIAL ENTRANCES MUST BE PAVED FROM THE EDGE OF DRIVING LANE TO A POINT PAST THE DITCH LINE AS SHOWN USING THE MINIMUM PAVEMENT DEPTHS BELOW UNLESS OTHERWISE PERMITTED BY PERMITS ENGINEER.

ASPHALT ENTRANCE APPROACH

SURFACE MATERIAL:

$\frac{1}{2}$ " ASPHALT SURFACE CL 2 0.38D PG64-22

BASE MATERIAL:

2 $\frac{1}{2}$ " ASPHALT BASE CL 2 1.0D PG64-22

SUBGRADE MATERIAL:

6" CRUSHED STONE BASE (PREFERRED) OR DGA

--OR--

CONCRETE ENTRANCE APPROACH

SURFACE MATERIAL:

8" PORTLAND CEMENT CONCRETE, CLASS A 3500 PSI

BASE MATERIAL:

4" CRUSHED STONE BASE (PREFERRED) OR DGA

--OR--

MATCH EXISTING PAVEMENT:

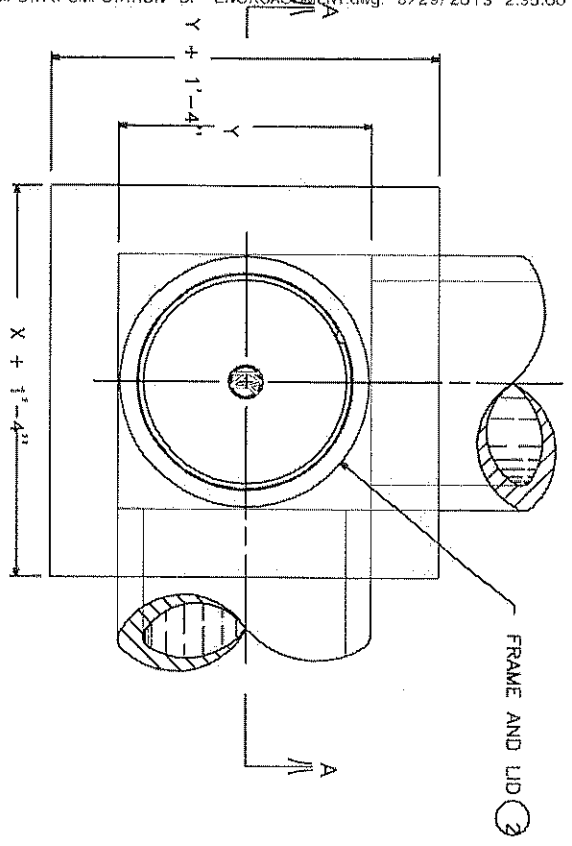
PAVEMENT TO BE EQUAL TO THE PAVEMENT DESIGN OF THE ROADWAY MAINLINE

SPECIAL NOTES:

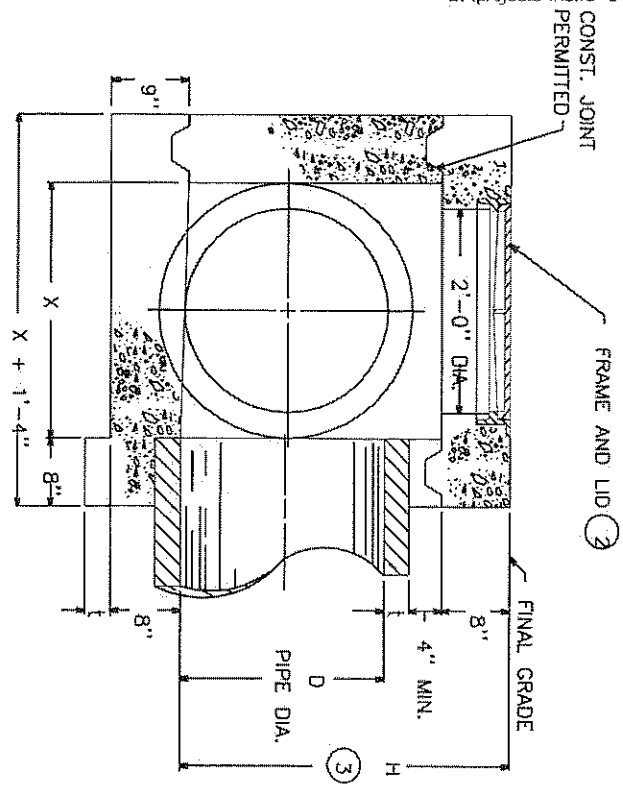
- ① ENTRANCE SHOULD BE CONSTRUCTED SO THAT ALL RUNOFF WILL DRAIN AWAY FROM ROADWAY & IS NOT ALLOWED ONTO THE SHOULDER OR DRIVING LANE.
- ② DITCHING OR OTHER EXCAVATION MAY BE NECESSARY TO ASSURE PROPER PIPE COVERAGE & PROVIDE POSITIVE DRAINAGE. MINIMUM DITCH FLOWLINE SLOPE IS $\frac{1}{2}'$ PER 100'.
- ③ MAXIMUM ENTRANCE SLOPE 16% ON RIGHT-OF-WAY. EXCAVATE WHERE NECESSARY TO ACHIEVE THIS SLOPE.
4. USE CORRUGATED METAL OR CONCRETE ENTRANCE PIPE. NO PLASTIC PIPE IS ALLOWED ON HIGHWAY RIGHT-OF-WAY WITHOUT PRIOR APPROVAL.
5. PIPE SIZE MUST BE APPROVED BY DISTRICT PERMITS ENGINEER.
6. CONSTRUCT 4:1 SLOPES AT PIPE ENDS. SAFETY HEADWALLS MAY BE REQUIRED ON PIPES GREATER THAN 18".

COMMERCIAL ENTRANCE APPROACH PROFILE

CE_PROFILE.DGN 3/26/2007
DIST 4
REV 11/07



PLAN VIEW



SECTION A-A

~ NOTES ~

1. THE CONTRACT UNIT PRICE EACH SHALL INCLUDE PAYMENT IN FULL FOR EXCAVATION, LABOR, FRAME AND LID, CONCRETE, AND ALL OTHER INCIDENTALS NECESSARY TO COMPLETE THE WORK.
 BID ITEM: JUNCTION BOX TYPE B (★)
 (★) = "1" (FRAME AND LID TYPE 1)
 (★) = "2" (FRAME AND LID TYPE 2)
2. WHEN THIS BOX IS TO BE USED IN NON-VEHICULAR TRAFFIC AREAS SEE CURRENT STD. DWG. RDM-100 "FRAME AND LID TYPE 1" WHEN THIS BOX IS TO BE USED IN VEHICULAR TRAFFIC AREAS SEE CURRENT STD. DWG. RDM-105 "FRAME AND LID TYPE 2."
3. THE MAXIMUM DEPTH OF BOX FROM FINAL GRADE TO FLOW LINE OF PIPE SHALL BE 8'-0". ANY BOXES DEEPER THAN 8'-0" SHALL BE SPECIFICALLY DESIGNED.
4. BASED ON H AS EQUAL TO D + t + 1'-0".
5. Q = CUBIC YARDS OF CONCRETE PER FOOT INCREASE OR DECREASE WHEN H VARIES FROM D + t + 1'-0".
6. NO DEDUCTIONS HAVE BEEN MADE FOR PIPE, SEE REFERENCE CHART FOR QUANTITIES TO DEDUCT.
7. THE DIMENSIONS AND QUANTITIES HAVE BEEN CALCULATED FOR ROUND CONCRETE PIPE. WHEN NON-CIRCULAR PIPE IS USED THE BOX SIZE SHALL BE DETERMINED BY CONTROLLING DIMENSIONS OF THE PIPE.
8. FOR THIS APPLICATION THE "X" DIMENSION IS ASSUMED TO BE EQUAL TO OR GREATER THAN THE "Y" DIMENSION.
9. THE BOX SIZE NUMBER TO BE SHOWN ON THE PLANS SHALL BE DETERMINED BY THE LARGEST PIPE IN THE "X" AND "Y" DIMENSION.

DIMENSIONS & ESTIMATE OF QUANTITIES

NO.	INLET SIZE	PIPE MAX. DIA.	H	CONCRETE CUBIC YARDS Q
1	2'-0"	12"	2'-2"	0.91
2	2'-0"	15"	2'-5"	0.98
3	2'-0"	18"	2'-9"	1.05
4	2'-6"	21"	3'-0"	1.27
5	2'-6"	21"	3'-0"	1.43
6	2'-0"	24"	3'-3"	1.36
7	2'-6"	24"	3'-3"	1.52

REFERENCE CHART		CONCRETE TO DEDUCT FOR EACH PIPE	CUBIC YARDS
DIA. OF PIPE	PIPE ON "X" SIDE OF BOX	PIPE ON "Y" SIDE OF BOX	
0	2'-0"	2'-0"	---
12"	2'-0"	2'-0"	0.1
15"-18"			
21"-24"	2'-6"	2'-6"	

SECTION 08331
OVERHEAD COILING DOORS
(ADDENDUM NO. 1)

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing all overhead door assemblies and frames and all appurtenant work, complete and operable, including miscellaneous metals for steel supports, hardware, locks, access panels, finish painting, field painting, parking control equipment for remote door controls, electrical connections and service for powered door operators.

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1.3 SPECIFICATIONS AND STANDARDS

A. General: Standards listed by reference, including revisions by issuing authority, from a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. American Society for Testing and Materials (ASTM):

1. ASTM A 653/A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. Manufacturers' Standards: In addition to the standards listed above, the overhead doors and their installation shall be in accordance with the manufacturer's published recommendations and specifications.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Manufactured materials shall be delivered in original and unbroken packages, containers, or bundles bearing the name of the manufacturer.

B. Storage: All materials shall be carefully stored in an area that is protected from deleterious elements. Storage shall be in a manner that will prevent damage or marring of the door and its finish.

PART 2 -- PRODUCTS

2.1 DOOR OPERATORS

A. Provide doors designed for hand chain operation.

1. Drive Orientation: For hand-chain operated doors, orient the drive from the left-hand side when facing the reference side of the door (side with counterbalance or hood exposed).

2.2 CURTAIN

A. Material: Interlocking steel slats, 20 gauge (0.036 inch minimum thickness), roll-formed from commercial quality hot-dipped galvanized (G-90) steel in compliance with ASTM A-653.

1. Slat Type: Insulated Flat Slat with back cover.
 - a. Insulation: Polyisocyanurate with R-value 6.24 and U-value 0.160.
 - b. Back Covers: Galvanized steel, 24 gauge (0.023 inch) minimum thickness.

B. Mounting: Face Mounting: fasten to face of wall on each side of door opening.

C. Color and Finish: One finish coat of Tan polyester paint applied over one coat of white epoxy primer.

D. Endlocks: Lateral movement of the slats to be contained by means of zinc-plated malleable endlocks fastened with two zinc-plated steel rivets.

E. Bottom Bar and Seal: Two roll-formed galvanized steel angles, minimum 1-1/2 inches by 1-1/2 inches by 1/8 inch (38.1 mm x 38.1 mm x 3.2 mm) with single-contact type bottom astragal. Structural angle bottom bar to receive one coat of rust-inhibitive primer.

F. Vision Panels: None.

G. Curtain Wear Straps: Polyester.

2.3 GUIDES

A. Guide Assemblies: To consist of three structural steel angles, minimum 3 inches by 2 inches by 3/16 inch and fitted with removable curtain stops. Steel guides to be provided with one coat of rust-inhibitive primer.

B. Jamb Construction: Masonry Jamb with anchor bolt fasteners.

C. Weather Seal: Snap-on vinyl seal.

2.4 COUNTERBALANCE SYSTEM

A. Headplates: 3/16 inch (4.8 mm) steel plate, attached to wall angle of guide assembly with 1/2 inch (12.7 mm) diameter class 5 case hardened bolts. Inside of drive bracket fitted with sealed ball bearing. Provide head plates with one coat of rust-inhibitive primer

B. Barrel: Minimum 4-1/2 inches (114.3 mm) O.D. and 0.120 inch (3.1 mm) wall thickness structural steel pipe. Deflection of pipe under full load shall not exceed 0.03 inch (0.8 mm) per foot of span.

C. Counterbalance: Provide torsion counterbalance mechanism as follows: Torsion Spring: Oil-tempered, helical torsion springs, grease packed and mounted on a continuous steel torsion shaft.

2.5 ENCLOSURES

A. Hood: Round Hood: 24 gauge steel, finish-painted to match curtain.

B. Hood Baffle: With EPDM rubber seal to inhibit air infiltration through hood cavity.

2.6 HARDWARE

A. Locks: Furnish door system with Locking Bar to receive padlock provided by owner.

PART 3 -- EXECUTION

3.1 GENERAL

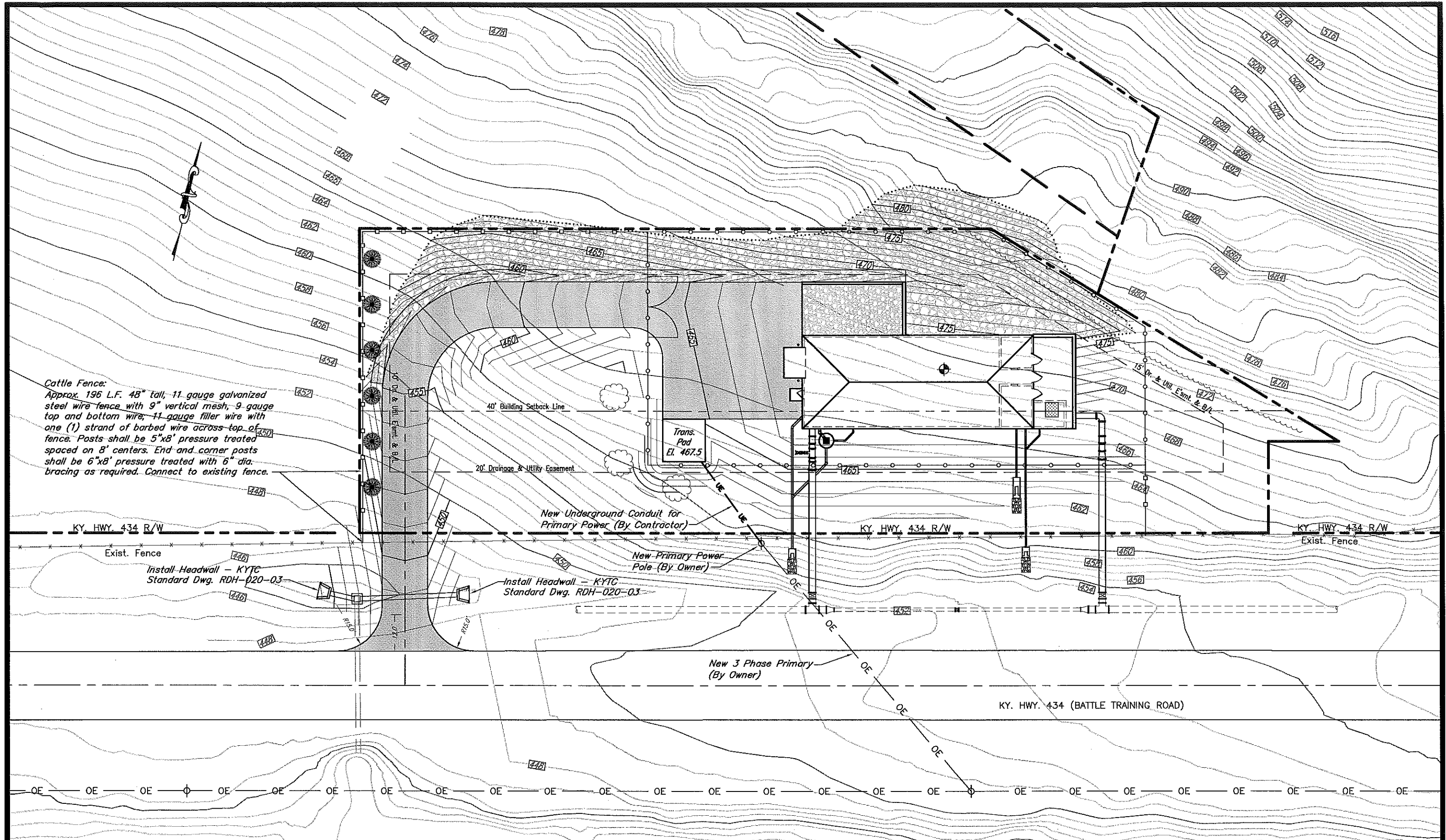
A. Installation shall be in accordance with the manufacturer's printed recommendations and instructions.

3.2 INSTALLATION

A. Doors shall be accurately cut, fitted, and installed level, square, plumb, and in alignment. Fasteners shall be sized for loads imposed and shall be of sufficient length. Doors shall be provided with accurately made cutouts, and shall be reinforced for strength where necessary. Doors shall be adjusted to provide smooth, unbinding operation with all hardware fully operable.

END OF SECTION

N:\P\2007107\PLANS\pump Station\Addendum No. 1\Site Plan.dwg, 3/4/2016 9:37:42 AM, JKP



Cattle Fence:
 Approx. 196 L.F. 48" tall, 11 gauge galvanized steel wire fence with 9" vertical mesh, 9 gauge top and bottom wire, 11 gauge filler wire with one (1) strand of barbed wire across top of fence. Posts shall be 5"x8' pressure treated spaced on 8' centers. End and corner posts shall be 6"x8' pressure treated with 6" dia. bracing as required. Connect to existing fence.

Install Headwall - KYTC
 Standard Dwg. RDH-020-03

Install Headwall - KYTC
 Standard Dwg. RDH-020-03

SHEET 1A - SITE PLAN REVISIONS

 **KENVIRONS, INC.**
 FRANKFORT, KENTUCKY

Project: 2007107
 Check By: RVW
 Date: 03/03/16
 Scale: 1"=30'

HARDIN COUNTY WATER DISTRICT NO. 2
COLESBURG PUMP STATION
ADDENDUM NO. 1

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00430	Bid Bond	1 to 2
	Compliance Statement (RD 400-6)	1 to 2
	Notice to Prospective Subcontractors of Requirements for Certifications of Non-Segregated Facilities	1
	Certification Regarding Debarment, Suspension, Ineligibility & Voluntary Exclusion	1 to 2
	Certification for Contracts, Grants & Loans	1
00510	Notice of Award	1
00521	Agreement	1 to 6
00610	Performance Bond	1 to 2
00615	Payment Bond	1 to 2
00550	Notice to Proceed	1
00625	Certificate of Substantial Completion	1
00710	General Conditions	1 to 57
00800	Supplementary Conditions	1 to 4
	Change Order (Form RD 1924-7)	1
	Partial Payment Estimate (Form RD 1924-18)	2
	Project Sign Detail	1
	KPDES Storm Water General Permit	
	Wage Determinations	
	Kentucky State Wage Determination	

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Appendix No. 1 – Report of Geotechnical Investigation

Battle Training Road Pump Station Site



**Section 00100
Advertisement for Bids**

**Hardin County Water District No. 2
360 Ring Road / P.O. Box 970
Elizabethtown, Kentucky 42701**

Separate Sealed BIDS for the construction of **Contract 26 – Colesburg Pump Station** will be received by the Hardin County Water District No. 2, 360 Ring Road, Elizabethtown, KY 42701 until 1:00 PM local time, March 9, 2016 and then publicly opened and read aloud. This contract consists of construction of the pump station and appurtenances.

The CONTRACT DOCUMENTS may be examined at the following locations:
Hardin County Water District No. 2, 360 Ring Road, Elizabethtown, KY 42701
KENVIRONS, INC., 452 VERSAILLES ROAD, FRANKFORT, KY 40601
F. W. DODGE/AGC, 950 CONTRACT STREET, LEXINGTON, KY 40505

Copies of the CONTRACT DOCUMENTS may be obtained from Lynn Imaging, 328 Old Vine Street, Lexington, KY 40507 (859-226-5850) and www.lynnimaging.com upon payment of a nonrefundable price of \$200.00 for each set plus any shipping charges.

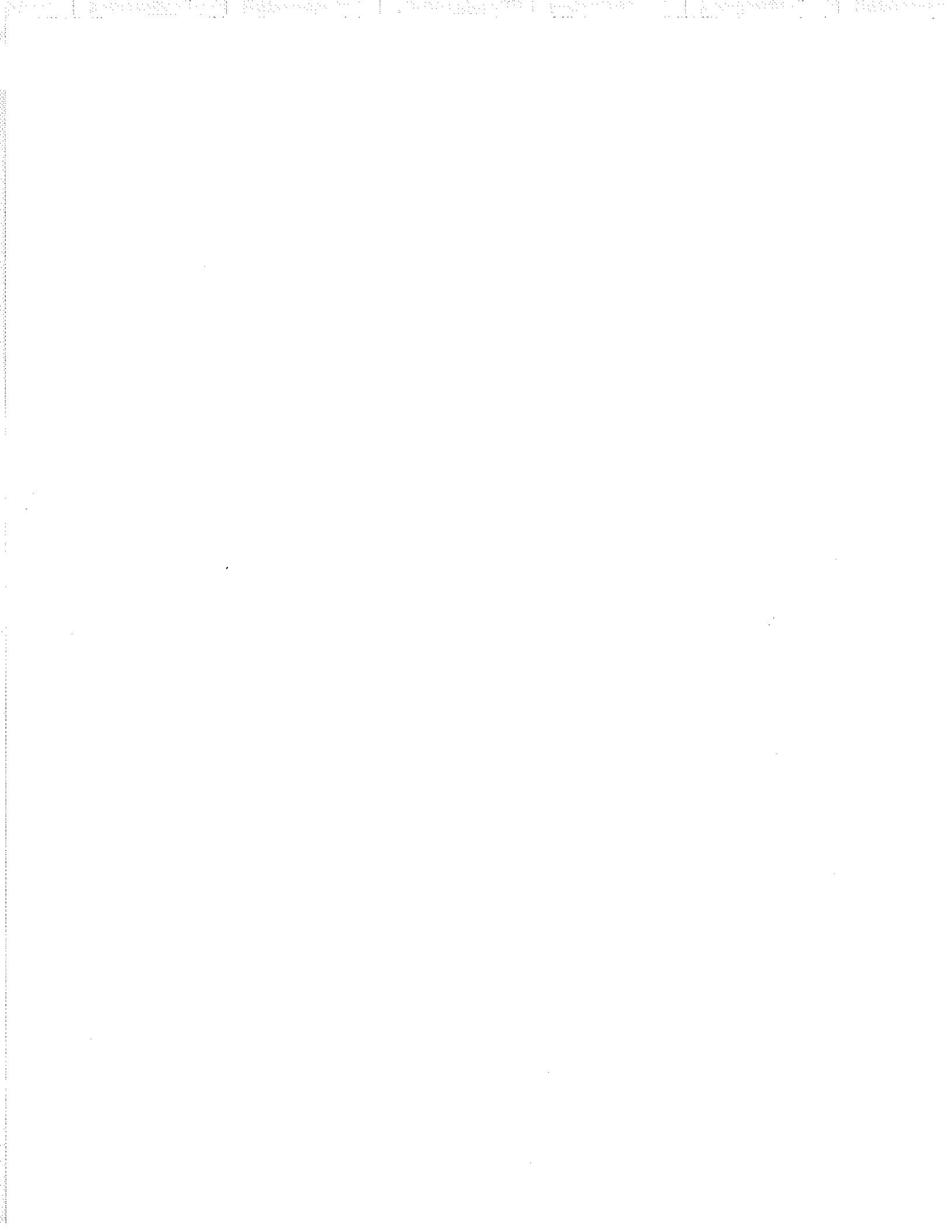
Each Bidder must accompany his bid with a Bid Bond in amount of not less than five (5) percent of the base bid. No Bidder may withdraw his bid for a period of ninety (90) days. The Bidder awarded the contract shall execute a 100% Performance Bond and a 100% Payment Bond and shall furnish insurance as required, in the General Conditions. This contract shall be completed within 270 calendar days after date of authorization to start work. Liquidated damages will be \$800 per calendar day.

Bidders must comply with the President's Executive Order Nos. 11246 and 11375, which prohibit discrimination in employment regarding race, creed, color, sex, or national origin. Bidders must comply with Section 3, Section 109, Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act and the contract Work Hours Standard Act. Bidders must certify that they do not, and will not, maintain or provide for their employees any facilities that are segregated on a basis of race, color, creed, or national origin.

Any bid that is obviously unbalanced may be rejected. The Hardin County Water District No. 2 reserves the right to reject any and all bids and waive informalities. Small, minority and women's businesses and labor surplus area firms are encouraged to bid this project.

By: Mike Bell, Chairman
Hardin County Water District No. 2

00100-1



**Section 00200
Instructions to Bidders**

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ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

- A. Issuing Office--The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the Advertisement for Bids may be obtained from the Issuing Office. *{If a refund of the deposit will be issued upon return of bidding documents, list here.}*
- 2.02 Complete sets of Bidding Documents must be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 Owner and Engineer in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, within five days of Owner's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be called for below.

A. References

B. Present Commitments

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 Subsurface and Physical Conditions

A. The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Bidding Documents.
2. Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Bidding Documents.

B. Copies of reports and drawings referenced in paragraph 4.01.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in paragraph 4.02 of the General Conditions has been identified and established in paragraph 4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 Underground Facilities

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

4.03 Hazardous Environmental Condition

A. The Supplementary Conditions identify those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that ENGINEER has used in preparing the Bidding Documents.

B. Copies of reports and drawings referenced in paragraph 4.03.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in paragraph 4.06 of the General Conditions has been identified and established in paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental

Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in paragraph 4.06 of the General Conditions.

- 4.05 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.
- 4.06 Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.
- 4.07 It is responsibility of each Bidder before submitting a Bid to:
- A. Examine and carefully study the Bidding Documents, the other related data identified in the Bidding Documents, and any Addenda;
 - B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
 - C. Become familiar with and satisfy Bidder as to all Federal, State, and local Laws and Regulations that may affect cost, progress, or performance of the Work;
 - D. Carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions, and (2) reports and drawings of Hazardous Environmental Conditions at the Site which have been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions;
 - E. Obtain and carefully study (or accept consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;
 - F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding;
 - G. Become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
 - H. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

- I. Promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and
 - J. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- 4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 - PRE-BID CONFERENCE

- 5.01 A pre-Bid conference will be held at *10:00 a.m. on March 3, 2016 at Hardin County Water District No. 2, 360 Ring Road, Elizabethtown, KY 42701 local time.* Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 - SITE AND OTHER AREAS

- 6.01 The Site is identified in the Bidding Documents. Easement for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than five days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

ARTICLE 8 - BID SECURITY

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 % of Bidder's maximum Bid price and in the form of a certified check or a Bid bond (EJCDC No. C-430, 2002 Edition) issued by a surety meeting the requirements of paragraphs 5.01 and 5.02 of the General Conditions.
- 8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the

Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 10 days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or 91 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

- 8.03 Bid security of other Bidders whom OWNER believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

- 9.01 The number of days within which, or the date by which, the Work is to be substantially completed. Upon substantial completion, if necessary, a date for final completion and payment should be determined between the Owner, Contractor, and Engineer based on remaining work, market, and weather conditions.

ARTICLE 10 - LIQUIDATED DAMAGES

- 10.01 Provisions for liquidated damages are set forth in the Agreement.

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

- 11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or "or-equal" materials and equipment as defined in paragraph 6.05 of the General Conditions, or those substitute materials and equipment approved by the Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function, and quality to be met by any proposed substitute or "or-equal" item. No item of material or equipment will be considered by Engineer as a substitute or equal until after the bids have been opened and the contract has been awarded. The burden of proof of the merit of the proposed item, and cost for review of a proposed substitute item, is upon the Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. Bidders shall not rely upon approvals made in any other manner. Any reduction made in contract price due to approval of a substitute item or equal, will be subtracted from the bidders contract and placed into contingency funds for the project.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, without an increase in the Bid.
- 12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest responsible Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner and Engineer makes no written objection prior to the giving

of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in paragraph 6.06 of the General Conditions.

- 12.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.
- 12.04 The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SC 6.06.

ARTICLE 13 - PREPARATION OF BID

- 13.01 The Bid form is included with the Bidding Documents. Additional copies may be obtained from Engineer.
- 13.02 All blanks on the Bid form shall be completed by printing in ink or by typewriter and the Bid signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each Bid item and alternative listed therein, or the words "No Bid," "No Change," or "Not Applicable" entered.
- 13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. If required by State where work is to be performed, the corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporation business address and state of incorporation shall be provided on the Bid Form.
- 13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The business address of the partnership shall be provided on the Bid Form.
- 13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the business address of the firm must be provided on the Bid Form.
- 13.06 A Bid by an individual shall show the Bidder's name and business address.
- 13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid form. The business address of the joint venture must be provided on the Bid Form.
- 13.08 All names shall be typed or printed in ink below the signatures.
- 13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers and dates of which shall be filled in on the Bid form.
- 13.10 The address and telephone number for communication regarding the Bid shall be shown.
- 13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number for the state of the Project, if any, shall also be shown on the Bid Form.

ARTICLE 14 - BASIS OF BID; COMPARISON OF BIDS

14.01 Lump Sum

- A. Bidders shall submit a Bid on lump sum basis as set forth in the Bid Form.

Unit Price

- A. Bidders shall submit a Bid on a unit price basis for each unit price item of Work listed in the Bid schedule.

ARTICLE 15 - SUBMITTAL OF BID

- 15.01 Bid Form is to be completed and submitted with all the attachments required.
- 15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement for Bids and shall be enclosed in an opaque sealed envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED." When using the mail or other delivery system, the Bidder is totally responsible for the mail or other delivery system delivering the Bid at the place and prior to the time indicated in the Advertisement for Bid. A mailed Bid shall be addressed to Owner at address in Article 1.01 of Bid Form.

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

- 16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.
- 16.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid or negotiated, that Bidder will be disqualified from further bidding on the Work. This provision to withdraw a Bid without forfeiting the Bid security does not apply to Bidder's errors in judgment in preparing the Bid.

ARTICLE 17 - OPENING OF BIDS

- 17.01 Bids will be opened at the time and place indicated in the Advertisement for Bids and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 18.01 All Bids will remain subject to acceptance for 90 days.

ARTICLE 19 - EVALUATION OF BIDS AND AWARD OF CONTRACT

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsive. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.
- 19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

- 19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- 19.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.
- 19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the contract Documents.
- 19.06 If the Contract is to be awarded, Owner will award the Contract to the responsible Bidder whose Bid, conforming with all the material terms and conditions of the Instructions to Bidders, is lowest in price and in the best interest of the Owner by considering other factors such as work history, recommendations, etc... In cases where the low bidder is not awarded the contract, submit an explanation of the selection process used, along with the recommendation for award, in order for all bidding requirements to be met for RD to concur in award of contract.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

- 20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by such bonds.

ARTICLE 21 - SIGNING OF AGREEMENT

- 21.01 When Owner gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within ten (10) days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within ten days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.
- 21.02 This Contract is expected to be funded in part with funds provided by the United States Department of Agriculture, Rural Development (RD). Refer to Article 18 of the General Conditions for information on the Federal Requirements.
- 21.03 Concurrence by RD in the award of the Contract is required before the Contract is effective.

**Section 00410
Bid Form**

Project Identification: Louisville Water Company Supplementary Supply

Contract Identification and Number: Contract 26 – Colesburg Pump Station

ARTICLE 1 - BID RECIPIENT

- 1.01 This Bid Is Submitted To: Hardin County Water District No. 2, 360 Ring Road, Elizabethtown, Kentucky 42701
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in the Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - BIDDER'S ACKNOWLEDGMENTS

- 2.01 Bidder accepts all of the terms and conditions of the Advertisement and Instructions to Bidders, including without limitations those dealing with the dispositions of Bid security. The Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

- 3.01 In submitting this Bid, Bidder represents that:
 - A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____
_____	_____
 - B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. Bidder is familiar with and is satisfied as to all Federal, State, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in SC-4.02, and (2) reports and drawings of a Hazard Environmental Condition, if any, which has been identified in SC-4.06.
 - E. Bidder has obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect

of the means, methods, techniques, sequences, and procedures of construction to be employed by the Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

- F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of the Work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.
- I. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
- J. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.
- K. Bidder will submit written evidence of its authority to do business in the State where the Project is located not later than the date of its execution of the Agreement.

ARTICLE 4 - FURTHER REPRESENTATIONS

4.01 Bidder further represents that:

- A. This Bid is genuine and not made in the interest of or on the behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

ARTICLE 5 - BASIS OF BID

Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Base Bid

<u>No.</u>	<u>Item Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Item Price</u>
1	Pump Station, Complete and Operable	LS	1	\$ _____	\$ _____
2	Sitework	LS	1	_____	_____
3	Yard Piping	LS	1	_____	_____
4	Bituminous concrete paving per plan dimensions including 18" RCP & Junction Box	LS	1	_____	_____
5	Chain Link Fence	LF	468	_____	_____
6	Woven Wire Fence	LF	196	_____	_____
7	Mobilization, Bonds, Insurance and Project Sign	LS	1	_____	_____
8	Structural Fill	TON	1,000	_____	_____
9	Equipment Allowance	LS	1	45,000.00	45,000.00
10	Fire Alarm System	LS	1	_____	_____
Total Base Bid					\$ _____

- A. See Specification Section 0100 for Bid Item Descriptions.
- B. Unit Prices have been computed in accordance with paragraph 11.03.A of the General Conditions.
- C. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the contract Documents.

ARTICLE 6 - TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete in accordance with paragraph 14.07.B of the General Conditions on or before the date, or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the work within the Contract Times.

ARTICLE 7 - ATTACHEMENTS TO THIS BID

- 7.01 The following documents are attached to and made a condition of the Bid:

- A. Required Bid security in the form of a Bid Bond (EJCDC No. C-430) or Certified Check (circle type of security provided);
- B. If Bid amount exceeds \$10,000, signed Compliance Statement (RD 400-6). Refer to specific equal opportunity requirements set forth in paragraph 18.10 of the General Conditions; **NA**
- C. If Bid amount exceeds \$25,000, signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier Covered Transactions (AD-1048); **NA**
- D. If Bid amount exceeds \$100,000, signed RD Instruction 1940-Q, Exhibit A-1, Certification for Contracts, Grants and Loans. Refer to paragraph 18.11 of the General Conditions. **NA**

ARTICLE 8 - DEFINED TERMS

8.01 The terms used in this Bid with the initial capitol letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 - BID SUBMITTAL

9.01 This Bid submitted by:

Name (typed or printed): _____

By: _____
(Individual's signature)

SEAL,
if required
by State

Doing business as: _____

Bidder's Business address:

Business Phone No. (____) _____

Business FAX No. (____) _____

Business E-Mail Address _____

State Contractor License No. _____ (If applicable)

Employer's Tax ID No. _____

Phone and FAX Numbers, and Address for receipt of official communications, if different from Business contact information:

9.02 Bid submitted on _____, 20____.

BID BOND

Any singular reference to Bidder, Surety, Owner, or other party shall be considered plural where applicable.

BIDDER (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):

BID

Bid Due Date:

Project (Brief Description Including Location):

BOND

Bond Number:

Date (Not later than Bid due date):

Penal sum

(Words)

(Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER

SURETY

(Seal

(Seal)

Bidder's Name and Corporate Seal

Surety's Name and Corporate Seal

By: _____
Signature and Title

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title

Attest: _____
Signature and Title

Note: Above addresses are to be used for giving required notice.

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

COMPLIANCE STATEMENT

This statement relates to a proposed contract with _____

(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Rural Housing Service (RHS), Rural Business-Cooperative Service (RBS), or the Rural Utilities Service (RUS) or their successor agencies, United States Department of Agriculture (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor, I represent that:

1. I have have not, participated in a previous contract or subcontract subject to Executive 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.
2. If I have participated in such a contract or subcontract, I have, have not, filed all compliance reports that have been required to file in connection with the contract or subcontract.

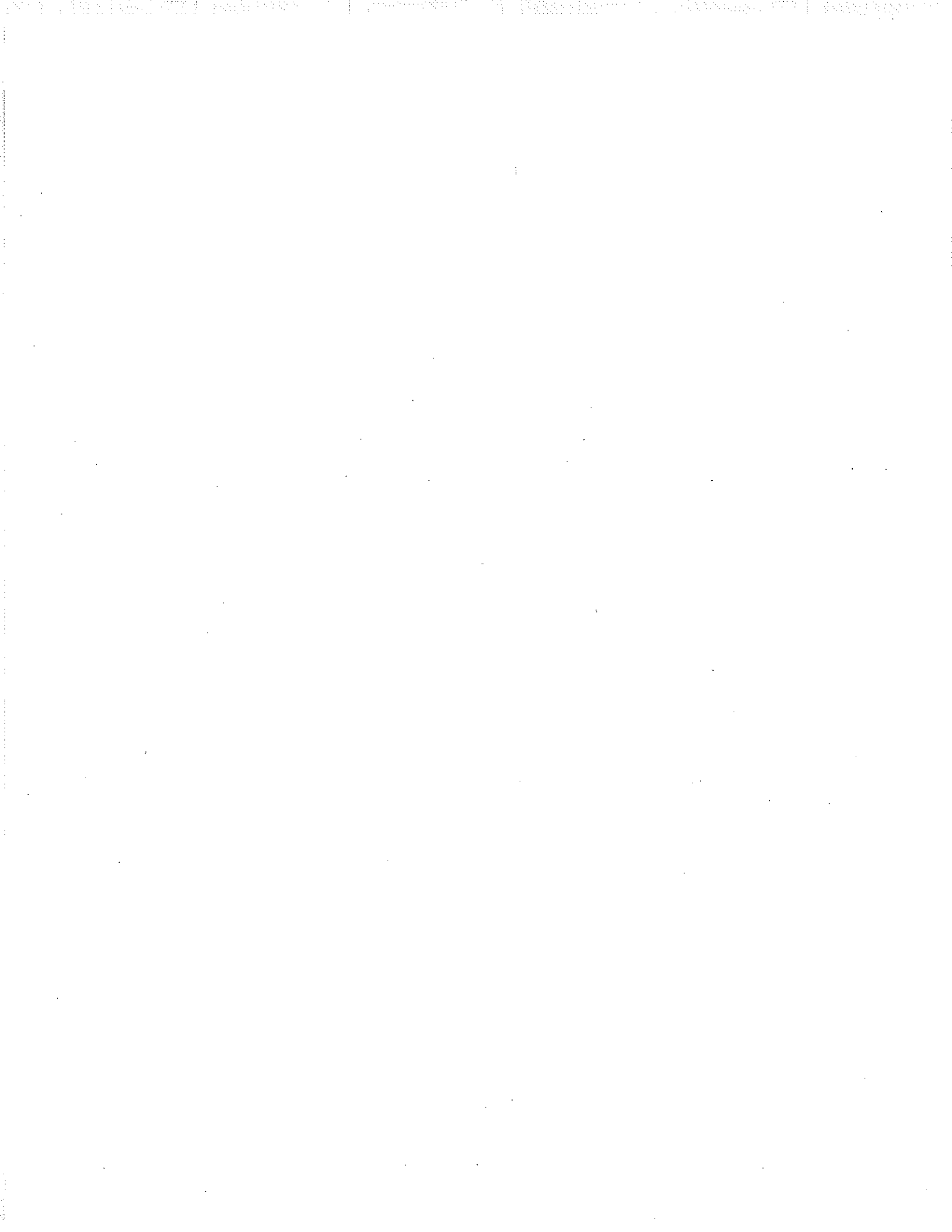
If the proposed contract is for \$50,000 or more and I have 50 or more employees, I also represent that:

3. I have, have not previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.
4. If I have participated in such a contract or subcontract, I have, have not developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the RHS, RBS or RUS, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, restaurants and other eating areas time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods): (See Reverse).

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays the valid OMB control number. The valid OMB control number for this information collection is 0575-0018. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.



**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR
CERTIFICATIONS OF NON-SEGREGATED FACILITIES**

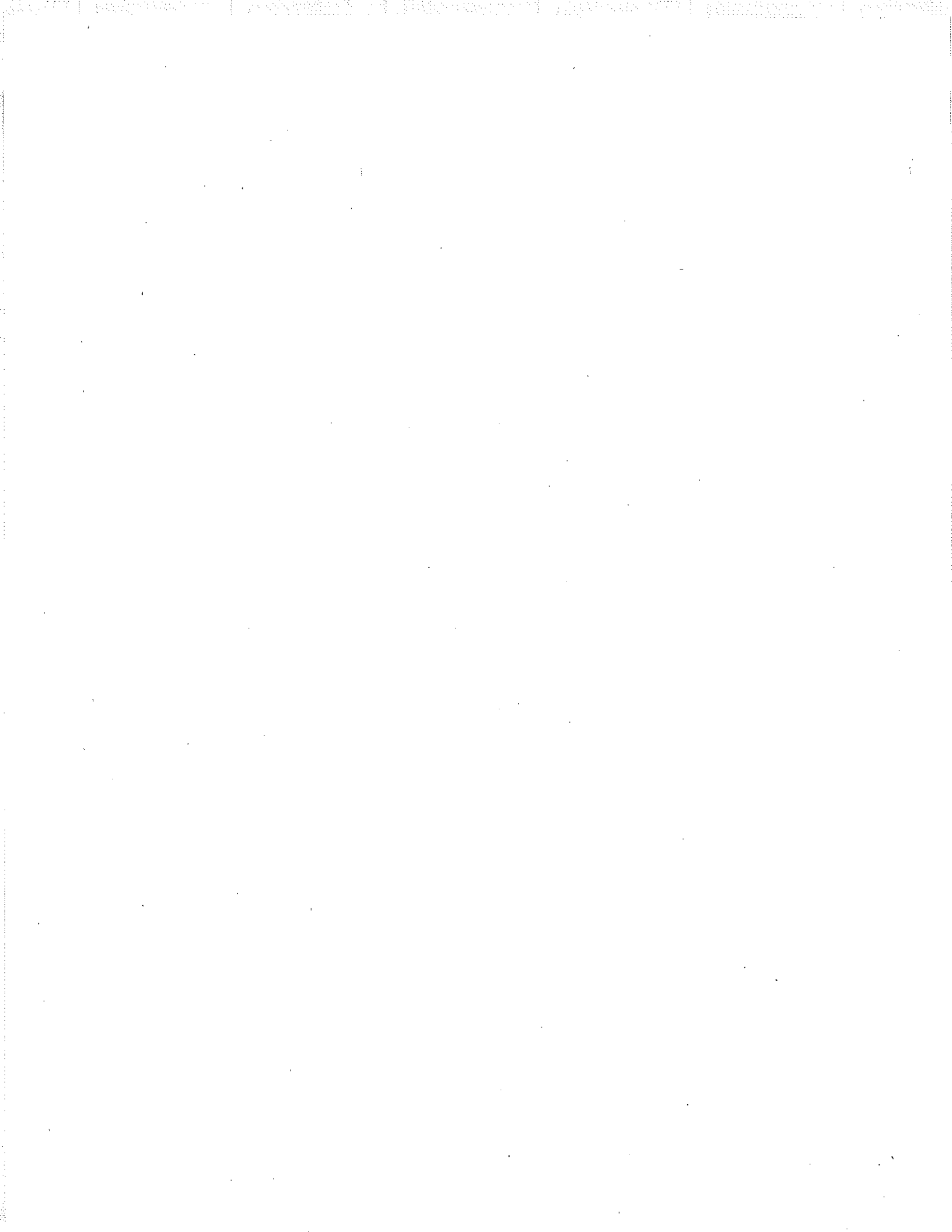
A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, may 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$ 10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

Date _____

(Signature of Bidder or Prospective Contractor)

Address (including Zip Code)



U.S. DEPARTMENT OF AGRICULTURE

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY
AND VOLUNTARY EXCLUSION - LOWER TIER COVERED TRANSACTIONS**

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 7 CFR Part 3017, Section 3017.510, Participants' responsibilities. The regulations were published as Part IV of the January 30, 1989, Federal Register (pages 4722-4733). Copies of the regulations may be obtained by contacting the Department of Agriculture agency with which this transaction originated.

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)

- (1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
- (2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

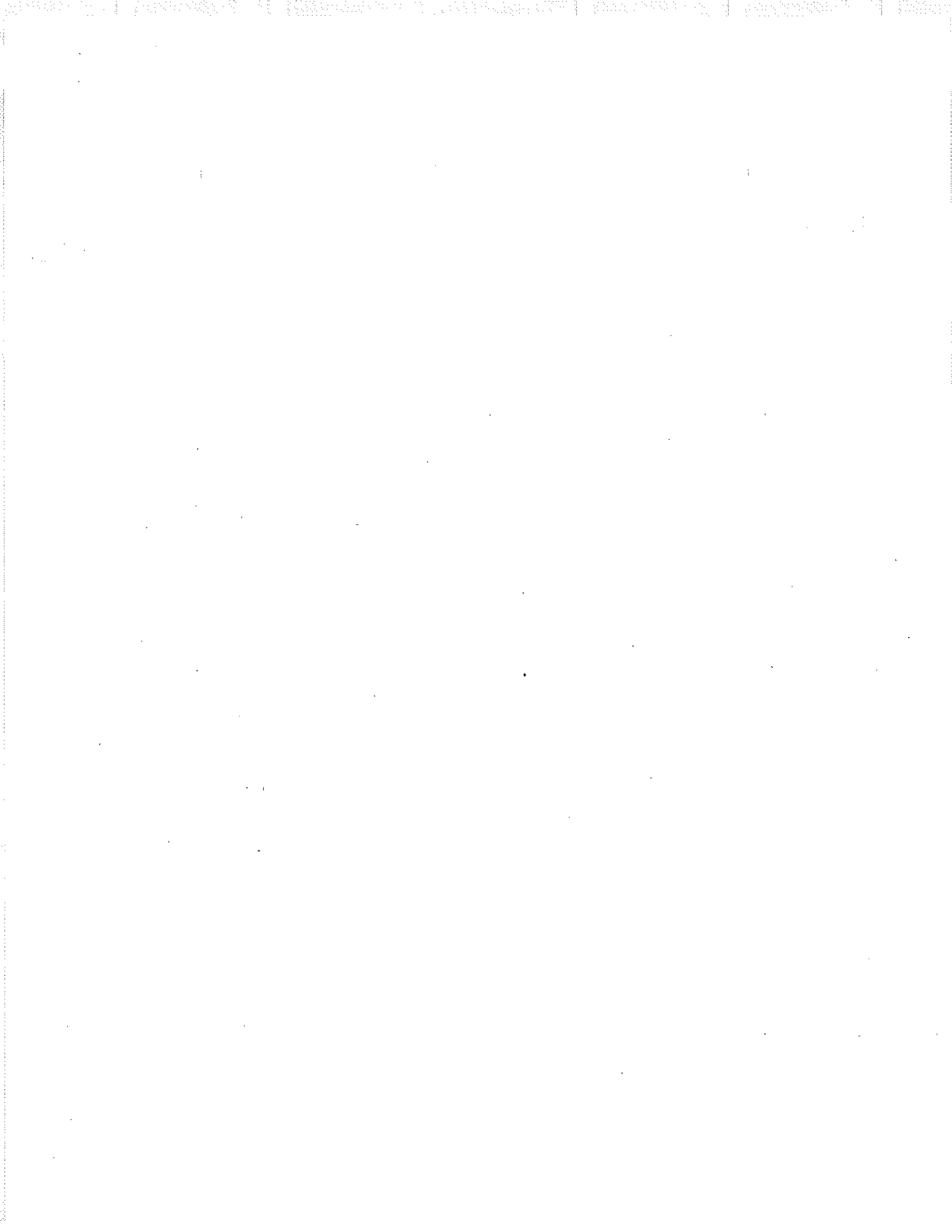
Organization Name

PR/Award Number or Project Name

Name(s) and Title(s) of Authorized Representative(s)

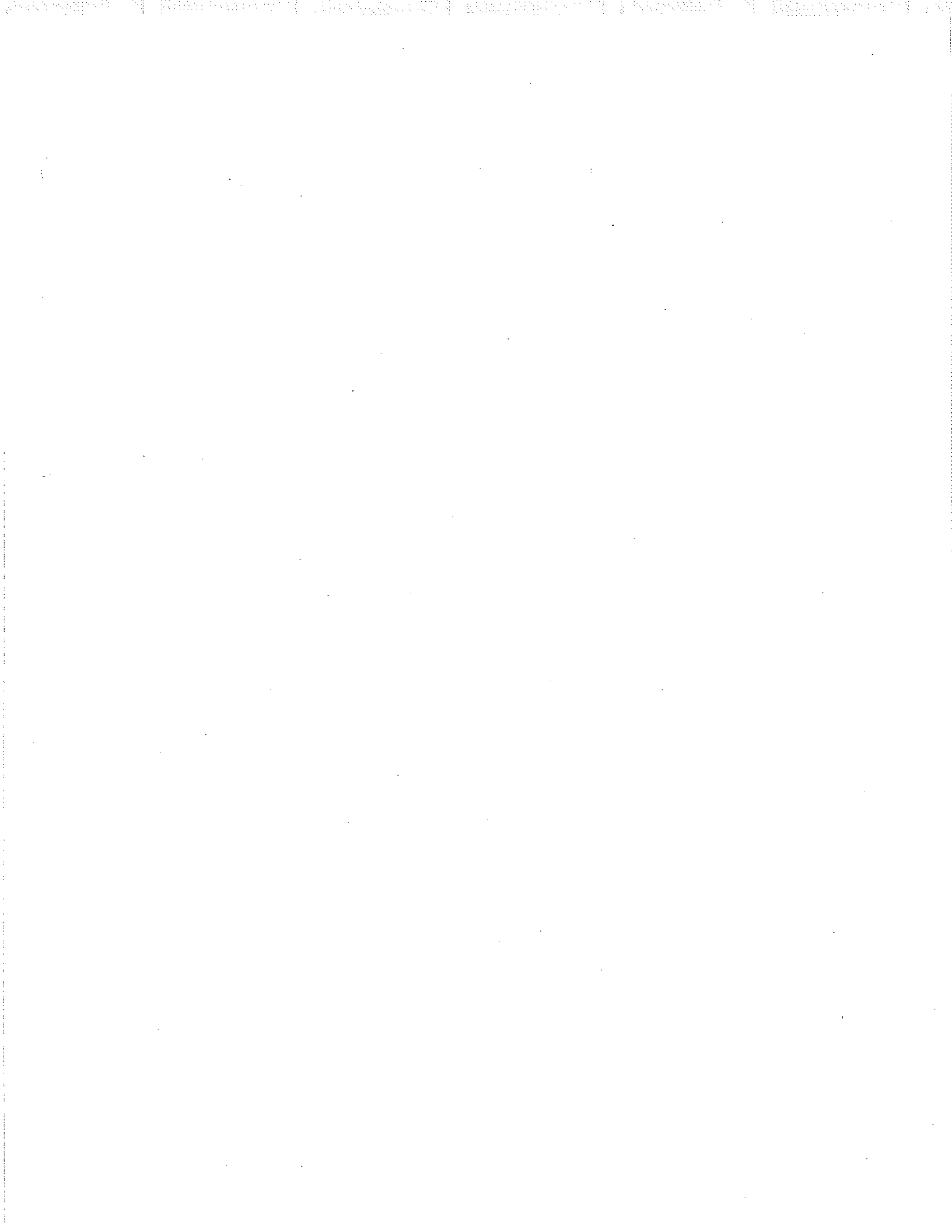
Signature(s)

Date



Instructions for Certification

1. By signing and submitting this form, the prospective lower tier participant is providing the certification set out on the reverse side in accordance with these instructions.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later than determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms "covered transactions," "debarred," "suspended," "ineligible," "lower tier covered transactions," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this form that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.



CERTIFICATION FOR CONTRACTS, GRANTS AND LOANS

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant or Federal loan, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant or loan.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant or loan, the undersigned shall complete and submit Standard Form - LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including contracts, subcontracts, and subgrants under grants and loans) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

(name)

(date)

(title)

oOo



NOTICE OF AWARD

To: _____

PROJECT

Description: _____

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated _____, _____, and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of \$_____.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this ____ day of _____, _____.

Owner

By: _____

Title: _____ President

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by _____ This the ____ day of _____, _____.

By: _____

Title: _____



**SUGGESTED FORM OF AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)
FUNDING AGENCY EDITION**

THIS AGREEMENT is by and between Hardin County Water District No. 2 (“Owner”) and
_____ (“Contractor”).

Owner and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1 – WORK

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

Construction of one booster pump station and all appurtenant work.

ARTICLE 2 – THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

Contract 26: Colesburg Pump Station

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by Kenvirons, Inc. (Engineer), who is to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

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

4.02 *Days to Achieve Substantial Completion and Final Payment*

A. The Work will be substantially completed within 210 days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and completed and ready for final payment at a date determined by Owner, Contractor, and Engineer after substantial completion, based on remaining work, weather and market conditions.

4.03 *Liquidated Damages*

Contractor and Owner recognize that time is of the essence on this Project and that the Owner will suffer financial loss if the Work is not substantially completed within the time specified in Paragraph 4.02 above, plus any extensions allowed

in accordance with Article 12 of the General Conditions. Accordingly, Contractor shall pay Owner \$500 for each day that expires after the time specified in Paragraph 4.02 until the work is substantially complete. After substantial completion, retainage may be reduced to an amount agreed upon by Owner, Contractor, and Engineer. It should be no less than 150% of the amount required for the completion and ready for final payment. Liquidated damages may not be assessed after substantial completion has been achieved.

ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraphs 5.01.A, 5.01.B, and 5.01.C below:

A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 25th day of each month during performance of the Work as provided in Paragraphs 6.02.A.1 and 6.02.A.2 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements:

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions:
 - a. 95 percent of Work completed (with the balance being retainage); and
 - b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
2. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, plus any reduction in retainage that has been agreed upon by Owner, Contractor, and Engineer.

6.03 *Final Payment*

A. Upon receipt of the final Application for Payment accompanied by Engineer's recommendation of payment in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay Contractor as provided in Paragraph 14.07 of the General Conditions the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages.

ARTICLE 7 – INTEREST

7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the maximum legal rate.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Agreement Contractor makes the following representations:

- A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
- B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 4.02 of the General Conditions.
- E. Contractor has obtained and carefully studied (or assumes responsibility for doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto.
- F. Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.
- G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
- I. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

- A. The Contract Documents consist of the following:

1. This Agreement (pages 1 to 6, inclusive).
 2. Performance bond (pages 1 to 2, inclusive).
 3. Payment bond (pages 1 to 2, inclusive).
 4. Other bonds (pages _____ to _____, inclusive).
 - a. _____ (pages _____ to _____, inclusive).
 - b. _____ (pages _____ to _____, inclusive).
 - c. _____ (pages _____ to _____, inclusive).
 5. General Conditions (pages 1 to 57, inclusive).
 6. Supplementary Conditions (pages 1 to 4, inclusive).
 7. Specifications as listed in the table of contents of the Project Manual.
 8. Drawings consisting of __ sheets with each sheet bearing the following general title: Addenda (numbers 1 to 1, inclusive).
 9. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid (pages 1 to 4, inclusive).
 - b. Documentation submitted by Contractor prior to Notice of Award (pages NA to _____, inclusive).
 - c. _____.
 10. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
 - a. Notice to Proceed
 - b. Work Change Directives.
 - c. Change Order(s).
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

- A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Other Provisions*

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement in four copies. One counterpart each has been delivered to Owner, Contractor, Engineer, and Agency. All portions of the Contract Documents have been signed, initialed, or identified by Owner and Contractor or identified by Engineer on their behalf.

NOTE(S) TO USER

See I-21 and correlate procedures for format and signing between the two documents.

This Agreement is dated _____. This Agreement shall not be effective unless and until Agency's designated representative concurs.

OWNER:

CONTRACTOR

Hardin County Water District No. 2

By: _____

By: _____

Title: Chairman

Title: _____

[CORPORATE SEAL]

[CORPORATE SEAL]

Attest: _____

Attest: _____

Title: General Manager

Title: _____

Address for giving notices:

Address for giving notices:

P.O. Box 970

Elizabethtown, KY 42701

Agent for service of process:

(If Contractor is a corporation or a partnership, attach evidence of authority to sign.)

Agency Concurrence: NA

As lender or insurer of funds to defray the costs of this Contract, and without liability for any payments thereunder, the Agency hereby concurs in the form, content, and execution of this Agreement.

Agency: _____

By: _____

Date: _____

Title: _____

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address): Hardin County Water District No. 2
360 Ring Road
Elizabethtown, Kentucky 42701

CONTRACT

Date:

Amount:

Description (Name and Location): Contract 26: Colesburg Pump Station
Hardin County, Kentucky

BOND

Bond Number:

Date (Not earlier than Contract Date):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

Company:

Signature: _____ (Seal)

Name and Title:

SURETY

(Seal)

Surety's Name and Corporate Seal

By: _____

Signature and Title

(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest: _____

Signature and Title

CONTRACTOR AS PRINCIPAL

Company:

Signature: _____ (Seal)

Name and Title:

SURETY

(Seal)

Surety's Name and Corporate Seal

By: _____

Signature and Title

(Attach Power of Attorney)

Attest: _____

Signature and Title:

EJCDC No. C-610 (2002 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, and the American Institute of Architects.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.
2. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 3.1.
3. If there is no Owner Default, Surety's obligation under this Bond shall arise after:
 - 3.1. Owner has notified Contractor and Surety, at the addresses described in Paragraph 10 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and
 - 3.2. Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 3.1; and
 - 3.3. Owner has agreed to pay the Balance of the Contract Price to:
 1. Surety in accordance with the terms of the Contract;
 2. Another contractor selected pursuant to Paragraph 4.3 to perform the Contract.
4. When Owner has satisfied the conditions of Paragraph 3, Surety shall promptly and at Surety's expense take one of the following actions:
 - 4.1. Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or
 - 4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
 - 4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and Contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or
 - 4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:
 1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or
 2. Deny liability in whole or in part and notify Owner citing reasons therefor.
5. If Surety does not proceed as provided in Paragraph 4 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 4.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.
6. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To a limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:
 - 6.1. The responsibilities of Contractor for correction of defective Work and completion of the Contract;
 - 6.2. Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions or failure to act of Surety under Paragraph 4; and
 - 6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.
7. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.
8. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.
9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
10. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.
11. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
12. Definitions.
 - 12.1. Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.
 - 12.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
 - 12.3. Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
 - 12.4. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

FOR INFORMATION ONLY – Name, Address and Telephone
 Surety Agency or Broker
 Owner's Representative (engineer or other party)

PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address): Hardin County Water District No. 2
360 Ring Road
Elizabethtown, Kentucky 42701

CONTRACT

Date:

Amount:

Description (Name and Location): Contract 26: Colesburg Pump Station
Hardin County, Kentucky

BOND

Bond Number:

Date (Not earlier than Contract Date):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Payment Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Company:

Signature: _____ (Seal)

Name and Title:

(Seal)

Surety's Name and Corporate Seal

By: _____

Signature and Title

(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest: _____

Signature and Title

CONTRACTOR AS PRINCIPAL

SURETY

Company:

Signature: _____ (Seal)

Name and Title:

(Seal)

Surety's Name and Corporate Seal

By: _____

Signature and Title

(Attach Power of Attorney)

Attest: _____

Signature and Title:

EJCDC No. C-615 (2002 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, the American Institute of Architects, the American Subcontractors Association, and the Associated Specialty Contractors.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.
2. With respect to Owner, this obligation shall be null and void if Contractor:
 - 2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and
 - 2.2. Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.
4. Surety shall have no obligation to Claimants under this Bond until:
 - 4.1. Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the addresses described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
 - 4.2. Claimants who do not have a direct contract with Contractor:
 1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and
 2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and
 3. Not having been paid within the above 30 days, have sent a written notice to Surety and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.
5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.
6. When a Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at Surety's expense take the following actions:
 - 6.1. Send an answer to that Claimant, with a copy to Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.
 - 6.2. Pay or arrange for payment of any undisputed amounts.
7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.
8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.
9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.
10. Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.
11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.
13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.
14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.
15. DEFINITIONS
 - 15.1. Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
 - 15.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
 - 15.3. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

**FOR INFORMATION ONLY – Name, Address and Telephone
 Surety Agency or Broker:
 Owner's Representative (engineer or other party):**

NOTICE TO PROCEED

TO: _____ DATE: _____

_____ Project: _____
_____ Contract 26 – Colesburg Pump Station

You are hereby notified to commence WORK in accordance with the Agreement dated _____, on or before _____, _____ and you are to complete the WORK within 210 consecutive calendar days thereafter. The date of completion of all WORK is therefore _____, _____.

Hardin County Water District No. 2
Owner

By _____
Title Chairman

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED

is hereby acknowledged by _____

_____ this the

_____, 2014.

By _____

Title _____

Employer Identification
Number _____



SECTION 00625 Certificate of Substantial Completion

Project: James Road and Bandy Area Reinforcements and Extensions	Owner: Southeastern Water Association	Owner's Contract No.:
Contract: Contract 8 - James Road and Bandy Area Pump Stations		Date of Contract:
Contractor:		Engineer's Project No.: 2007269

This [tentative] [definitive] Certificate of Substantial Completion applies to:

- All Work under the Contract Documents:
 The following specified portions:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

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

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:

- Amended Responsibilities
 Not Amended

Owner's Amended Responsibilities:

Contractor's Amended Responsibilities:

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

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

Executed by Engineer

Date

Accepted by Contractor

Date

Accepted by Owner

Date



This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the Controlling Law.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT FUNDING AGENCY EDITION

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By



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AMERICAN COUNCIL OF ENGINEERING COMPANIES

AMERICAN SOCIETY OF CIVIL ENGINEERS

This document has been approved and endorsed by

The Associated General Contractors of America



and the

Construction Specification Institute



Knowledge for Creating
and Sustaining
the Built Environment

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor Funding Agency Edition No. C-521 (2002 Edition). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the EJCDC Construction Documents, General and Instructions (No. C-001, 2002 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (No. C-800, 2002 Edition).

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GENERAL CONDITIONS

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda* – Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agency* – The Federal or state agency named as such in the Agreement.
 3. *Agreement* – The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 4. *Application for Payment* – The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 5. *Asbestos* – Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 6. *Bid* – The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 7. *Bidder* – The individual or entity who submits a Bid directly to Owner.
 8. *Bidding Documents* – The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 9. *Bidding Requirements* – The Advertisement or Invitation to Bid, Instructions to Bidders, bid security of acceptable form, if any, and the Bid Form with any supplements.
 10. *Change Order* – A document recommended by Engineer which is signed by Contractor and Owner and Agency and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
 11. *Claim* – A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 12. *Contract* – The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
 13. *Contract Documents* – Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor's submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

14. *Contract Price* – The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
15. *Contract Times* – The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any, (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
16. *Contractor* – The individual or entity with whom Owner has entered into the Agreement.
17. *Cost of the Work* – See Paragraph 11.01.A for definition.
18. *Drawings* – That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
19. *Effective Date of the Agreement* – The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
20. *Engineer* – The individual or entity named as such in the Agreement.
21. *Field Order* – A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
22. *General Requirements* – Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.
23. *Hazardous Environmental Condition* – The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.
24. *Hazardous Waste* – The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
25. *Laws and Regulations; Laws or Regulations* – Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens* – Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
27. *Milestone* – A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.
28. *Notice of Award* – The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
29. *Notice to Proceed* – A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
30. *Owner* – The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
31. *PCBs* – Polychlorinated biphenyls.

32. *Petroleum* – Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
33. *Progress Schedule* – A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
34. *Project* – The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
35. *Project Manual* – The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
36. *Radioactive Material* – Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
37. *Related Entity* – An officer, director, partner, employee, agent, consultant, or subcontractor.
38. *Resident Project Representative* – The authorized representative of Engineer who may be assigned to the Site or any part thereof.
39. *Samples* – Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
40. *Schedule of Submittals* – A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
41. *Schedule of Values* – A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
42. *Shop Drawings* – All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
43. *Site* – Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
44. *Specifications* – That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
45. *Subcontractor* – An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
46. *Substantial Completion* – The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.
47. *Successful Bidder* – The Bidder submitting a responsive Bid to whom Owner makes an award.

48. *Supplementary Conditions* – That part of the Contract Documents which amends or supplements these General Conditions.
49. *Supplier* – A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.
50. *Underground Facilities* – All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
51. *Unit Price Work* – Work to be paid for on the basis of unit prices.
52. *Work* – The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
53. *Work Change Directive* – A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and Agency upon recommendation of the Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

- A. The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.
 - B. *Intent of Certain Terms or Adjectives*
 1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.
- C. *Day*
 1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents, or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or
 - c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement.

2.04 *Starting the Work*

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

2.05 *Before Starting Construction*

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

2.06 *Preconstruction Conference*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, Agency, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage

as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 Reference Standards

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

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

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 - 1. A Field Order;
 - 2. Engineer's approval of a Shop Drawing or Sample; (Subject to the provisions of Paragraph 6.17.D.3) or
 - 3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

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

3.06 *Electronic Data*

- A. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any,

of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

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

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and
2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb

such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review.* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

- A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and
 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data,
 - b. locating all Underground Facilities shown or indicated in the Contract Documents,

- c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and
- d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

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

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any.
- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06. H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

5.04 *Contractor's Liability Insurance*

- A. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
 5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
 2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
 3. include completed operations insurance;
 4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
 5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
 6. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
 7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.
 - a. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (Contractor shall be responsible for any deductible or self-insured retention). This insurance shall:
1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
 2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.
- B. Contractor shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.
- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Contractor as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for:
1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Contractor and made payable to Contractor as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Contractor shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof.
- B. Contractor as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Contractor's exercise of this power. If such objection be made, Contractor as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Contractor as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Contractor as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of

non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
 - 1. "*Or-Equal*" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times, and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
 - b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
 - c. The procedure requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances.
 - d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) will perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;
 - b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
 - c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services;
 - 4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor
 2. shall anything in the Contract Documents create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's primary responsibility to make certain

that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work, Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved

Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
1. all persons on the Site or who may be affected by the Work;
 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract

Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

- A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.
1. *Shop Drawings*
 - a. Submit number of copies specified in the General Requirements.
 - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.
 2. *Samples*
 - a. Submit number of Samples specified in the Specifications.
 - b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
- B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Submittal Procedures*
1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:
 - a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;
 - c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and
 - d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.
 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
 3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its Related Entities shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. use or occupancy of the Work or any part thereof by Owner;
5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
6. any inspection, test, or approval by others; or
7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, consultants and subcontractors arising out of:
 1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
 - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 - 3. the extent of such authority and responsibilities will be provided.

- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

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

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

- A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

8.06 *Insurance*

- A. Owner's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

- A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

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

8.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

- A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and will not be changed without written consent of Owner and Engineer.

9.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

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

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, subject to written approval by Agency at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

10.03 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 Notification to Surety.

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

10.05 Claims

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).
- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part,
 2. approve the Claim, or
 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.
 - 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
 - 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 - 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
 - 4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
 - 5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are

consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

- c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressages, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.

- C. **Contractor's Fee:** When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. **Documentation:** Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

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

11.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if
1. the Bid price of a particular item of Unit Price Work amounts to more than 5 percent of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and
 2. there is no corresponding adjustment with respect to any other item of Work; and
 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. Contractor's Fee: The Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

- e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
- f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.B.
 - 1. delays caused by or within the control of Contractor; or
- D. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of Engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

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

13.03 *Tests and Inspections*

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

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

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. repair such defective land or areas; or
 - 2. correct such defective Work; or
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;

- b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
 - b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
- a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. the Contractor's performance or furnishing of the Work is inconsistent with funding Agency requirements;
 - d. there are other items entitling Owner to a set-off against the amount recommended; or
 - e. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.
3. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1.

14.03 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Agency, Contractor, and Engineer shall make a prefinal inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will within said 14 days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.
 - 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

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

14.07 *Final Payment*

A. *Application for Payment*

- 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.7;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Engineer's Review of Application and Acceptance

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims. The remaining balance of any sum included in the final Application for Payment but held by OWNER for Work not fully completed and accepted will become due when the Work is fully completed and accepted.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
3. Contractor's disregard of the authority of Engineer; or
4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),
2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and
3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by

Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B, and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 - 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

- A. Owner and Contractor may mutually request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association. Timely submission of the request shall stay the effect of Paragraph 10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
 1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions, or
 2. agrees with the other party to submit the Claim to another dispute resolution process, or
 3. gives written notice to the other party of their intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or
 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

ARTICLE 18 – FEDERAL REQUIREMENTS

18.01 *Agency Not a Party*

- A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees is a party to this Contract.

18.02 *Contract Approval*

- A. Owner and Contractor will furnish Owner's attorney such evidence as required so that Owner's attorney can complete and execute the following "Certificate of Owner's Attorney" (Exhibit GC-A) before Owner submits the executed Contract Documents to Agency for approval.
- B. Concurrence by Agency in the award of the Contract is required before the Contract is effective.

18.03 *Conflict of Interest*

- A. Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer.
- B. Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.

18.04 *Gratuities*

- A. If Owner finds after a notice and hearing that Contractor, or any of Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, Owner may, by written notice to Contractor, terminate this Contract. Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.
- B. In the event this Contract is terminated as provided in paragraph 18.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of this Contract by Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, Owner may pursue exemplary damages in an

amount (as determined by Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.

18.05 *Audit and Access to Records*

- A. For all negotiated contracts and negotiated modifications (except those of \$10,000 or less), Owner, Agency, the Comptroller General, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Contractor, which are pertinent to the Contract, for the purpose of making audits, examinations, excerpts and transcriptions. Contractor shall maintain all required records for three years after final payment is made and all other pending matters are closed.

18.06 *Small, Minority and Women's Businesses*

- A. If Contractor intends to let any subcontracts for a portion of the work, Contractor shall take affirmative steps to assure that small, minority and women's businesses are used when possible as sources of supplies, equipment, construction, and services. Affirmative steps shall consist of: (1) including qualified small, minority and women's businesses on solicitation lists; (2) assuring that small, minority and women's businesses are solicited whenever they are potential sources; (3) dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women's businesses; (4) establishing delivery schedules, where the requirements of the work permit, which will encourage participation by small, minority and women's businesses; (5) using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce; (6) requiring each party to a subcontract to take the affirmative steps of this section; and (7) Contractor is encouraged to procure goods and services from labor surplus area firms.

18.07 *Anti-Kickback*

- A. Contractor shall comply with the Copeland Anti-Kickback Act (18 USC 874 and 40 USC 276c) as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.

18.08 *Clean Air and Pollution Control Acts*

- A. If this Contract exceeds \$100,000, Contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 USC 7401 *et seq.*) and the Federal Water Pollution Control Act as amended (33 USC 1251 *et seq.*). Contractor will report violations to the Agency and the Regional Office of the EPA.

18.09 *State Energy Policy*

- A. Contractor shall comply with the Energy Policy and Conservation Act (P.L. 94-163). Mandatory standards and policies relating to energy efficiency, contained in any applicable State Energy Conservation Plan, shall be utilized.

18.10 *Equal Opportunity Requirements*

- A. If this Contract exceeds \$10,000, Contractor shall comply with Executive Order 11246, "Equal Employment Opportunity," as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and as supplemented by regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."
- B. Contractor's compliance with Executive Order 11246 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative active obligations required by the Standard Federal Equal Employment

Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4 and its efforts to meet the goals established for the geographical area where the Contract is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting Contractor's goals shall be a violation of the Contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

- C. Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the Contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number; estimated dollar amount of subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the Contract is to be performed.

18.11 *Restrictions on Lobbying*

- A. Contractor and each subcontractor shall comply with Restrictions on Lobbying (Public Law 101-121, Section 319) as supplemented by applicable Agency regulations. This Law applies to the recipients of contracts and subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. If applicable, Contractor must complete a certification form on lobbying activities related to a specific Federal loan or grant that is a funding source for this Contract. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 USC 1352. Each tier shall disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Certifications and disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

18.12 *Environmental Requirements*

- A. When constructing a project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental constraints:
1. Wetlands – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
 2. Floodplains – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, i.e., alluvial soils on NRCS Soil Survey Maps.
 3. Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact shall be immediately reported to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the State Historic Preservation Officer (SHPO).
 4. Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

EXHIBIT GC-A

Certificate of Owner's Attorney

I, the undersigned, _____, the duly authorized and acting legal representative of _____, do hereby certify as follows:

I have examined the attached Contract(s) and performance and payment bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements is adequate and has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions, and provisions thereof.

Date: _____



Section 00800 Supplementary Conditions

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract Funding Agency Edition (No. C-710, 2002 Edition) and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions will have the meanings indicated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

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SC-1.01.A.2. Add the following language to the end of Paragraph 1.01.A.2:

The Project is financed in whole or in part by USDA Rural Development pursuant to the Consolidated Farm and Rural Development Act (7 USC Section 1921 et seq.).

SC-1.01.A.4. Add the following language to the end of Paragraph 1.01.A.4:

The Application for Payment form to be used on this Project is Form RD 1924-18. The Agency must approve all Applications for Payment before payment is made.

SC-1.01.A.10. Add the following language to the end of Paragraph 1.01.A.10:

The Change Order form to be used on this Project is Form RD 1927-7. Agency approval is required before Change Orders are effective.

SC-1.01.A.15. Delete in it's entirety and replace with the following:

Contract Times: The number of days or date stated in the Agreement to achieve substantial completion. Final completion date will be determined by Contractor, Owner and Engineer, after substantial completion, based on remaining work, weather and market conditions.

SC-2.03.A. Delete Paragraph 2.03.A in its entirety and insert the following in its place:

- A. The Contract Times will commence to run on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 10 days after the Effective Date of the Agreement.

SC-4.02. Delete Paragraphs 4.02.A and 4.02.B in their entirety and insert the following:

- C. In preparation of Drawings and Specification, Engineer relied upon the following reports of exploration and tests of subsurface conditions at the site: N/A

SC-4.06. Delete Paragraphs 4.06.A and 4.06.B in their entirety and insert the following:

- A. No reports or explorations or tests of subsurface conditions at or contiguous to the Site are known to the Owner or Engineer.
- B. Not used.

SC-5.03. Add the following new paragraph immediately after Paragraph 5.03.B:

- C. Failure of the Owner to demand such certificates or other evidence of full compliance with these insurance requirements or failure of the Owner to identify a deficiency from evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

SC-5.04. Add the following new paragraph immediately after Paragraph 5.04.B:

- C. The limits of liability for insurance required by Paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

- 1. Workers' Compensation, and related coverages under Paragraphs 5.04.A.1 and A.2 of the General Conditions:

- a. State: Statutory
- b. Applicable Federal (e.g., Longshoremen's) Statutory
- c. Employer's Liability \$ 500,000

- 2. Contractor's General Liability under Paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody, and control of the Contractor:

- a. General Aggregate \$ 2,000,000
- b. Products - Completed Operations Aggregate \$ 1,000,000
- c. Personal and Advertising Injury \$ 1,000,000

- d. Each Occurrence
(Bodily Injury and
Property Damage) \$ 1,000,000
 - e. Property Damage liability
insurance will provide
Explosion, Collapse, and
Underground coverages where
applicable.
 - f. Excess or Umbrella Liability
 - 1) General Aggregate \$ 5,000,000
 - 2) Each Occurrence \$ 5,000,000
3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions:
- a. Bodily Injury:
 - Each Person \$ 1,000,000
 - Each Accident \$ 1,000,000
 - b. Property Damage:
 - Each Accident \$ 1,000,000
 - c. Combined Single Limit of \$ 1,000,000
4. The Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:
- a. Bodily Injury:
 - Each Person \$ 2,000,000
 - Each Accident \$ 2,000,000
 - b. Property Damage:
 - Each Accident \$ 2,000,000
 - Annual Aggregate \$ 2,000,000

SC-6.06 Add a new paragraph immediately after Paragraph 6.06.G:

- H. The Contractor shall not award work valued at more than fifty (50%) percent of the Contract Price to Subcontractor(s), without prior written approval of the Owner.

SC-9.03.A. Add the following language at the end of paragraph 9.03.A:

The Engineer will provide Resident Project Representative services for this project. The Duties, Responsibilities, and Limitations of Authority of the Resident Project Representative will be as stated in Exhibit D of the Agreement Between Owner and Engineer, E-510, 2002 Edition, as amended and executed for this specific Project.

SC-14.02.A.3 Add the following language at the end of paragraph 14.02.A.3:

No payments will be made that would deplete the retainage prior to substantial completion, nor place in escrow any funds that are required for retainage, or invest the retainage for benefit.

SC-14.02.C.1. Delete Paragraph 14.02.C.1 in its entirety and insert the following in its place:

- 1. The Application for Payment with Engineer's recommendations will be presented to the Owner and Agency for consideration. If both the Owner and Agency find the Application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 14.02.D will become due ten days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

SC-18.08 Delete paragraph 18.08.A in its entirety and insert the following in its place:

- A. If this Contract exceeds \$100,000, the Contractor shall comply with all applicable standards, orders, or requirements issued under Section 306 of the Clean Air Act (42 USC §1857(h)), Section 508 of the Clean Water Act (33 USC §1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR Part 15).

Form RD 1924-18
(Rev. 6-97)

UNITED STATES DEPARTMENT OF AGRICULTURE
RURAL DEVELOPMENT
FARM SERVICE AGENCY

PARTIAL PAYMENT ESTIMATE

CONTRACT NO. _____

PARTIAL PAYMENT ESTIMATE NO. _____

PAGE _____

OWNER: _____

CONTRACTOR: _____

PERIOD OF ESTIMATE

FROM _____ TO _____

CONTRACT CHANGE ORDER SUMMARY

ESTIMATE

No.	Agency Approval Date	Amount			
		Additions	Deductions		
				1. Original Contract	
				2. Change Orders	\$0.00
				3. Revised Contract (1 + 2)	\$0.00
				4. Work Completed*	
				5. Stored Materials*	
				6. Subtotal (4 + 5)	\$0.00
				7. Retainage*	
				8. Previous Payments	
				9. Amount Due (6-7-8)	\$0.00
TOTALS		\$0.00	\$0.00	* Detailed breakdown attached	
NET CHANGE		\$0.00	\$0.00		

CONTRACT TIME

Original (days) _____
Revised _____
Remaining _____

On Schedule

Yes
 No

Starting Date _____
Projected Completion _____

CONTRACTOR'S CERTIFICATION:

The undersigned Contractor certifies that to the best of their knowledge, information and belief the work covered by this payment estimate has been completed in accordance with the contract documents, that all amounts have been paid by the contractor for work for which previous payment estimates was issued and payments received from the owner, and that current payment shown herein is now due.

Contractor _____

By _____

Date _____

APPROVED BY OWNER:

Owner _____

By _____

Date _____

ARCHITECT OR ENGINEER'S CERTIFICATION:

The undersigned certifies that the work has been carefully inspected and to the best of their knowledge and belief, the quantities shown in this estimate are correct and the work has been performed in accordance with the contract documents.

Architect or Engineer _____

By _____

Date _____

ACCEPTED BY AGENCY:

The review and acceptance of this estimate does not attest to the correctness of the quantities shown or that the work has been performed in accordance with the contract documents.

By _____

Title _____

Date _____

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0575-0042. The time required to complete this information collection is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed and completing and reviewing the collection of information.

AMERICAN RECOVERY AND REINVESTMENT ACT TEMPORARY CONSTRUCTION SIGN FOR USDA RURAL DEVELOPMENT PROJECTS

PANTONE
 SOLID
 COATED

BLUE PMS 534C

RED PMS, 484C

GREEN, PMS 576

TOWNSCAPE
 AND LETTER
 FORMS
 (BLUE, PMS 288)

ROLLING FIELDS
 (GREEN, PMS 343)

LETTERING
 (GREEN, PMS 343)

WHITE BACKGROUND

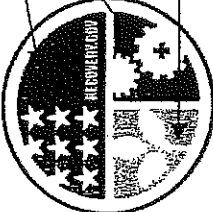
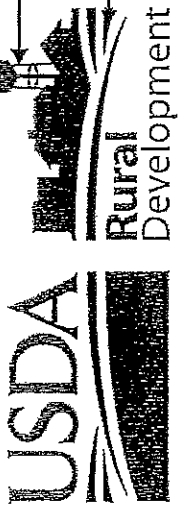
Project Title

Sponsor / Developer

Official(s) or Sponsor Address

Architect or Engineer
 (second line)

Contractor
 (second line)

Committed to the future of rural communities.

Financed by United States Department of Agriculture (USDA) Rural Development

Barack Obama, President of the United States
 Tom Vilsack, Secretary of Agriculture

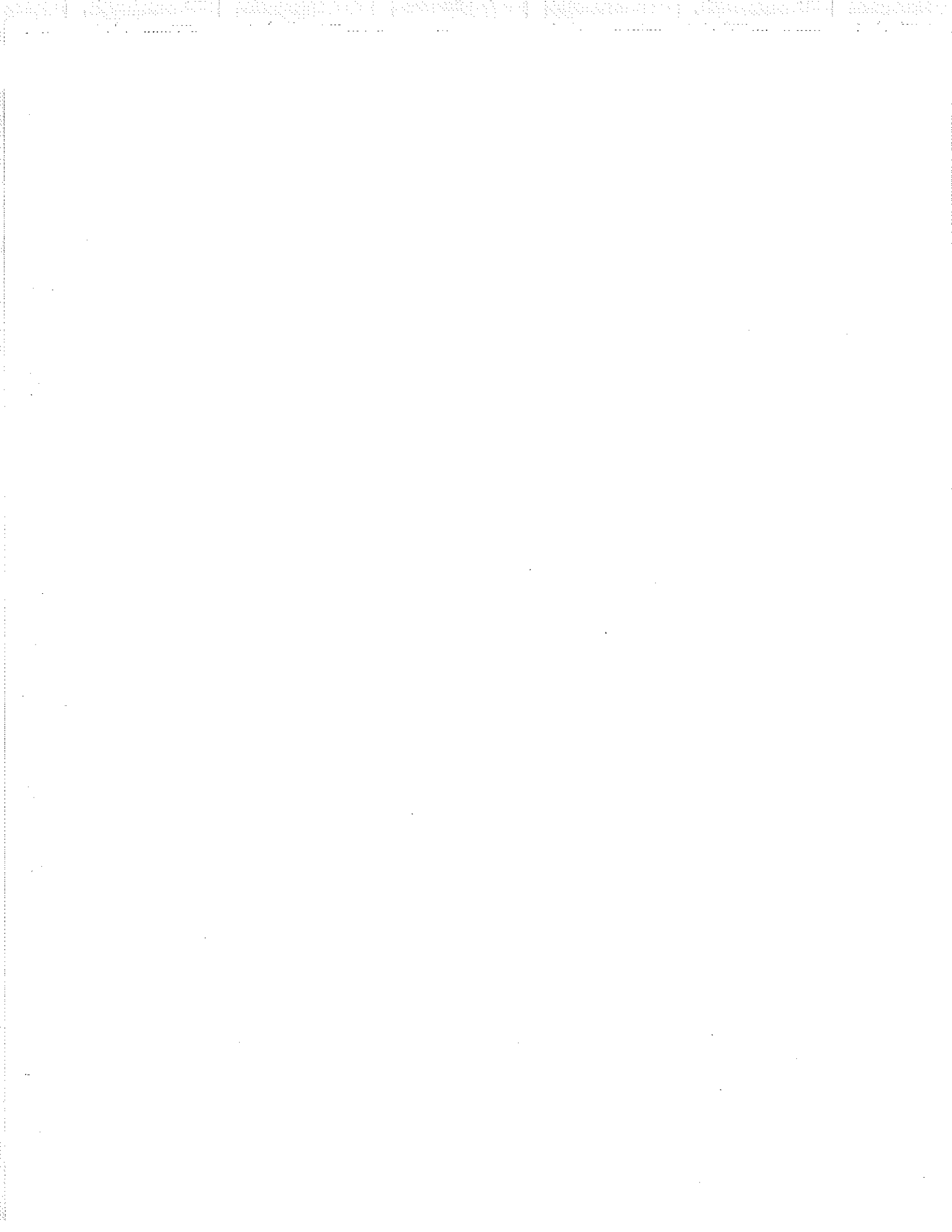
This institution is an equal opportunity provider.

BLACK
 LETTERING

BLACK LETTERING

SIGN DIMENSIONS: 1200 mm x 2400 mm x 19 mm (approx. 4' x 8' x 3/4")
 PLYWOOD PANEL (APA RATED A-B GRADE-EXTERIOR)

KPDES STORM WATER GENERAL PERMIT



NOTICE OF INTENT

All construction projects with surface disturbance of more than 1 acre during the period of construction must have a KPDES Storm Water General Permit. The contractor must complete and submit the attached form at least 48 hours prior to start of construction to the address below:

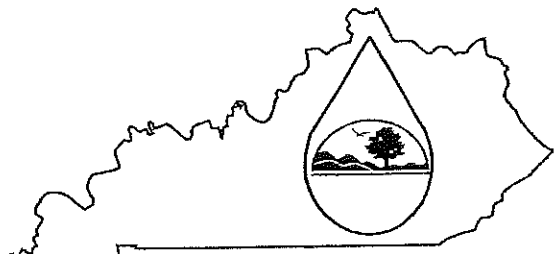
Section Supervisor
Permits Support Section
Surface Water Permits Branch
Kentucky Division of Water
200 Fair Oaks
Frankfort, Kentucky 40601

The electronic Notice of Intent (eNOI) for Stormwater Discharges Associated with Construction Activity (KPDES Form NOI-SWCA) under the KPDES General Permit is available on the Web.

For the eNOI, visit: <https://dep.gateway.ky.gov/eForms/default.aspx?FormID=7>.



FORM NOI-SWCA

	<h2 style="margin: 0;">KENTUCKY POLLUTION DISCHARGE ELIMINATION SYSTEM (KPDES)</h2> <p style="margin: 10px 0 0 0;">Notice of Intent (NOI) for coverage of Storm Water Discharges Associated with Construction Activities Under the KPDES Storm Water General Permit KYR100000</p>
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This is an application for:

- New construction activity.
- Modification of coverage for additional area in same watershed.
- Modification of coverage for additional area in different watershed.

If Modification is checked, state reason for Modification:

For Agency Use	Permit No. (Leave Blank)	K	Y	R	1	0				
For Agency Use	AI ID (Leave Blank)									

SECTION I - FACILITY OPERATOR INFORMATION

Operator Name(s)*:	Phone*:
Mailing Address*:	Status of Owner/Operator: <input type="checkbox"/> Private <input type="checkbox"/> State <input type="checkbox"/> Federal <input type="checkbox"/> Public (other than state or federal)
City*:	State* Zip Code*:

SECTION II - FACILITY/SITE LOCATION INFORMATION

Name of Project*:	Physical Address*:	City*:
State*:	Zip Code*:	County*:
Latitude (decimal degrees)*:	Longitude (decimal degrees)*:	SIC Code*:

SECTION III - SITE ACTIVITY INFORMATION

For single projects provide the following information

Total Number of acres in project*:	Total Number of acres to be disturbed*:	Start date:	Completion date:
------------------------------------	---	-------------	------------------

For common plans of development projects provide the following information

Total Number of acres in project*:	Number of individual lots in development:	Number of lots to be developed:
Total acreage intended to be disturbed*:		Number of acres intended to be disturbed at any one time:
Start date:	Completion date:	List Contractors:

SECTION IV - DISCHARGE TO A WATER BODY

Name of Receiving Water*:	Anticipated number of discharge points:
Location of anticipated discharge points: Latitude (decimal degrees)*	Longitude (decimal degrees)*
Receiving Water Body Stream Use Designation	<input type="checkbox"/> Cold Water Aquatic Habitat <input type="checkbox"/> Domestic Water Supply <input type="checkbox"/> Outstanding State Resource Water <input type="checkbox"/> Secondary Contact Recreation <input type="checkbox"/> Primary Contact Recreation <input type="checkbox"/> Warm Water Aquatic Habitat
Antidegradation Categorization	<input type="checkbox"/> Outstanding National Resource Water <input type="checkbox"/> Exceptional Water <input type="checkbox"/> High Quality Water <input type="checkbox"/> Impaired Water
Name of Receiving Water*:	Anticipated number of discharge points:
Location of anticipated discharge points: Latitude (decimal degrees)*	Longitude (decimal degrees)*
Receiving Water Body Stream Use Designation	<input type="checkbox"/> Cold Water Aquatic Habitat <input type="checkbox"/> Domestic Water Supply <input type="checkbox"/> Outstanding State Resource Water <input type="checkbox"/> Secondary Contact Recreation <input type="checkbox"/> Primary Contact Recreation <input type="checkbox"/> Warm Water Aquatic Habitat
Antidegradation Categorization	<input type="checkbox"/> Outstanding National Resource Water <input type="checkbox"/> Exceptional Water <input type="checkbox"/> High Quality Water <input type="checkbox"/> Impaired Water

FORM NOI-SWCA

SECTION V – DISCHARGE TO AN MS4			
Name of MS4:		Date of application /notification to the MS4 for construction site coverage:	
Number of discharge points:	Location of each discharge point: Latitude (decimal degrees):*		Longitude (decimal degrees):*
SECTION VI – CONSTRUCTION ACTIVITIES IN OR ALONG A WATER BODY			
Will the project require construction activities in a water body or the riparian zone: <input type="checkbox"/> Yes <input type="checkbox"/> No			
If yes, describe scope of activity:			
Is a Clean Water Act 404 permit required: <input type="checkbox"/> Yes <input type="checkbox"/> No		Is a Clean Water Act 401 Water Quality Certification required: <input type="checkbox"/> Yes <input type="checkbox"/> No	
SECTION VII – NOI PREPARER INFORMATION			
First Name:*	Last Name:*	Phone :*	eMail Address:*
Mailing Address:*	City:*	State:*	Zip Code:*
SECTION VIII – ATTACHMENTS			
Attach a full size color USGS 7½-minute quadrangle map with the facility site clearly marked. USGS maps may be obtained from the University of Kentucky, Mines and Minerals Bldg. Room 106, Lexington, Kentucky 40506. Phone number (859) 257-3896.			
SECTION IX – CERTIFICATION			
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.			
Signature:*		First Name:*	Last Name:*
Phone:*	eMail Address:		Date:*

This completed application form and attachments should be sent to: SWP Branch, Division of Water, 200 Fair Oaks, Frankfort, Kentucky 40601. Questions should be directed to: SWP Branch, Operational Permits Section at (502) 564-3410.

KENTUCKY POLLUTANT DISCHARGE ELIMINATION SYSTEM FORM NOI-SWCA – INSTRUCTIONS

WHO MUST FILE A NOTICE OF INTENT (NOI) FORM

Federal law at 40 CFR Part 122 prohibits point source discharges of stormwater associated with industrial activity to a water body of the Commonwealth of Kentucky without a Kentucky Pollutant Discharge Elimination System (KPDES) permit. The operator of an industrial activity that has such a storm water discharge must submit a NOI to obtain coverage under the KPDES Storm Water General Permit. If you have questions about whether you need a permit under the KPDES Storm Water program, or if you need information as to whether a particular program is administered by the state agency, call the Storm Water Contact, Operational Permits Section, Kentucky Division of Water at (502) 564-3410.

WHERE TO FILE NOI FORM

NOIs must be sent to the following address or submitted in on-line at <https://dep.gateway.ky.gov/eForms/Default.aspx?FormID=3>:

Operational Permits Section
SWP Branch, Division of Water
200 Fair Oaks Lane
Frankfort, KY 40601

Electronic NOI-SWCAs are to be submitted a minimum of seven (7) working days prior to commencement of construction related activities. Paper NOI-SWCAs are to be submitted a minimum of thirty (30) working days prior to commencement of construction related activities.

COMPLETING THE FORM

Enter information in the appropriate areas only. (*) denotes a required field. Enter N/A (Not Applicable) for fields that are required but do not apply to your submission. If you have any questions regarding the completion of this form call the Storm Water Contact, Operational Permits Section, at (502) 564-3410.

SECTION I – FACILITY OPERATOR INFORMATION

Operator Name(s): Enter the name or names of all operators applying for coverage under KYR10 using this NOI.

Mailing Address, City, State, and Zip Code: Provide the mailing address of the primary operator

Phone No.: Provide the telephone numbers of the person who is responsible for the operation.

Status of Owner/Operator: Select the appropriate legal status of the operator of the facility from the dropdown list.

Federal
Public (other than federal or state)
State
Private

SECTION II – FACILITY/SITE LOCATION INFORMATION

Name of Project: Provide the name of the project.

Physical Address, City, State, Zip Code and County: Provide the physical address of the project.

Latitude/Longitude: Provide the general site latitude and longitude of the operation.

SIC Code: Enter the Standard Industrial Code for the project

SECTION III – SITE ACTIVITY INFORMATION

For single projects provide the following information:

Total number of acres in project: Indicate the total acreage of the project including both disturbed and undisturbed areas.

Total number of acres to be disturbed: Indicate the total number of acres of the project to be disturbed.

Anticipated start date: Indicate the approximate date of when construction activities will begin.

Anticipated completion date: Indicated the approximate date of when final stabilization will be achieved.

For common plans of development provide the following information:

Total number of acres in project: Indicate the total acreage of the project including both disturbed and undisturbed areas.

Number of individual lots in development, if applicable: Indicate the number of individual lots or unit in the common plan of development

Number of lots to be developed: Indicate the number of lots that you intend to develop.

Total acreage of lots intended to develop: Indicate the total acreage of the lots you intend to develop

Total acreage intended to disturb: Indicate the total acreage of the lots you intend to disturb

Number of acres intended to disturb at any one time: Indicate the maximum number of acres to be disturbed at any one time.

Anticipated start date: Indicate the approximate date of when construction activities will begin.

Anticipated completion date: Indicated the approximate date of when final stabilization will be achieved.

List of contractors: Provide the names of all known contractors that will be working on site.

**KENTUCKY POLLUTANT DISCHARGE ELIMINATION SYSTEM
FORM NOI-SWCA – INSTRUCTIONS**

SECTION IV – IF THE PERMITTED SITE DISCHARGES TO A WATER BODY THE FOLLOWING INFORMATION IS REQUIRED

Name of Receiving Water: Provide the names of the each water body receiving discharges from the site. Provide only official USGS names do not provide local names

Anticipated number of discharge points: Indicate the number of discharge points to each receiving water body.

Location of anticipated discharge points: Provide the latitude and longitude of each discharge point. Add points as necessary.

Receiving Water Body Stream Use Designation: Check all appropriate boxes

Antidegradation Categorization: Select from the drop down box one of the following:

Outstanding National Resource Water

Exceptional Water

High Quality Water

Impaired Water

SECTION V – IF THE PERMITTED SITE DISCHARGES TO A MS4 THE FOLLOWING INFORMATION IS REQUIRED

Name of MS4: Provide the name of the MS4 to which the activity will discharge

Number of discharge points to the MS4: Indicate the number of discharge points

Location of each discharge point: Provide the latitude and longitude of each discharge point. Add points as necessary

Date of application/notification to the MS4 for construction site permit coverage: Indicate the date the MS4 has or will be notified.

SECTION VI – CONSTRUCTION ACTIVITIES IN OR ALONG A WATER BODY

Will the project require construction activities in a water body or the riparian zone: Select Yes or No from the drop down box.

If Yes, describe scope of activity: Provide a brief description of the activity (ies) that will take place in the water body or the riparian zone.

Is a Clean Water Act 404 permit required: Select Yes or No from the drop down box.

Is a Clean Water Act 401 Water Quality Certification required: Select Yes or No from the drop down box.

SECTION VII – NOI PREPARER INFORMATION

Provide the name, mailing address, telephone number and eMail address of the person preparing the NOI.

SECTION VIII – Attachments

Attach a USGS topographic map indicating the location of the activity and the proposed discharge points.

SECTION IX – CERTIFICATION

Provide the name, mailing address, telephone number and eMail address of the person who is responsible for the activity

Signature: Provide full name of the responsibility party. This will constitute a signature.

The NOI must be signed as follows:

Corporation: by a principal executive officer of at least the level of vice president

Partnership or sole proprietorship: by a general partner or the proprietor respectively

WAGE DETERMINATIONS



KENTUCKY STATE WAGE DETERMINATION





Matthew G. Bevin
Governor

Jenean M. Hampton
Lt. Governor

Kentucky Labor Cabinet
Department of Workplace Standards
Division of Employment Standards, Apprenticeship
and Mediation

1047 US Hwy 127 S STE 4
Frankfort, Kentucky 40601
Phone: (502) 564-3070
Fax: (502) 696-1897
www.labor.ky.gov

Derrick K. Ramsey
Secretary

February 16, 2016

Carlos Miller
Kenvirons Inc.
452 Versailles Rd.
Frankfort KY 40601

Re: Hardin County Water District No. 2, Transmission Pipeline and Booster Pump Station

Advertising Date as Shown on Notification: February 18, 2016

Dear Carlos Miller:

This office is in receipt of your written notification on the above project as required by KRS 337.510 (1).

I am enclosing a copy of the current prevailing wage determination number CR 2-010, dated December 4, 2015 for HARDIN County. This schedule of wages shall be attached to and made a part of the specifications for the work, printed on the bidding blanks, and made a part of the contract for the construction of the public works between the public authority and the successful bidder or bidders.

The determination number assigned to this project is based upon the advertising date contained in your notification. There may be modifications to this wage determination prior to the advertising date indicated. In addition, if the contract is not awarded within 90 days of this advertising date or if the advertising date is modified, a different set of prevailing rates of wages may be applicable. It will be the responsibility of the public authority to contact this office and verify the correct schedule of the prevailing rates of wages for use on the project. Your project number is as follows: 047-H-00370-15-2, Heavy/Highway

Sincerely,

Michael C. Donta
Deputy Commissioner



KENTUCKY LABOR CABINET
PREVAILING WAGE DETERMINATION
CURRENT REVISION
LOCALITY NO. 010

HARDIN COUNTY

Determination No. CR 2-010 2015

Date of Determination: December 4, 2015

Project No. 047-H-00370-15-2
Type: ___ Bldg HH

This schedule of the prevailing rate of wages for Hardin County has been determined in accordance with the provisions of KRS 337.505 to 337.550. This determination shall be referred to as Prevailing Wage Determination No. CR 2-010 2015

Apprentices shall be permitted to work as such subject to Administrative Regulations 803 KAR 1:010. Copies of these regulations will be furnished upon request to any interested person.

Overtime is to be computed at not less than one and one-half (1 1/2) times the indicated BASE RATE for all hours worked in excess of eight (8) per day, and/or in excess of forty (40) per week. However, KRS 337.540 permits an employee and employer to agree, in writing, that the employee will be compensated at a straight time base rate for hours worked in excess of eight (8) hours in any one calendar day, but not more than ten (10) hours worked in any one calendar day, if such written agreement is prior to the over eight (8) hours in a calendar day actually being worked, or where provided for in a collective bargaining agreement. The fringe benefit rate is to be paid for each hour worked at a straight time rate for all hours worked. Fringe benefit amounts are applicable for all hours worked except when otherwise noted. Welders will receive rate for craft in which welding is incidental.

NOTE: The type of construction shall be determined by applying the following definitions:

BUILDING CONSTRUCTION

Building construction is the construction of sheltered enclosures with walk-in access for the purpose of housing persons, machinery, equipment, or supplies. It includes all construction of such structures, the installation of utilities and the installation of equipment, both above and below grade level, as well as incidental grading, utilities and paving.

HIGHWAY CONSTRUCTION

Highway construction includes the construction, alteration or repair of roads, streets, highways, runways, taxiways, alleys, trails, paths, parking areas, and other similar projects not incidental to building or heavy construction. It includes all incidental construction in conjunction with the highway construction project.

HEAVY CONSTRUCTION

Heavy projects are those projects that are not properly classified as either "building" or "highway". For example, dredging projects, water and sewer line projects, dams, flood control projects, sewage treatment plants and facilities, and water treatment plants and facilities are considered heavy.



Anthony Russell, Commissioner
Department of Workplace Standards
Kentucky Labor Cabinet

Determination No. CR 2-010 2015
December 4, 2015

ASBESTOS / INSULATION WORKERS:

(Including duct (hot/cold), pipe insulator & pipe wrapping):

BASE RATE \$27.53
 FRINGE BENEFITS 14.79

Hazardous Material Handlers: (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems):

BASE RATE \$19.35
 FRINGE BENEFITS 10.35

BOILERMAKERS:

BASE RATE \$35.80
 FRINGE BENEFITS 24.26

BRICKLAYERS:

Bricklayers:

BASE RATE \$24.24
 FRINGE BENEFITS 8.25

Tile Setters: BUILDING

BASE RATE \$22.64
 FRINGE BENEFITS 6.10

Tile Finishers: BUILDING

BASE RATE \$15.42
 FRINGE BENEFITS 5.63

CARPENTERS:

Acoustical ceiling installation only:

BUILDING

BASE RATE \$25.77
 FRINGE BENEFITS 7.40

Drywall Hanging & metal stud installation: BUILDING

BASE RATE \$21.72
 FRINGE BENEFITS 13.52

Floor Laying, Carpet & Vinyl Only:

BUILDING

BASE RATE \$29.99
 FRINGE BENEFITS 1.32

Form Work Only: BUILDING

BASE RATE \$22.19
 FRINGE BENEFITS 12.25

All other work: BUILDING

BASE RATE \$23.54
 FRINGE BENEFITS 9.10

CARPENTERS/HEAVY:

Carpenters:

HEAVY

BASE RATE \$27.50
 FRINGE BENEFITS 16.06

Piledrivermen: HEAVY

BASE RATE \$27.75
 FRINGE BENEFITS 14.96

Divers: HEAVY

BASE RATE \$41.63
 FRINGE BENEFITS 14.96

Form Work Only: HEAVY

BASE RATE \$27.50
 FRINGE BENEFITS 16.06

CEMENT MASONS / CONCRETE FINISHERS:

BUILDING

BASE RATE \$20.21
 FRINGE BENEFITS 9.70

ELECTRICIANS:

Electricians: BUILDING & HEAVY

BASE RATE \$30.01
 FRINGE BENEFITS 15.65

ELECTRICIANS / LINE CONSTRUCTION:

Cable Splicer:

BASE RATE \$32.19
 FRINGE BENEFITS 11.88

Equipment Operator A: John Henry Rock Drill, D6 (or equivalent) and above, Trackhoe Digger, Cranes (greater than 25 tons and less than 45 tons)

BASE RATE \$28.81
 FRINGE BENEFITS 11.13

Equipment Operator B: Cranes (6-25 tons), Backhoes, Road Tractor, Dozer up to D5, Pressure Digger-Wheeled Or Tracked, all Tension Wire Stringing Equipment

BASE RATE \$25.42
 FRINGE BENEFITS 10.38

Equipment Operator C: Trencher, Vibratory Compactor, Ground Rod Driver, Boom Truck (6 tons or below), Skid Steer Loaders

BASE RATE \$20.33
 FRINGE BENEFITS 9.25

Groundmen:

BASE RATE \$17.12
 FRINGE BENEFITS 8.55

Linemen and Technician

BASE RATE \$29.36
 FRINGE BENEFITS 11.25

Cranes 45 tons or larger to be paid 100% of journeyman lineman's rate

ELEVATOR MECHANICS:

BASE RATE \$36.94
 FRINGE BENEFITS 20.035

GLAZIERS:

BASE RATE \$25.18
 FRINGE BENEFITS 10.30

IRONWORKERS:

Structural & Reinforcing: BUILDING

BASE RATE \$27.56
 FRINGE BENEFITS 20.30

Ornamental: BUILDING

BASE RATE \$26.40
 FRINGE BENEFITS 19.15

Structural: HEAVY

BASE RATE \$25.46
 FRINGE BENEFITS 17.49

LABORERS / BUILDING:

Mason Tender-cement/concrete, Power Tool Operator:			
	BUILDING	BASE RATE	\$19.62
		FRINGE BENEFITS	9.48
LABORER	COMMON OR GENERAL	BASE RATE	\$18.86
		FRINGE BENEFITS	5.22
LABORER	MASON TENDER-BRICK	BASE RATE	\$19.24
		FRINGE BENEFITS	3.79
LABORER	PIPELAYER	BASE RATE	\$20.36
		FRINGE BENEFITS	9.90

LABORERS / HEAVY

Concrete Saw (hand held/walk behind):	HEAVY	BASE RATE	\$28.89
		FRINGE BENEFITS	9.85
Flagger	HEAVY	BASE RATE	\$28.72
		FRINGE BENEFITS	9.85
Concrete Finishing	HEAVY	BASE RATE	\$24.21
		FRINGE BENEFITS	11.45
Concrete Worker	HEAVY	BASE RATE	\$23.31
		FRINGE BENEFITS	11.45
Common or General:	HEAVY	BASE RATE	\$16.18
		FRINGE BENEFITS	10.43
Pipelayer	HEAVY	BASE RATE	\$18.56
		FRINGE BENEFITS	4.50

MILLWRIGHTS:

	BASE RATE	\$24.18
	FRINGE BENEFITS	15.64

OPERATING ENGINEERS / BUILDING:

Drill, Loader, Crane, Forklift:			
	BUILDING	BASE RATE	\$28.85
		FRINGE BENEFITS	14.40
Oiler:	BUILDING	BASE RATE	\$25.13
		FRINGE BENEFITS	14.40
Bulldozer:	BUILDING	BASE RATE	\$21.49
		FRINGE BENEFITS	3.84

OPERATING ENGINEERS / BUILDING CONTINUED

Backhoe/Excavator/Trackhoe: BUILDING	BASE RATE	\$24.35
	FRINGE BENEFITS	13.00

CRANE WITH BOOM 150 FEET AND OVER, INCLUDING JIB, SHALL RECEIVE \$.75 ABOVE GROUP 1
 ALL CRANES WITH PILING LEADS WILL RECEIVE \$.50 ABOVE GROUP 1 REGARDLESS OF BOOM LENGTH

Paver (asphalt, aggregate, concrete): BUILDING	BASE RATE	\$22.52
	FRINGE BENEFITS	4.00

Roller: BUILDING	BASE RATE	\$23.60
	FRINGE BENEFITS	12.65

OPERATING ENGINEERS / HEAVY:

GROUP 1: Crane, Drill, Pumpcrete: HEAVY	BASE RATE	\$29.95
	FRINGE BENEFITS	14.40

GROUP 2: Bobcat, skid steer/skid loader, concrete pump: HEAVY	BASE RATE	\$27.26
	FRINGE BENEFITS	14.40

GROUP 3: All Off Road Material Handling Equipment, including Articulating Dump Trucks HEAVY	BASE RATE	\$26.65
	FRINGE BENEFITS	14.15

GROUP 4: Oiler, Pump: HEAVY	BASE RATE	\$26.96
	FRINGE BENEFITS	14.40

Forklift: HEAVY	BASE RATE	\$27.38
	FRINGE BENEFITS	14.15

Backhoe/Excavator/Trackhoe: HEAVY	BASE RATE	\$20.85
	FRINGE BENEFITS	5.00

Bulldozer: HEAVY	BASE RATE	\$25.35
	FRINGE BENEFITS	16.74

Loader: HEAVY	BASE RATE	\$26.50
	FRINGE BENEFITS	13.00

Mechanic: HEAVY	BASE RATE	\$25.81
	FRINGE BENEFITS	13.00

Roller: HEAVY	BASE RATE	\$23.39
	FRINGE BENEFITS	13.00

OPERATING ENGINEERS / HEAVY CONTINUED:

Trencher:	HEAVY	BASE RATE	\$26.34
		FRINGE BENEFITS	12.58

*Cranes with booms 150 ft. & over (including jib) and where the length of the boom in combination with the length of the piling leads equals or exceeds 150 ft. - \$1.00 over Group 1. Employees assigned to work below ground level are to be paid 10% above basic wage rate. This does not apply to open cut work.

PAINTERS:

Brush, Roller:	BUILDING	BASE RATE	\$20.83
		FRINGE BENEFITS	11.84

Spray:	BUILDING	BASE RATE	\$22.81
		FRINGE BENEFITS	11.87

Sign Painter & Erector:	BUILDING	BASE RATE	\$20.23
		FRINGE BENEFITS	3.25

Brush & Roller Only:	HEAVY	BASE RATE	\$18.50
		FRINGE BENEFITS	12.02

Spray, Sandblast, Power Tools, Waterblast & Steam Cleaning:	HEAVY	BASE RATE	\$19.00
		FRINGE BENEFITS	12.02

PIPEFITTERS:		BASE RATE	\$31.54
		FRINGE BENEFITS	14.78

PLUMBERS:		BASE RATE	\$22.73
		FRINGE BENEFITS	7.67

ROOFERS		BASE RATE	\$20.61
		FRINGE BENEFITS	5.12

SHEETMETAL WORKERS (including metal roofs): (Includes installation of HVAC duct & system)		BASE RATE	\$29.45
		FRINGE BENEFITS	18.70

SPRINKLER FITTERS: (Fire Sprinklers)		BASE RATE	\$31.35
		FRINGE BENEFITS	17.52

TRUCK DRIVERS / BUILDING:

10 Yard Truck:	BUILDING	BASE RATE	\$16.27
		FRINGE BENEFITS	1.50
Dump Truck:	BUILDING	BASE RATE	\$23.60
		FRINGE BENEFITS	8.03

TRUCK DRIVERS / HEAVY

Mobile Batch Truck Tender:	HEAVY	BASE RATE	\$16.57
		FRINGE BENEFITS	7.34

Greaser, Tire Changer, & Mechanic Tender:	HEAVY	BASE RATE	\$16.68
		FRINGE BENEFITS	7.34

Single Axle Dump & Flatbed, Semi-Trailer or Pole Trailer when used to pull building materials & equipment; Tandem Axle Dump; Distributor; Mixer, & Truck Mechanic:	HEAVY	BASE RATE	\$16.86
		FRINGE BENEFITS	7.34

Euclid, Other Heavy Earthmoving Equipment & Lowboy; Articulator Cat Truck & 5 Axle Vehicle; Winch & A-Frame when used in transporting materials; Ross Carrier; Fork Lift Truck when used to transport building materials; & Drivers on Pavement Breaker:	HEAVY	BASE RATE	\$16.96
		FRINGE BENEFITS	7.34

Dump Truck:	HEAVY	BASE RATE	\$16.80
		FRINGE BENEFITS	4.06

BRICKLAYER:	HIGHWAY	BASE RATE	\$25.96
		FRINGE BENEFITS	10.64

CARPENTER:	HIGHWAY	BASE RATE	\$27.50
		FRINGE BENEFITS	16.06

DIVER:	HIGHWAY	BASE RATE	\$41.63
		FRINGE BENEFITS	16.06

PILEDRIVER:	HIGHWAY	BASE RATE	\$27.75
		FRINGE BENEFITS	16.06

ELECTRICIAN:	HIGHWAY	BASE RATE	\$30.01
		FRINGE BENEFITS	15.65

IRONWORKERS	HIGHWAY	BASE RATE	\$27.56
		FRINGE BENEFITS	20.30

LABORERS / HIGHWAY:

Group 1: aging and curing of concrete, asbestos abatement worker, asphalt plant, asphalt, batch truck dump, carpenter tender, cement mason tender, cleaning of machines, concrete, demolition, dredging, environmental-nuclear, radiation, toxic & hazardous waste – level D, flagperson, grade checker, hand digging & hand back filling, highway marker placer, landscaping, mesh handler & placer, puddler, railroad, rip-rap & grouter, right of way, sign, guard rail & fence installer, signal person, sound barrier installer, storm & sanitary sewer, swamper, truck spotter & dumper, wrecking of concrete forms, general cleanup.

HIGHWAY	BASE RATE	\$22.71
	FRINGE BENEFITS	11.05

Group 2: batter board man (sanitary storm sewer), brickmason tender, mortar mixer operator, scaffold builder, Burner & welder, bushhammer, chainsaw operator, concrete saw operator, deckhand scow man, dry cement Handler, environmental – nuclear, radiation, toxic & hazardous waste – Level C, forklift operator for masonry, form setter, green concrete cutting, hand operated grouter & grinder machine operator, jackhammer, pavement breaker, paving joint machine, pipelayer, plastic pipe fusion, power driven Georgia Buggy & wheel barrow, power post hole digger, precast manhole setter, walk behind tamper, walk behind trencher, sand blaster, concrete chipper, surface grinder, vibrator operator, wagon driller.

HIGHWAY	BASE RATE	\$22.96
	FRINGE BENEFITS	11.05

Group 3: asphalt lutemen & raker, gunnite nozzleman, gunnite operator & mixer, group pump operator, side rail setter, rail paved ditches, screw operator, tunnel (free air) water blaster:

HIGHWAY	BASE RATE	\$23.01
	FRINGE BENEFITS	11.05

Group 4: Caisson worker (free air), cement finisher, environmental-nuclear, radiation, toxic & hazardous waste Levels A & B, miner & driller (free air), tunnel blaster & tunnel mucker (free air), directional & horizontal boring, air Track drillers (all types), powderman & blasters, troxler & concrete tester if Laborer is utilized.

HIGHWAY	BASE RATE	\$23.61
	FRINGE BENEFITS	11.05

OPERATING ENGINEERS/ HIGHWAY

GROUP 1 - A-Frame Winch Truck; Auto Patrol; Backfiller; Batcher Plant; Bituminous Paver; Bituminous Transfer Machine; Boom Cat; Bulldozer; Mechanic; Cableway; Carry-All Scoop; Carry Deck Crane; Central Compressor Plant; Cherry Picker; Clamshell; Concrete Mixer (21 cu. ft. or Over); Concrete Paver; Truck-Mounted Concrete Pump; Core Drill; Crane; Crusher Plant; Derrick; Derrick Boat; Ditching & Trenching Machine; Dragline; Dredge Operator; Dredge Engineer; Elevating Grader & Loaders; Grade-All; Gurries; Heavy Equipment Robotics Operator/Mechanic; High Lift; Hoe-Type Machine; Hoist (Two or More Drums); Hoisting Engine (Two or More Drums); Horizontal Directional Drill Operator; Hydrocrane; Hyster; KeCal Loader; LeTourneau; Locomotive; Mechanic; Mechanically Operated Laser Screed; Mechanic Welder; Mucking Machine; Motor Scraper; Orangepeel Bucket; Overhead Crane; Piledriver; Power Blade; Pumpcrete; Push Dozer; Rock Spreader, attached to equipment; Rotary Drill; Roller (Bituminous); Rough Terrain Crane; Scarifier; Scoopmobile; Shovel; Side Boom; Subgrader; Tailboom; Telescoping Type Forklift; Tow or Push Boat; Tower Crane (French, German & other types); Tractor Shovel; Truck Crane; Tunnel Mining Machines, including Moles, Shields or similar types of Tunnel Mining Equipment

HIGHWAY	BASE RATE	\$29.95
	FRINGE BENEFITS	14.40

OPERATING ENGINEERS / HIGHWAY CONTINUED:

Group 2: Air Compressor (Over 900 cu. ft. per min.); Bituminous Mixer; Boom Type Tamping Machine; Bull Float; Concrete Mixer (Under 21 cu. ft.); Dredge Engineer; Electric Vibrator; Compactor/Self-Propelled Compactor; Elevator (One Drum or Buck Hoist); Elevator (When used to Hoist Building Material); Finish Machine; Firemen & Hoist (One Drum); Flexplane; Forklift (Regardless of Lift Height); Form Grader; Joint Sealing Machine; Outboard Motor Boat; Power Sweeper (Riding Type); Roller (Rock); Ross Carrier; Skid Mounted or Trailer Mounted Concrete Pump; Skid Steer Machine with all Attachments; Switchman or Brakeman; Throttle Valve Person; Tractair & Road Widening Trencher; Tractor (50 H.P. or Over); Truck Crane Oiler; Tugger; Welding Machine; Well Points; & Whirley Oiler

HIGHWAY	BASE RATE	\$27.26
	FRINGE BENEFITS	14.40

Group 3: All off road material handling equipment, including articulating dump trucks, greaser on grease facilities servicing heavy equipment:

HIGHWAY	BASE RATE	\$27.68
	FRINGE BENEFITS	14.40

Group 4: bituminous distributor, burlap & curing machine, cement gun, concrete saw, conveyor, deckhand oiler, grout pump, hydraulic post driver, hydro seeder, mud jack, oiler, paving joint machine, power form handling equipment, pump, roller (earth), steerman, tamping machine, tractor (under 50 hp) & vibrator:

HIGHWAY	BASE RATE	\$26.96
	FRINGE BENEFITS	14.40

Cranes with booms 150 ft & over including JIB and where length of the boom in combination with the length of the piling leads equals or 150 ft - \$1.00 over Group 1 rate.

PAINTERS:

Brush & Roller	HIGHWAY	BASE RATE	\$18.50
		FRINGE BENEFITS	11.97

Spray, Sandblast, Power tools, Waterblast & Steam Cleaning:

HIGHWAY	BASE RATE	\$19.50
	FRINGE BENEFITS	11.97

PLUMBERS:

HIGHWAY	BASE RATE	\$32.00
	FRINGE BENEFITS	17.17

TRUCK DRIVERS

Group 1: Mobile batch truck tender:

HIGHWAY	BASE RATE	\$16.57
	FRINGE BENEFITS	7.34

Group 2: Greaser, tire changer, mechanic tender:

HIGHWAY	BASE RATE	\$16.68
	FRINGE BENEFITS	7.34

Group 3: Single axle dump, flatbed, semi trailer or pole trailer when used to pull building materials and equipment, tandem axle dump, distributor, mixer & truck mechanic

HIGHWAY	BASE RATE	\$16.86
	FRINGE BENEFITS	7.34

Group 4: Euclid & other heavy earth moving equipment & lowboy, articulator cat, 5-axle vehicle, winch & A frame when used in transporting materials, ross carrier, forklift when used to transport building materials & pavement breaker.

HIGHWAY

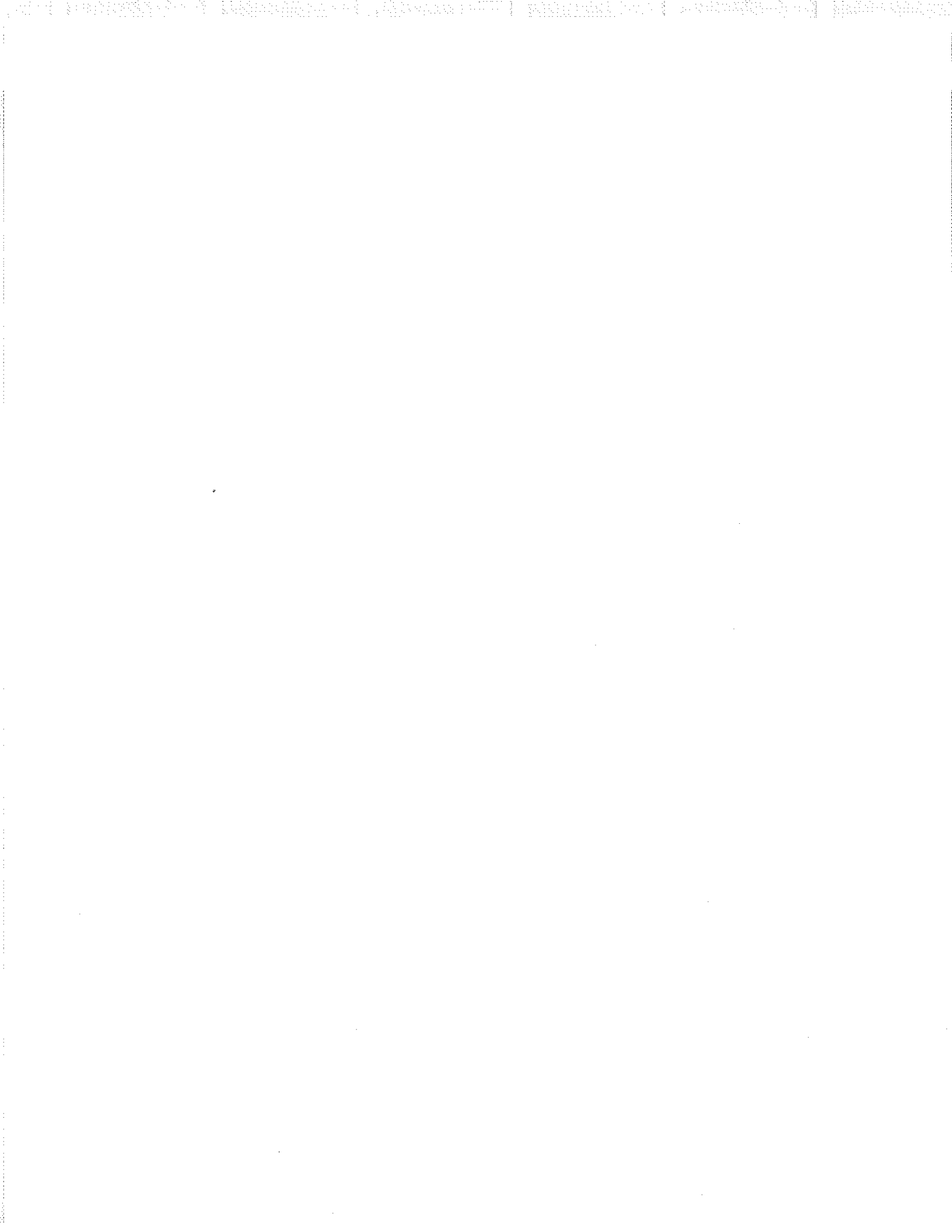
BASE RATE	\$16.96
FRINGE BENEFITS	7.34

End of Document
CR 2-010 2015
December 4, 2015

TECHNICAL SPECIFICATIONS



DIVISION 1
GENERAL REQUIREMENTS



SECTION 01000

SUMMARY OF WORK AND BID ITEM DESCRIPTIONS

1. SCOPE OF WORK PERFORMED UNDER THIS CONTRACT

The Hardin County Water District No. 2 distributes potable water in the outlying areas of the county. This contract provides for the construction of a 2-10 MGD booster pump station.

2. BID ITEM DESCRIPTIONS

The following Bid Item Descriptions are general in nature and may not be all inclusive. The intent is to provide broad categories of the work for bidding purposes. It is understood that the Bidder has included costs for all equipment, materials and work as shown on the Drawings and described in the Specifications and categorized those costs in one or more of the indicated Bid Items.

1. **Pump Station, complete and operable** – Construction of pump station including building, foundation, retaining walls, pumps, electrical/mechanical, piping, painting, excavation, crushed stone backfill, foundation drains and all items pertinent to the pump station.
2. **Sitework** – Final grading, stone rip-rap slopes and rock lined ditches with geotextile fabrics, piping and headwalls for gutter and floor drain discharge, seeding and fertilizing for grass cover.
3. **Yard Piping** – Installation of suction and discharge piping from connection to transmission main on Hwy 434 to pump station piping, including valves, fire hydrant and all appurtenances. Applicable Specification Section 13104.
4. **Bituminous Concrete Paving** – Construction of all bituminous concrete paving per plan dimensions in conformance with Specifications Section 02513 and including 18" RCP and junction box.
5. **Chain Link Fence** – Installation of chain link fencing including 20' gate per Specification Section 02100 and drawings Sheet D-1.
6. **Woven Wire Fence** – Installation of #9 galvanized 6" x 6" woven wire farm fence with one strand of barbed wire at top attached to 6-inch round treated posts with appropriate pull post configuration to allow fence stretching for a tight installation.

7. **Mobilization, Bonds, Insurance and Project Sign** – Mobilization, acquisition of Performance and Payment Bonds, Insurance Certificates and preparation and erection of project sign per detail contained in the Specifications and limited to 3% of Total Base Bid amount.
8. **Crushed Stone Structural Fill (KDOT No. 9's)** – The Crushed Stone Structural Fill Unit Price shall include all Crushed Stone Structural Fill required under any structural elements. This Unit Price does not include any rock associated with trenching, pavements, access roads or contractor errors. This item does not apply to aggregate base under bituminous paving, sidewalks or gravel areas. There will be no compensation for over excavation beyond the plan limits. The intent of this item is to establish a unit price for crushed stone fill in the event unforeseen subsurface conditions necessitate additional foundation stabilization beyond the plan limits. The unit price shall include all costs associated with removing and disposing of unsuitable foundation material on the project site and filling with crushed stone aggregate. Aggregate shall be compacted in 12 inch lifts. Copies of the purchase tickets, indicating the rock weight, shall be delivered to the Engineer's representative the day of the rock shipment. The tickets will be used for payment to the Contractor. No stockpiling of rock for structural fill purposes will be allowed. The cost associated with this item shall be included in the Base Bid. Upon completion of the Project, a Final Adjusting Change Order will be executed to reflect the actual quantity and cost of the structural rock fill.
9. **Equipment Allowance** – This bid item stipulates an established cost of \$45,000 for the purchase of a Chloramination Analyzer and Telemetry Panel and shall be included in the Total Base Bid. The Owner shall obtain cost quotations for the equipment and deliver the quotations to the Contractor for the purchase of the equipment. A contract cost adjustment will be made by Change Order to reflect the actual equipment cost.
10. **Fire Alarm System** – Furnishing and installation of all equipment associated with only the Fire Alarm System complete and operable as contained in the Drawings and Specifications. This item is specifically excluded from **Bid Item No. 1 – Pump Station, Complete and Operable** to allow deletion from the project at the Owner's discretion. The Security and Detection System shall **not** be included in this Bid Item.

END OF SECTION

SECTION 01001

SPECIAL CONDITIONS

1.0 DESCRIPTION OF THE WORK AND DESIGNATION OF OWNER

These Specifications and accompanying Drawings describe the work to be done and the materials to be furnished for the construction of the project entitled "24-inch Transmission Pipeline".

All references to the Owner in these Specifications, Contract Documents and plans shall mean the Hardin County Water District No. 2.

2.0 AVAILABLE FUNDS

This project is funded by Rural Development, BRAC, KIA and Hardin County Water District No. 2.

3.0 TIME OF COMPLETION

The time allowed for completion of this contract is 270 calendar days.

The time allowed for completion shall begin at midnight, Eastern Standard Time, on the date which the Owner, or his authorized representative, the Engineer, shall instruct the Contractor in writing to start work, but no later than 10 days after Notice to Proceed.

Additional time will be allowed the Contractor to cover approved over-runs or additions to the contract in the same proportion that the said over-run or addition in net monetary value bears to the original amount; the total of said additional time to be computed to the nearest whole calendar day.

4.0 LIQUIDATED DAMAGES

It is understood that time is the essence of this contract and that the Owner will sustain damages, monetary and otherwise, in the event of delay in completion of the work hereby contracted.

Therefore, if the said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part of the consideration for the awarding of these contracts, to pay to the Owner the amount specified in the contract, not as a penalty but as liquidated damages for such breach of contract

as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the Contract for completing the work.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

Liquidated damages are fixed at \$800 per calendar day of over-run beyond the date set for completion or authorized extension thereof.

5.0 INSURANCE

Insurance is to be furnished by the Contractor for the benefit of the Owner, Contractor, and Subcontractors as their interests may appear. The minimum amounts of insurance coverage to be furnished under these contracts, in accordance with the applicable provisions of the General Conditions.

All policies written for and applicable to the contract of which this Specification is a part shall provide for a minimum of fifteen (15) days written cancellation notice with notice to be given both to the Owner and the Engineer. The Owner and Engineer shall be included as additional insured parties.

6.0 BONDING

6.1 PERFORMANCE AND PAYMENT BOND

The Contractor shall furnish separate performance and payment bonds issued by an approved bonding company in an amount at least equal to one hundred (100%) per cent of the contract price, as security for the faithful performance of this contract and for the payment of persons performing labor and furnishing materials in connection with this contract. These bonds shall be executed by a company authorized to do business in the State of Kentucky and shall be signed or countersigned by a Kentucky resident agent. Bonds shall remain in effect for one year after date of final acceptance of the work.

6.2 DEPARTMENT OF TRANSPORTATION BONDING

See Section 15100 – WATER LINES, Subsection 1.1.

7.0 SITE DIMENSIONS

All Contractors furnishing materials and equipment for this contract shall obtain exact dimensions at the site. Scale or figure dimensions on the drawings and

details show the correct size under ideal conditions and shall not, under any circumstances, be so construed as to relieve the Contractor from responsibility for taking measurements at the site and furnishing materials or equipment of the correct size.

8.0 DAMAGE TO EQUIPMENT STORED AND/OR IN PLACE PRIOR TO INITIAL OPERATION

Any equipment damaged or which has been subjected to possible damage by reason of inundation, improper storage and/or protection during the construction period of project, shall be handled only as follows:

- a) Be replaced with new equipment.
- b) With approval of the Engineer, be returned to the manufacturer of the equipment, or his authorized repair agency, for inspection and repair provided, however, that such repair after inspection will place the equipment in new condition, and restore the manufacturer's guarantee the same as for new equipment.

9.0 SALVAGED MATERIALS AND EQUIPMENT

All materials and/or equipment to be removed from existing structures and not specifically specified to be re-used shall remain the property of the Owner. Such materials and/or equipment shall be stored on sites by the Contractor as directed by the Owner.

The use of second hand and/or salvaged materials will not be permitted, unless specifically provided for in the detailed specifications. Materials and equipment shall be new when turned over to the Owner.

10.0 TEMPORARY FACILITIES

- a) Build and maintain temporary offices and storage sheds as necessary for the work. Location of temporary buildings shall be subject to the approval of the Engineer.
- b) Provide temporary heat, light and power required by the work. Temporary telephone service shall be provided in the job office paid for by the General Contractor, except that the party placing a long distance call shall pay the toll charge.
- c) Each Contractor shall construct and maintain, in a sanitary condition, sanitary facilities for his employees and also employees of his subcontractors. At completion of the contract work these sanitary facilities shall be properly disposed of as directed by the Engineer.

- d) Temporary construction for safety measures, hoists and scaffolds shall be erected in accordance with the General Conditions.
- e) Construction yard shall be located on job site. Provide security and safety protection.
- f) The obtaining of all utilities for construction, including power and water, shall be the responsibility of the Contractor, and he shall bear the cost of all utilities used for construction. Cost of all connections and facilities for use of utilities shall be borne by the Contractor.

11.0 PROPERTY PROTECTION

Care is to be exercised by the Contractor in all phases of construction to prevent damage and injury to the Owner's or other property.

In connection with work performed on "private property" (property other than that belonging to the Owner), the Contractor shall confine his equipment, the storage of materials, and the operation of his workmen to the limits indicated on the plans, or to lands and right-of-way provided for the project by the Owner, and shall take every precaution to avoid damage to the private property Owner's buildings, grounds and facilities.

Fences, hedges, shrubs, etc. within the construction limits shall be carefully removed, preserved, and replaced when the construction is completed. Where ditches or excavations cross lawns, the sod shall be removed carefully and replaced when the backfilling has been completed. If sod is damaged or not handled properly, it shall be replaced with new sod equal to existing sod at the Contractor's expense. Grassed areas, other than lawns, shall be graded, fertilized and seeded when construction is completed. When construction is completed the private property Owner's facilities and grounds shall be restored to as good or better condition than found as quickly as possible at the Contractor's expense.

12.0 CONFLICT WITH OR DAMAGE TO EXISTING UTILITIES AND FACILITIES

Insofar as location data is available to the Engineers, existing underground utilities (such as waterlines, sewer lines, gas lines, telephone conduits, etc.) are accurately located on the drawings. Due, however, to the approximate nature of much of this data, the location of any particular facility cannot be certified to be correct. In general, locations and elevations shown are approximate only.

Before proceeding with the work, the Contractor shall confer with all public or private companies, agencies, or departments that own and operate utilities in the vicinity of the construction work. The purpose of the conference is to verify the location of, and possible interference with, the existing utilities that are shown on

the Plans, arrange for necessary suspension of service, and make arrangements to locate and avoid interference with all utilities that are not shown on the Plans.

13.0 CONTROL OF EROSION

The Contractor shall be responsible for control of siltation and erosion from the project work. Control shall include all necessary ditching, check dams, mulching, etc. to prevent deposition of materials in roadside ditches. The Owner shall incur no extra costs from such work.

14.0 MEASUREMENT AND PAYMENT

14.1. Measurement of Quantities. All Work completed under the Agreement will be measured by the ENGINEER according to United States standard measure.

14.1.1. Unless otherwise specified, measurement of concrete quantities will include only that volume within the neat lines as shown on the Plans or as altered by the ENGINEER to fit field conditions. The prismatic formula will be used in computing the volumes of structures, or portions of structures, having end sections of unequal areas.

14.1.2. All items which are measured by the linear foot, such as pipe, will be measured along the centerline distance of the installed item with no allowance for connections, fittings or laps at connections.

14.1.3. In computing volumes of excavation, borrow and embankments, the average end-area method will be used. For the purpose of ascertaining quantities, it is agreed that the planimeter shall be considered an instrument of precision adapted to the measurement of areas.

14.2. Lump Sum. When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

14.3. Plan Quantities. When the plan quantities for a specific portion of the Work are designated as the pay quantities in the Contract Documents, they shall be the final quantities for which payment for such specific portion of the Work will be made, unless the dimensions of said portions of the Work shown on the plans are revised by the ENGINEER. When revised dimensions result in an increase or decrease in the quantities of such Work, the final quantities for payment will be revised in the amount represented by the authorized changes in dimensions.

14.4. Actual Quantities. When actual quantities for a specific portion of the Work are designated as the pay quantities in the Contract Documents, they shall be the final quantities for which payment for such specific portion of the Work will

be made. The actual quantities will be determined by the difference in field measurements and cross sections before and after construction.

14.5 Scope of Payment. The contract unit prices whether based on lump sum, plan quantities or actual quantities for the various bid items of the Contract Documents shall be considered full compensation for all labor, materials, supplies, equipment, tools, and all things of whatever nature required for the complete incorporation of the item into the Work the same as though the items were to read "in Plan" unless the Contract Documents provide otherwise.

14.6 Payments. Estimates for payment, partial payments and final payments shall be in accordance with and follow procedures set forth in the General Conditions and Supplementary Conditions.

15.0 ACCESS ROADS

15.1 The CONTRACTOR, CONTRACTOR'S employees and all trucks delivering equipment, supplies or materials to the project shall use the access roads shown in the Plans for entering and leaving the project sites.

16.0 TESTING LABORATORY SERVICES

16.1 GENERAL

16.1.1 Work Included. From time to time during progress of the Work, the OWNER may require that testing be performed to determine that materials provided for the Work meet the specified requirements; such testing includes, but is not necessarily limited to:

- 1) Material Compaction
- 2) Cast-In-Place Concrete

16.1.2 Related Work Described Elsewhere. Requirements for testing may be described in various Sections of these Specifications; where no testing requirements are described, but the OWNER decides that testing is required, the OWNER may require testing to be performed under current pertinent standards for testing.

16.1.3 Selection of Testing Laboratory. The OWNER will select a testing laboratory.

16.1.4 Codes and Standards. Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

16.1.5 Product Handling. The CONTRACTOR shall promptly process and distribute all required copies of test reports for which he is responsible and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay in progress of the Work.

16.2 Payment for Testing Services.

16.2.1 Initial Services. The OWNER will pay for all initial testing services required by the OWNER.

16.2.2 Retesting. When initial tests indicate non-compliance with the Contract Documents, all subsequent retesting made necessary by the non-compliance shall be performed by a testing laboratory selected by the CONTRACTOR and approved by the ENGINEER and the costs thereof will be paid directly by the CONTRACTOR.

16.2.3 CONTRACTOR'S Convenience Testing. Inspection or testing performed exclusively for the CONTRACTOR'S convenience shall be the sole responsibility of the CONTRACTOR.

16.3 EXECUTION.

16.3.1 Cooperation with Testing Laboratory. Representatives of the testing laboratory shall have access to the Work at all times. The CONTRACTOR shall provide facilities for such access in order that the laboratory may properly perform its functions.

16.3.2 Schedules for Testing.

16.3.2.1 Establishing Schedule. By advance discussion with the testing laboratory selected by the OWNER, the CONTRACTOR shall allow for the time required for the laboratory to perform its tests and to issue each of its findings. The CONTRACTOR shall allow for this time within the construction schedule.

16.3.2.2 Revising Schedule. When changes of construction schedule are necessary during construction, the CONTRACTOR shall coordinate all such changes of schedule with the testing laboratory as required.

16.3.2.3 Adherence to Schedule. When the testing laboratory is ready to test according to the determined schedule but is prevented from testing or taking specimens due to incompleteness of the Work, all extra costs for testing attributed to the delay may be back-charged to the CONTRACTOR and shall not be borne by the OWNER.

16.3.3 Taking Specimens. All specimens and samples for testing, unless otherwise provided in these Contract Documents, will be taken by the testing

laboratory; all sampling equipment and personnel will be provided by the testing laboratory; and all deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

17.0 SUBMITTALS AND SUBSTITUTIONS

17.1 GENERAL.

17.1.1 Work Included. Wherever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards. To insure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data and for its review and approval or rejection by the ENGINEER.

17.1.2 Related Work Described Elsewhere.

17.1.2.1 Contractual requirements for submittals are described in the General Conditions and Supplementary Conditions.

17.1.2.2 Individual submittals required are described in the pertinent sections of these Specifications.

17.2 SUBSTITUTIONS.

17.2.1 ENGINEER'S Approval Required. The Agreement is based on the materials, equipment, and methods described in the Contract Documents. The ENGINEER will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required by the ENGINEER to evaluate the proposed substitution. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this Work by the ENGINEER.

17.2.2 "Or Equal". Where the phrase "or equal" occurs in the Contract Documents, do not assume that material, equipment, or methods will be approved as equal by the ENGINEER unless the item has been specifically approved for this Work. The decision of the ENGINEER shall be final.

17.2.3 Availability of Specified Items. The CONTRACTOR shall verify prior to bidding that all specified items will be available in time for installation during orderly and timely progress of the Work. In the event the specified item or items will not be so available, the CONTRACTOR shall notify the ENGINEER prior to receipt of Bids.

17.3 Identification of Submittals. The CONTRACTOR shall completely identify each submittal and resubmittal by showing at least the following information:

- 1) Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.
- 2) Name of project as it appears in these Specifications.
- 3) Drawing number and Specifications Section number to which the submittal applies.
- 4) Whether this is an original submittal or re-submittal.

17.4 COORDINATION OF SUBMITTALS.

17.4.1 General. Prior to submittal for ENGINEER'S review, the CONTRACTOR shall use all means necessary to fully coordinate all material, including the following procedures:

- 1) Determine and verify all field dimensions and conditions, materials, catalog numbers, and similar data.
- 2) Coordinate as required with all trades and with all public agencies involved.
- 3) Secure all necessary approvals from public agencies and others and signify by stamp, or other means, that they have been secured.
- 4) Clearly indicate all deviations from the Contract Documents.

17.4.2 Grouping of Submittals. Unless otherwise specifically permitted by the ENGINEER, the CONTRACTOR shall make all submittals in groups containing all associated items; the ENGINEER may reject partial submittals as not complying with the provisions of the Contract Documents.

17.5 Timing of Submittals. The CONTRACTOR shall make all submittals far enough in advance of schedule dates of installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery. In scheduling, allow at least five full working days for the ENGINEER'S review following his receipt of the submittal.

18.0 INSTALLATION REQUIREMENTS

Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the respective manufacturers, unless otherwise specified.

19.0 PROOF OF COMPLIANCE

Whenever the Contract Documents require that a product be in accordance with Federal specification, ASTM designation, ANSI specification, or other association standard, the CONTRACTOR shall present an affidavit from the manufacturer certifying that the product complies therewith. Where requested or specified, the CONTRACTOR shall submit supporting test data to substantiate compliance.

20.0 PROJECT RECORD DOCUMENTS

20.1 As the Work progress, the CONTRACTOR shall keep a complete and accurate record of changes or deviations from the Contract Documents and the Shop Drawings, indicating the Work as actually installed. Changes shall be neatly and correctly shown on the respective portion of the affected document, using blackline prints of the Drawings affected, or the Specifications, with appropriate supplementary notes. This record set of Drawings, Shop Drawings, and Specifications shall be kept at the job site for inspection by the ENGINEER.

20.2 The records above shall be arranged in order, in accordance with the various sections of the Specifications, and properly indexed. Prior to application for final payment, and as a condition to its approval by the ENGINEER, deliver the record Drawings and Specifications, arranged in proper order, indexed, and endorsed as hereinbefore specified.

20.3 No review or receipt of such records by the ENGINEER or OWNER shall be a waiver of any deviation from the Contract Documents or the Shop Drawings or in any way relieve the CONTRACTOR from his responsibility to perform the Work in accordance with the Contract Documents and the Shop Drawings to the extent they are in accordance with the Contract Documents.

21.0 PROJECT MEETINGS

The CONTRACTOR'S Superintendent for the Work shall attend project meetings as required by either the OWNER or ENGINEER.

22.0 VIDEO TAPE

The line CONTRACTOR, before proceeding with any work, shall make or have made a video of all areas where work is to be performed and a copy of this video

cassette shall be furnished to the ENGINEER to review for completeness. This video shall be utilized as backup and reference for claims and cleanup.



SECTION 01002

SPECIAL CONSTRUCTION CONSIDERATIONS

1.0 CONSTRUCTION SEQUENCE

It shall be the sole responsibility of the Contractor to plan and implement construction sequences, to follow the Plans and Specifications and to protect any portions of the Work already completed.

2.0 CLEAN-UP

The work will not be considered as complete, and final payment will not be made, until all areas in connection with the Work have been cleared of all rubbish, equipment, excess materials and temporary structures.

3.0 SECURITY BY CONTRACTOR

In addition to the other provisions of the Contract Documents, the Contractor shall be responsible for providing security as he deems necessary for his work areas, storage areas, office areas, equipment, and any other item or area that he is using. The Owner will not be responsible for any damages due to insufficient site security.

4.0 BID SCHEDULE QUANTITIES

The material quantities shown in the bid schedule are not guaranteed and should not be used indiscriminately when ordering materials. The Contractor shall be responsible for ordering material quantities necessary for installation to the limits as shown on the drawings unless otherwise instructed. Any left-over quantities shall be the property of the Contractor unless other arrangements are made. The Owner shall not be responsible for re-stocking or other charges associated with left-over materials or increased costs associated with increases in price for materials needed to complete the project as shown on the drawings.

5.0 PERMITS

The contractor shall obtain and pay for all grading, storm water, etc. permits, if any, required to complete the work. The contractor shall maintain compliance with all conditions, limitations and stipulations of all permits. The contractor shall not commence work, except mobilization, until he has obtained all required permits for said work. The contractor shall supply the owner with copies of all permits within 24 hours of receipt. A KPDES Storm Water Discharge Permit will be required for this project. The contractor shall fill out, sign and submit the Notice of Intent (NOI) and the Notice of Termination (NOT).

DIVISION 2

SITE WORK

SECTION 02001

EARTHWORK

1.0 SCOPE

This section covers the required topsoil removal, excavation, the removal and proper utilization or disposal of all excavated materials, necessary borrow, fill requirements, and the shaping and finishing of all excavation work to the required lines and grades.

2.0 TOPSOIL REMOVAL

All topsoil on areas to receive fill shall be stripped and stockpiled at an approved location.

3.0 CLEARING AND GRUBBING

Work shall consist of cutting and removing designated trees, stumps, brush, logs, removal of fences, or other loose and projecting material. Unless otherwise specified, it shall also include the grubbing of stumps, roots and other natural obstructions which, in the opinion of the Engineer, must be removed to prosecute properly the construction work and operate properly the facility upon the completion of construction.

No cleared or grubbed materials shall be used in backfills or embankment fills.

All stumps, roots and other objectionable material shall be grubbed up so that no roots larger than 3 inches in diameter remain less than 18 inches below the ground surface.

All holes and depressions left by grubbing operations shall be filled with suitable material and compacted to grade.

Disposal shall be by burning or other methods satisfactory to the Engineer; however, burning will be permitted only when the Contractor has obtained written permission from the local regulatory agency.

The Contractor shall also remove from the site and satisfactorily dispose of all miscellaneous rubbish including, but not limited to, masonry, scrap metal, rock, pavement, etc., that is under the fill or to be removed as shown on the Drawings, specified herein, or directed by the Engineer.

Existing improvements, adjacent property, utility and other facilities, and trees, plants and brush that are not to be removed shall be protected from injury or damage resulting from the Contractor's operations.

Trees and shrubs, designated to remain or that are beyond the clearing and grubbing limits, which are injured or damaged during construction operations shall be treated at the Contractor's expense by experienced tree surgery personnel.

3.1 EROSION CONTROL

Temporary measures shall be applied throughout the construction permit to control and to minimize siltation to adjacent properties and waterways. Such measures shall include, but not be limited to, the use of berms, baled straw silt barriers, gravel or crushed stone, mulch, slope drains and other methods. These temporary measures shall be applied to erodible material exposed by any activity associated with the construction of this project.

4.0 STRUCTURAL EXCAVATION

Structural excavation shall consist of and include the removal of all materials encountered or involved in the excavation and subgrade preparation for the placing of structures. The final depths and extent of structural excavation will be determined by the nature of the material encountered; however, after excavation to the limits as shown on the drawings, the ENGINEER shall inspect the work and determine if additional excavation is required.

5.0 EXCAVATION CONSTRUCTION METHODS

5.1 OPEN-CUT EXCAVATION - GENERAL

All open cut excavation shall be performed in accordance with this section to the lines, grades, and dimensions shown on the drawings or established by the ENGINEER.

All necessary precautions shall be taken to preserve the material below and beyond the lines of all excavation in the soundest possible condition. Any damage to the work due to the CONTRACTOR'S operations, including shattering of the material beyond the required excavation lines, shall be repaired at the expense of and by the CONTRACTOR. Any and all excess excavation for the convenience of the CONTRACTOR for any purpose or reason, except as may be ordered in writing by the ENGINEER and whether or not due to the fault of the CONTRACTOR, shall be at the expense of the CONTRACTOR. Where required to complete the work, all such excess excavation and overexcavation shall be refilled with materials furnished and placed at the expense of and by the CONTRACTOR. Slopes shattered or loosened by blasting shall be taken down at the expense of and by the CONTRACTOR.

All excavation for embankment and structure foundations shall be performed in the dry. No excavation shall be made in frozen materials without written approval.

The bottom and side slope of rock or shale upon or against which concrete or pervious blanket material is to be placed shall be excavated to the required dimensions as shown on the drawings or established by the ENGINEER. No material will be permitted to extend within the neat lines of the structure. If, at any point in rock or shale upon written orders from the ENGINEER, material is excavated beyond the limits required to receive the structure, the additional excavation shall be filled solidly with concrete. If material is excavated beyond the limits required to receive the structure without written orders from the ENGINEER, the additional excavation shall be brought back to grade with "Class A" concrete at the CONTRACTOR'S expense.

5.2 UTILIZATION OF EXCAVATED MATERIAL

All suitable material removed from the excavations shall be used insofar as practicable, in constructing the permanent works and at such other places as directed. The CONTRACTOR shall not waste materials removed from excavations and suitable for use in the construction of the permanent works, without a written application to do so and a written approval from the ENGINEER.

5.3 DISPOSAL OF SURPLUS AND/OR WASTE MATERIAL

All surplus excavated material and/or all waste materials shall be disposed of outside of the floodplain in an area provided by the CONTRACTOR and approved by the ENGINEER.

The surfaces thereof shall be left in a neat and sightly condition and sloped to provide positive drainage. Compaction of the waste materials shall be required.

5.4 BLASTING FOR EXCAVATION

A. General

Blasting may be done only to the depth, amount, and extent, and in such locations approved by the ENGINEER. Approval of the methods of blasting by the ENGINEER will not relieve the CONTRACTOR of his responsibility in blasting operation, and no payment will be made for any necessary extra excavation below or outside of the limit lines indicated on the drawings, or modifications thereof, due solely to injury caused by over-shooting, improper blasting, or carelessness on the part of the CONTRACTOR. All material thus removed shall be replaced by concrete when a concrete structure is to be placed upon or against such surface, or by compacted fill material when fill is to be

placed thereon, at the expense of the CONTRACTOR and in a manner satisfactory to the ENGINEER. Extra fill is to be of the same type as that to be placed directly above it.

B. Blasting Trench and/or Structure Excavation

The use of explosives or blasting material of any kind in trench excavation and/or the structure excavation shall be carried out by using not over one-half (1/2) pound of explosives (equivalent in strength to 40 percent dynamite) per cubic yard of material to be blasted and by shooting only a few holes simultaneously.

C. Use of Explosives

The transportation, handling, storage, and use of dynamite and other explosives shall be directed and supervised by a person of proven experience and ability in blasting operation. All blasting operations shall be in accordance with applicable local, state, and federal laws. Before any explosives are brought on the job, permission to do so shall be obtained from the ENGINEER. All blasts shall be fired electrically with an electric blasting machine. Where detonating cord is used as a detonating agent, the detonation cord shall be fired with an electric blasting cap. Delay electric detonators shall be used for all delayed blasts. Blasting machines used for firing shall be known to be in good condition and of sufficient capacity to fire all charges. Rubber-covered or other adequately insulated copper wires in good condition shall be used for firing lines and shall have solid cores of appropriate gage. Sufficient firing lines shall be provided to permit the blaster to be located at a safe distance from the blast. Single conductor lead lines shall be used. All operations involving the handling or use of explosives shall be discontinued during approach of a thunderstorm or while it is in progress. Blasting operations in the proximity of overhead power lines, communication lines, or other structures shall not be carried on until the operator and/or OWNER of such lines has been notified and precautionary measures deemed necessary have been taken. All holes loaded on a shift shall be fired on the same shift. The use of black powder is prohibited. Before any drilling operations in preparation for blasting are started, the CONTRACTOR shall furnish the ENGINEER a detailed plan of operations showing the method proposed for the prevention of damage. In order to assure adequate protection, such plan may be modified to meet the conditions that may develop.

5.5 SHEETING AND BRACING

Sheeting and bracing as may be required to safely support the sides of excavations while maintaining the required side slopes shall comply with the safety precautions as outlined in current and accepted safety manuals, such as "Associated General Contractors Manual of Accident Prevention in Construction". Where sheeting and bracing are necessary to prevent caving of the walls of excavations and to safeguard the workmen, the excavations shall be dug to such widths that proper allowance is made for the space occupied by the

sheeting and bracing. The CONTRACTOR shall perform the additional excavation required and furnish and put in place the necessary sheeting and bracing and shall remove the same as the excavation is filled, at his own expense.

5.6 REMOVAL OF WATER

The CONTRACTOR shall construct and maintain all necessary channels, flumes, and/or other temporary diversion and protective works; shall furnish all materials required therefore; and shall furnish, install, maintain and operate all well points, casings, pumps and other equipment for dewatering the various parts of the work and for maintaining the foundations, trenches and other parts of the work free from water as required for constructing each part of the work. After having served their purpose, all temporary protective works shall be removed, or leveled, to give a slightly appearance and so as not to interfere in any way with the operation, usefulness or stability of the permanent structures.

5.7 PROTECTION OF FINISHED STRUCTURE EXCAVATIONS

It shall be the CONTRACTOR'S responsibility to maintain finished excavated foundation surfaces for the works in good condition until such time as the structures are placed on or against the surfaces.

5.8 BORROW

Borrow excavation shall consist of and include the required excavation and proper utilization of approved materials obtained from designated areas when sufficient quantities of suitable materials are not available from other required excavation.

The control of excavation in any borrow area and the selection of materials therefrom shall at all times be as directed by the ENGINEER. On completion of excavation, all borrow pits shall be left in a neat and sightly condition. Unless otherwise approved by the ENGINEER, all borrow pits shall be so graded and dressed that water will readily drain therefrom, and away from all embankments, berms and structures. When shown on the drawings, terraces, or diversions shall be constructed to protect the slopes of the borrow areas from erosion and shall be considered a subsidiary of this specification.

6.0 STRUCTURE FOUNDATION FILL

After clearing and stripping operations have been completed, all structure locations shall be proofrolled with a loaded pan or heavy pneumatic tired vehicle to densify upper soils and to locate possible areas which will require undercutting, removal and/or recompaction. This operation shall be conducted under the surveillance of the ENGINEER.

6.1 FILL MATERIAL APPROVAL

Before initiating filling operations, the CONTRACTOR shall receive approval of fill material by the ENGINEER. Several laboratory Proctor density tests shall be run on representative samples obtained from the proposed borrow material.

6.2 PLACEMENT OF FILLS

Where structures or other appurtenances are constructed on fill, the fill shall be placed in layers not over six (6") inches deep, as measured before compaction and be thoroughly compacted.

6.3 COMPACTION

Compaction may be obtained by use of a sheeps foot roller or pneumatic-tired roller. Water shall be applied as directed to obtain close adhesion between layers and all parts of the material. Fill shall be compacted to a minimum of 95% of the Standard Proctor maximum dry density (ASTM Specifications D- 698). A minimum of two (2) compaction tests per each two (2') feet of fill on a structure location shall be run by an experienced soils engineering technician.

In order to prevent damage to existing structures, heavy construction equipment shall not be allowed to operate within approximately 8 feet horizontally of the existing structure exterior wall.

7.0 BACKFILLING AROUND STRUCTURES

Only suitable material approved by the ENGINEER shall be used for backfilling around structures.

Backfilling around structures shall have material placed in layers of six (6") inch depth and compacted by pneumatic tools or other small equipment operated by hand. In no case shall the backfilling be allowed to obtain an elevation of one (1') foot above any other area. It shall be uniformly compacted throughout the structure depth. Any deviation shall be cause for the ENGINEER to require the material deposited to be removed and recompacted at the CONTRACTOR'S expense.

All backfilling shall be done in such a manner that the pipe or structure over or against which it is being placed will not be disturbed or injured. Any pipe or structure injured, damaged or moved from its proper line or grade during backfilling operations shall be removed or repaired to the satisfaction of the ENGINEER and then re-backfilled.

8.0 DAM EMBANKMENT (Not Applicable to this Project)

One foot of material shall be stripped from the top of the existing embankment. This material shall be stockpiled for use as final cover. The surface of the embankment shall then be moistened and/or worked with a harrow, scarifier, or other suitable equipment to provide a satisfactory bonding surface for the additional fill. The surface condition must be approved by the ENGINEER prior to any fill being placed.

No fill material used in raising the embankment shall be dumped in place, but shall be distributed by blading or dozing in a manner that will insure placement so that voids, pockets, and bridging are held to a minimum. The hauling and placement equipment shall be routed over the area such that all areas receive approximately the same compactive effort. The fill shall be compacted such that in-place density checks indicate a soil dry density of at least 90 percent of the maximum value as determined by the standard Proctor density test. The embankment shall be raised in approximately horizontal lifts extending the entire length and width of the embankment. The thickness of the lifts before compaction shall not be more than eight (8) inches.

The stockpiled topsoil shall be uniformly spread over the raised embankment to insure that the final surface is capable of being vegetated.

It is anticipated that sufficient material to reach the designated elevations and grades will be generated from the excavation necessary to construct the principal spillway and the cleaning of the emergency spillway. Should an insufficient supply of material be available from these two sources, the needed additional material will be obtained from the borrow area below the toe of the embankment designated on the Drawings. Borrow operations shall be conducted in accordance with 4.08 BORROW.

9.0 PRELOADING OF STRUCTURES

All tanks shall be preloaded with water prior to making final pipe connections. Elevations of structures shall be monitored until settlement has virtually ceased.

10.0 BACKFILLING TRENCHES

The backfill shall be in accordance with other applicable sections of these specifications.

11.0 FINISH GRADING

Finish grading shall be to the finished elevations and grades shown, and shall be made to blend into conformation with remaining natural ground surfaces. All finish graded surfaces shall be left smooth and free to drain. Areas to be sown in grasses shall be prepared according to Section 02003. Excess materials shall

be spread and compacted as directed. Grading within the construction area and around the outside of building and structure lines shall be performed in a manner which will prevent accumulation of water within the area. Where necessary, or where shown, finish grading shall be extended to insure that water will be directed to drainage ditches, and the site area left smooth and free from depressions holding water.

12.0 MAINTENANCE

All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments and channels shall be maintained by the CONTRACTOR in good condition at all times until final acceptance by the OWNER. The CONTRACTOR shall maintain trench backfill at the original ground surface by periodically adding specified backfill material as necessary or when directed by the ENGINEER. Such maintenance shall be continued until final acceptance of the project.

13.0 PAYMENT

Payment for all excavation and fill work shown on the Drawings and herein specified, that is required to complete the clearing, grubbing, site grading, roads, structural excavation, trench excavation, borrow excavation, backfill, sheeting, shoring, topsoil, crushed stone or gravel, drainage, pumping, embankment fills and any other excavation and fills required to complete the work as shown on the Drawings shall be included in the work to which it is subsidiary in the Bid Schedule and no measurement of the quantities will be made. The contours and elevations of the present ground are believed to be reasonably correct but are not guaranteed. The CONTRACTOR shall satisfy himself by actual examination of the site of work as to the existing elevations and contours and the amount of work required under this Section.

The cost of all initial soils inspections and testing shall be paid by the OWNER. If compaction tests do not meet required values, the cost of additional testing as required by the ENGINEER shall be paid by the CONTRACTOR.

SECTION 02003

SEEDING, MULCHING AND CLEANING UP

1.0 GENERAL

The Work covered by this Specification consists of furnishing all materials, equipment, and labor for preparing the seedbed, fertilizing, seeding and mulching the disturbed areas as directed by the ENGINEER. This Specification also covers cleaning up and repairing damage.

The ENGINEER shall direct all areas to receive seeding and mulching. All areas receiving seeding and mulching shall have lime and fertilizer applied.

2.0 MATERIALS

2.1 LIME

Two tons of agricultural limestone per acre shall be required.

2.2 FERTILIZER

A. Amounts. The following amounts of fertilizer are required per acre:

(1) Nitrogen (N)	60 lbs.
(2) Phosphorous (P205)	120 lbs.
(3) Potash	120 lbs.

B. Analysis. This requirement can be met by applying fertilizer having an analysis of 10-20-20 at the rate of 600 pounds per acre.

2.3 SEED

The following amounts of pure live seed are required per acre:

(1) KY-31 Fescue	60 lbs.
(2) Perennial Ryegrass	25 lbs.
(3) Red Clover	10 lbs.

2.4 MULCH

Mulch shall consist of wood fiber applied at a rate of 1600 pounds per acre, bituminous treated straw applied at a rate of 2000 pounds per acre or other mulch subject to the advance approval of the ENGINEER.

3.0 EXECUTION

3.1 TIME

The seeding shall be completed within two weeks after completion of the work or as soon thereafter as conditions are favorable.

3.2 PREPARATION OF SEEDBED

- A. Application of Lime and Fertilizer. Immediately prior to seedbed preparation, the CONTRACTOR shall apply the agricultural lime and fertilizer uniformly over the area to be seeded.
- B. Mechanical Tillage. The seedbed shall be prepared by pulverizing and breaking up the soil to a minimum depth of two inches with a disk harrow, drag harrow, spike tooth harrow or similar tool. All rocks, clods, and undesirable material that would interfere with seeding operations shall be removed.

3.3 SEEDING

- A. Time. The seeding operations shall be performed immediately after, or as soon as practicable, after the seedbed has been prepared.
- B. Equipment. The seed shall be drilled or broadcast uniformly over the seedbed with regular approved type of equipment or method acceptable to the ENGINEER.
- C. Tillage. The seeded area shall be passed over with a harrow or cultipacker to help cover more seed and improve seedling establishment. Excessive tillage shall be avoided.

3.4 MULCHING

The approved mulch shall be applied uniformly over the seeded area at the rate required.

4.0 CLEANING UP

4.1 After all construction work is complete, prior to final payment, all exposed areas shall be cleaned and left in a sightly manner.

4.2 All unused material shall be removed from the site. No burning will be allowed on the site.

5.0 HYDROSEEDING AND HYDROMULCHING

The CONTRACTOR may hydroseed and hydromulch if the following requirements are met.

1. The individual seed quantities shall be increased by 20%.
2. The mulch shall be a processed hay or straw applied at a rate of 3/4 ton per acre with 80 lbs. per acre of an organic tackifier.
3. The hydroseeder slurry shall not be allowed to drop below a pH of 5.0.

6.0 MAINTENANCE AND WARRANTIES

6.1 MAINTENANCE

The CONTRACTOR shall be responsible for the maintenance of all work under this Section until final acceptance. Adequate protection of exposed slopes shall be provided at all times to prevent excessive erosion. No work will be accepted unless there is evidence of healthy growth and sufficient cover to prevent erosion.

6.2 WARRANTIES

Work executed under this Section shall be guaranteed for one year with the guarantee beginning on the date of final acceptance of all work under this Contract. Any seeded areas of the site which are found to not have an adequate growth of cover during the guarantee period, shall be re-seeded as soon as weather conditions permit, at no cost to the OWNER.

7.0 PAYMENT

Payment for all revegetation work and cleanup shall be included in the work to which it is subsidiary in the Bid Schedule and no measurement of the quantities will be made.

SECTION 02100

FENCE CONSTRUCTION

11.0 SCOPE

Fencing is normally bid as an alternate construction item and if included is to be constructed at locations and in the manner shown on the plans.

11.1 CHAIN LINK FENCING

Fencing shall be of non-climable type as manufactured by the Cyclone Fence Company, or approved equal. It shall be standard overall height of seven (7) feet and constructed of chain link fabric with three rows of barb wire on top of steel brackets. Chain link fabric shall be one foot less than complete overall height of fence.

Vehicular gates shall be as shown on the DRAWINGS.

11.1.1 Option. These Specifications are based upon the use of steel, chain link, galvanized fencing. At Contractor's option, and at no additional expense to Owner, fencing may be constructed of aluminum products and accessories. Basic specification requirements for aluminum shall be equivalent to specifications for steel fencing. Aluminum fencing products and accessories shall also conform to applicable portion of the "Recommended Commercial Standard for Aluminum Alloy Chain Link Fencing" as published by the Chain Link Fence Manufacturers Institute.

11.1.2 Material. All fencing materials shall conform to applicable portions of the Standards of the Chain Link Fence Manufacturers Institute (CLFMI). Material for framework shall be open hearth, copper-bearing steel conforming to the applicable requirements of the latest ASTM for Standard Specifications, Serial Designation A7 for Steel for Bridges and Buildings.

End, corner, angle and pull posts shall be 3-inch outside diameter, standard tubular steel weighing not less than 5.79 pounds per linear foot. Line posts shall be 2 1/4-inch structural "H" sections weighing 4.1 pounds per linear foot or 2 3/8-inch outside diameter steel pipe weighing 3.65 pounds per linear foot. Top rail shall be 1 5/8-inch outside diameter steel pipe weighing 2.27 pounds per linear foot or "H" section weighing 2.27 pounds linear foot. Top rails shall be provided with expansion rail couplings spaced at not less than 20 foot intervals. Gate posts for pedestrian gates shall be 3-inch outside diameter pipe weighing 5.79 pounds per linear foot. Gate posts for vehicular gates shall be 4-inch outside diameter pipe weighing 9.1 pounds per linear foot.

Braces shall be provided at all corners and wherever fabric is not continuous, such as at gates or at other openings. Braces shall be of the same material as top rail. Extension arms on intermediate posts shall be of pressed steel. Extension arms on end and corner posts shall be heavy malleable iron. Extension arms shall carry 3 barbed wires. Fittings used in connection with the fence and gates shall be malleable iron or pressed steel. Barbed wire shall be four-point pattern, two strand, No. 12-1/2 gauge, copper-bearing steel wire, heavily hot galvanized after weaving, with large barbs placed 3 inches apart. Chain link fabric shall be copper-bearing base metal No. 9 gauge wire heavily zinc coated by hot dip process after weaving. The fabric shall have a knuckled selvage along the top rail and a twisted and barbed selvage at the bottom. The barbing shall be done by cutting the wire on a bias, creating sharp points. A 2-inch padlock and chain shall be furnished with each gate. Three keys shall be furnished with each padlock. Chain shall be welded to the gate. Gate frames shall be of 1.9 inch outside diameter pipe weighing 2.72 pounds per linear foot. Corner fittings shall be heavy, malleable iron castings or pressed steel. Fabric shall be same as in fence. Each gate frame shall be equipped with 3/8-inch diameter adjustable ball-and-socket hinges, catch and stops. Double gates shall have center rests. Hinges shall provide for swinging the gate open through an arc of not less than 180 degrees. Gates shall be suitably braced and reinforced to prevent sagging. Double gates shall be provided with center plumber rod, catch and semi-automatic outer catches to secure gate in opened position. All materials entering into the construction of required fencing shall be heavily galvanized by the hot dip process.

11.1.3 Construction. End, corner and gate posts shall be set in a concrete base not less than 18 inches in diameter which shall extend at least three inches below the bottom of the post. The post shall extend to a depth of at least three feet below the surface of the ground. A brace shall be spaced midway in height of each end, corner and gate post and shall extend to the first line post. Braces shall be securely fastened to posts by means of malleable iron connections and trussed from line post back to end, corner or gate post with a 3/8-inch diameter rod.

Line posts shall be set in a concrete base not less than 12 inches in diameter which shall extend at least three inches below the bottom of the post. The post shall extend to a depth of at least thirty inches below the surface of the ground. Line posts shall be equally spaced along the line of fence at intervals not to exceed ten (10') feet.

Galvanized steel pipe sleeves, 4-inch O.D. for corner, pull and gate posts and 3 1/2-inch O.D. for line posts shall be embedded in concrete as shown on the plans for all fence posts to be installed on concrete structures.

Top rail shall be installed between line posts. Fabric shall not be erected until concrete has had sufficient time to cure. Chain-link fabric shall be stretched to

uniform tightness on the outside of the posts with suitable tools and shall be attached with No. 6 gauge galvanized wire clips securely clinched and attached by means of adjustable clamps. Fabric shall be fastened to line posts at 14-inch intervals. Fabric shall be attached to rail at 24-inch intervals by galvanized tie wires.

A No. 7 coil spring galvanized wire shall be stretched along the bottom of the fence and securely fastened to the posts. The chain-link fabric shall be attached to the tension wire at intervals not to exceed two feet.

11.2 MEASUREMENT AND PAYMENT

Payment for this item will be based on the linear feet of fence installed as measured to the nearest 1.0 foot in the field. Payment on a linear foot basis will be the method of compensation for installation of fencing including posts, gates, concrete, and any other work, incidentals or equipment required for a satisfactory installation as shown on the Drawings.

Gates, which are normally considered incidental to the fence installation, may be segregated into separate bid items. Attention is directed to the Bid Schedule for specific project treatment.



SECTION 02513

ASPHALT CONCRETE PAVING

1.0 QUALITY ASSURANCE

1.1 REFERENECS

- A. Kentucky Standard Specifications for Road and Bridge Construction, latest edition (KS).
- B. Asphalt Institute:
 - 1. AI MS-2 – Mix Design Methods for Asphalt Concrete and other Hot-Mix Types.
 - 2. AI MS-19 – Basic Asphalt Emulsion Manual.

2.0 SUBMITTALS

- 2.1 Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.
- 2.2 Provide product and material data, and design mix for each layer of material: sub-base, base course asphalt, wear course asphalt.

3.0 PRODUCTS

- 3.1 Provide plant mixed, hot laid asphalt-aggregate mixture complying with ASTM D 3515 and as recommended by local paving authorities to suit project conditions:
 - A. Base Course with 3.0-6 percent of asphalt cement by weight in mixture in accordance with AI MS-2.
 - B. Binder Course with 4.5-6 percent of asphalt cement by weight in mixture in accordance with AI MS-2.
 - C. Wear Course with 5-7 percent of asphalt cement by weight in mixture in accordance with AI MS-2.
- 3.2 Sub-base shall be dense graded aggregate, naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag and

- natural or crushed sand, complying with Section 805 of Kentucky Standard Specifications for Road and Bridge Construction.
- 3.3 Tack coat and primer asphalt shall be provided as required per Kentucky Standard Specifications.
- 3.4 Commercial chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid or wadable powder form, as manufactured by Allied Chemical Corp. Cia-Gigy Corp., Dow Chemical U.S.A.
- 3.5 Lane Marking Paint: Chlorinated rubber alkyed type, AASHTO M 248 (FS TT-P-115), Type III.
- 3.6 Pipe bollards – 6" steel pipe x 6'-6", hot dipped galvanized, set in 24" hole x 24" deep, surrounded by concrete and filled with concrete.
- 3.7 Wheel Stops: Precast of 3,500 psi air entrained concrete, approximately 6" high, 9" wide and 7'-0" long, with chamfered corners and drainage slots on underside, and anchor holes 1" diameter, placed vertically, 2" from each end.

4.0 EXECUTION

4.1 Site Conditions:

- A. Contractor shall inspect existing conditions at site relative to previous excavation and grading, as well as site preparation by others, and report any unacceptable conditions to the Architect in writing prior to beginning work. Beginning work will indicate acceptance of existing conditions as satisfactory for completing the work, and no claim for additional costs relative to preparation, repair, or modification of previous work will be allowed because of those conditions.
- B. All preparation of subgrade, placement of gravel, and paving shall be in accordance with Kentucky Standard Specifications for Road and Bridge Construction.
- C. Establish and maintain required lines and elevations.
- D. Apply prime and tack coats when ambient temperature is above 50°F (10°C), and when temperature has not been below 35°F (1°C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

- E. Construct asphalt concrete surface course when atmospheric temperature is above 40°F (4°C), and when base is dry. Base course may be placed when air temperature is above 35°F (2°C) and rising.

4.2 INSTALLATION

A. Place wetted subbase in two lifts, minimum thickness after compaction with 10 ton roller: 10" at main drive, loading and service areas for trucks or busses, 8" typical at parking area for passenger cars. Compact/consolidate each layer to density of 84% or greater, of solid volume throughout layer. Additional wetting of base course during compaction may be required.

B. If Owner has employed or required a testing agent, each layer of subbase should be tested in increments of 2000 sf to ascertain proper consolidation has been reached. Testing shall be performed just prior to beginning asphalt coating. If no testing agent is employed, proof roll area to be paved prior to placing subbase, and again after placing subbase. Provide proof rolling of prepared soil subbase, and later on aggregate course in addition to testing at Owner's request.

C. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.

D. Provide and install asphalt primer and/or tack coat as required by Asphalt Institute or Kentucky Standard Specifications for current job conditions.

E. Place asphalt concrete mixture on prepared surface, spread and strike off. Spread mixture at minimum temperature of 225 degrees F (107 degrees C). Place inaccessible and small areas by hand. Place binder course of 3" compacted thickness, wear course of 2" compacted thickness, to required grade and cross section.

F. Provide paving and base at all drives and parking areas not indicated to be concrete.

G. Begin rolling when mixture will bear roller weight without excessive displacement. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers. Accomplish breakdown or immediately following rolling of joints and outside surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material. Follow breakdown rolling as soon as possible while mixture is hot. Continue second rolling until mixture has been thoroughly compacted. Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

H. Remove and replace paving in areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

I. After final rolling, do not permit vehicular traffic on pavement until it has cooled to less than 140°F and hardened. Erect barricades as required.

J. Sweep and clean surface to eliminate loose material and dust. Layout lines and areas to be painted, and obtain approval by Architect prior to paint application.

K. Apply 1 coat of traffic and lane marking paint according to manufacturer's recommendations for application, and at locations indicated on Contract Drawings (mark between designated spaces; i.e., 8 spaces at 8.5') whether or not specifically noted to paint lines on drawings. Use mechanical equipment to produce uniform, straight edges with 4" – wide lines.

L. Repairs and patching to existing pavement made necessary by either damage from construction equipment during the work on this project, or by cutting existing paving as part of utility installation, shall be performed in steps similar to those described herein. Cut out all areas to be repaired with saw to provide straight lines on all sides.

M. Contractor shall make repairs to correct non-compliance with tolerances or with water drainage, in accordance with cited specification.

N. Install bollards at locations indicated.

O. Install wheel stops at each new parking space indicated in the area of construction. Set typically 2' from wheel face to edge of pavement. Secure wheel stops to concrete surface with not less than two ¾" diameter galvanized steel dowels. Length of dowel to penetrate at least 6" into soil subbase. Drill placement holes oversize and embed dowels in hot grout material.

4.3 FIELD QUALITY CONTROL

A. Test in place asphalt concrete courses for compliance with requirements for thickness and surface smoothness (using 10' straightedge) to the following tolerances:

Base course thickness ½"
Wearing course thickness – ¼"
Base course surface ¼"
Wearing course surface 3/16"
Crown surface variance ¼"

B. Test aggregate course for minimum density at least one test every 2,500 s.f.

4.4 Paving slope should drain water from surface.

4.5 MEASUREMENT AND PAYMENT

No measurements will be made. Payment will be made on the basis of the plan dimensions shown on the Plans.

DIVISION 3
CONCRETE

SECTION 03251

EXPANSION, CONSTRUCTION, AND CONTROL JOINTS

1.0 GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society for Testing and Materials (ASTM):
 - a. A36, Standard Specification for Structural Steel.
 - b. A525, Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 - c. D226, Standard Specification for Asphalt- Saturated Organic Felt Used in Roofing and Waterproofing.
 - d. D227, Standard Specification for Coal-Tar-Saturated Organic Felt Used in Roofing and Waterproofing.
 - e. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type) (AASHTO M33).
 - f. D1056, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
 - g. D 175 1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
2. Corps of Engineers (COE): CRD-C-572, Corps of Engineers Specifications for Polyvinylchloride Waterstop.
3. American National Standards Institute (ANSI): ANSI/NSF 61, Drinking Water System Components, Health Effects.

1.2 SUBMITTALS

A. Shop Drawings-

1. Plastic Type Water Stops: Details of splices to be used and method of securing water stop in the forms and supporting water stop so as to maintain proper orientation and location during concrete placement.
2. Construction Joints: Layout and location indicating type to be used.
3. Joint fillers for horizontal joints.
4. Preformed control joints.
5. Water stop.

- B. Samples: Splice, joint, and fabricated cross of each size, shape, and fitting of water stop(s) proposed for use.
- C. Quality Control Submittals:
 - 1. Joint Filler for Potable Water Structures: Copy of applicable NSF listing.
 - 2. Water stop manufacturer's written instructions for product shipment, storage, handling, installation field splices, and repair.
 - 3. Joint Filler and Primer: Manufacturer's written instructions for product shipment, storage, handling, application, and repair.
 - 4. Preformed Control Joint: Manufacturer's written instructions for product shipment, storage, handling, application, and repair.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Acceptance of pourable joint filler for potable water structures by federal EPA or by a state health agency.
 - 1. Pourable Joint Filler: Certified as meeting NSF 61.
- B. Special Inspection (Kentucky Building Code 2007, Section 1704) :
 - 1. Special Inspections to be performed under this contract is listed under General Provisions of Structural Drawings. If special inspection is required, Owner will retain the services of a Special Inspector of Record to inspect all applicable work under this contract and this Contractor is responsible for providing safe access to all areas of work under this contract to be inspected at no additional cost to the Owner or His/Her Agents. No reinforcing steel erection or concreting shall take place without written approval of the Special Inspector of Record (SIR). Any progression of work without the approval of the SIR will be subject to demolition at this contractor's expense. At the completion of the Special Inspection secure a written approval from the SIR for placing concrete in the forms that were approved for concreting.
 - 2. The extent of special inspection to be performed is listed in Table 1704.4 of the Kentucky Building Code 2007 (KBC 2007).

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Acceptance at Site: Verify that water stops delivered are in accordance with cross-section dimensions as shown and manufacturer's product data prior to unloading and storing onsite.

2.0 PRODUCTS

2.1 LABYRINTH WATER STOP

- A. Extruded from polyvinyl chloride (PVC) in conformance with Corps of Engineers' Specification CRD-C-572.
- B. Size and configuration as shown.

2.2 PLASTIC WATER STOP

- A. Extruded from an elastomeric plastic compound of which the basic resin shall be polyvinyl chloride (PVC). Reclaimed PVC in the compound is not acceptable.
- B. Specific Gravity: Approximately 1.37.
- C. Shore Durometer Type A Hardness: Approximately 80.
- D. Performance Requirements: Corps of Engineers' Specification CRD-C-5 72.
- E. Type: Center bulb with a number of parallel ribs or protrusions on each side of strip center.
- F. Corrugated or tapered type water stops are not acceptable.
- G. Thickness: Constant from bulb edge to the outside stop edge.
- H. Minimum Weight per Foot of Water Stop:
 - 1. 1.62 pounds for 3/8-inch by 6-inch.
 - 2. 2.30 pounds for 3/8-inch by 9-inch.
- I. Manufacturers and Catalog Numbers:
 - 1. Vulcan Metal Products, Inc., Construction Materials Division, Birmingham, AL; Catalog No. 3/81-15M: Type 8069 (6-inch by 3/8-inch).
 - 2. Vinylex Corp., Knoxville, TN; Catalog No. 03250/VIN: No. RB6-38H (6-inch by 3/8-inch).
 - 3. Greenstreak Plastic Products, St. Louis, MO; Catalog No. 03250/GRD: Style 732 (6-inch by 3/8-inch).
 - 4. A. C. Horn, Inc., Beltsville, MD; Catalog No. CSP-162: Type 9 (6-inch by 3/8-inch).

2.4 WIRE LOOPED PLASTIC WATER STOP

- A. Furnish as an alternative to plastic water stops.
- B. Same material and geometry as plastic water stops.
- C. Furnish with continuous galvanized wire looping at edge for convenience in positioning and securing stop in place in the forms.
- D. Manufacturers and Catalog Numbers: Paul Murphy Plastics, Roseville, MI; "Wire Stop Water Stop",- geometry numbers ACR 6380, ACR 9380, as shown on Paul Murphy Plastics Co. Drawing No. CCP-120-12M.

2.5 BOND BREAKER

- A. Tape for Expansion Joints: Adhesive-backed glazed butyl or polyethylene tape same width as the joint that will adhere to the premolded joint material or concrete surface.
- B. Use either bond breaker tape or a bond prevention material as specified in Section 03300, CAST-IN-PLACE CONCRETE, except where a tape is specifically called for.

2.6 PREMOLDED JOINT FELLER

- A. Bituminous Type: ASTM D994 or D1751
- B. Sponge Rubber: Neoprene, closed-cell, expanded; ASTM D1056, Type 2C5, with a compression deflection, 25 percent deflection (limits), 119 to 168 kPa (17 to 24 psi) minimum.
 - 1. Manufacturer and Product: Rubatex Corp.; R45 IN.

2.7 PREFORMED CONTROL JOINT

- A. One-Piece, Flexible, Polyvinyl Chloride Joint Former:
 - 1. Manufacturer and Product: Vinylex Corp., Knoxville, TN- Kold-Seal Zip-Per Strip KSF-150-50-50.
- B. One-Piece Steel Strip with Preformed Groove:
 - 1. Manufacturer and Product: Burke Concrete Accessories, Inc., San Mateo, CA; Keyed Kold Retained Kap.

C. Furnish in full-length, unspliced pieces.

2.8 POURABLE JOINT FILLERS

A. Filler for Potable Water Structures:

1. Meet requirements of ANSI/NSF 61
2. Multicomponent sealant, self-leveling or nonsag as required for level, sloping, or vertical joints.
3. Color: White.
4. Manufacturers and Products:
 - a. Sika Chemical Co., Lyndhurst, NJ; Sikaflex-2C or Sikaflex-1A.
 - b. Product Research Chemical Corp., Gloucester City, NJ; Permapol RC-270SL Reservoir Sealant or RC-270 Gun Grade Reservoir Sealant, with PRC Primer No. 57.

2.9 STEEL EXPANSION JOINT DOWELS

A. Dowels: ASTM A36 round smooth steel bars.

B. Bar Coating: Two-coat System No. 29A, FUSION BONDED, STEEL DOWEL COATING, as specified in Section 09900, PAINTING [A: AND PROTECTIVE COATINGS,] with a factory-applied lubricating coating.

2.10 ACCESSORIES

A. Joint Sealants: As specified in Section 07900, JOINT SEALANTS.

B. Nonshrink Grout:

1. As specified in Section 03600, GROUT.
2. Compatible with joint sealant.

C. Roofing Felt: ASTM D226, Type II, 30-pound asphalt-saturated or equal weight of ASTM D227 coal-tar saturated felt.

D. Reinforcing Steel: As specified in Section 03210, REINFORCING STEEL.

E. Nails: As required for securing bituminous type premolded joint filler.

F. Masking Tape: As required to temporarily adhere to concrete at each side of joint to receive filler.

3.0 EXECUTION

3.1 GENERAL

- A. Construct straight joints; make vertical or horizontal, except where walls intersect sloping floors.
- B. Commence concrete placement after the joint preparation is complete.
- C. Time Between Concrete Pours: As specified in Section 03300, CAST-IN-PLACE CONCRETE.

3.2 SURFACE PREPARATION

A. Construction Joints: Prior to placement of abutting concrete, clean contact surface:

- 1. Remove laitance and spillage from reinforcing steel and dowels.
- 2. Roughen surface to a minimum of 1/4-inch amplitude:
 - a. Sandblast after the concrete has fully cured.
 - b. Water blast after the concrete has partially cured
 - c. Green cut fresh concrete with high pressure water and hand tools.
- 3. Perform cleaning so as not to damage water stop, if one is present.

B. Expansion Joint with Pourable Filler:

- 1. Use motorized wire brush or other motorized device to mechanically roughen and thoroughly clean concrete surfaces on each side of joint from plastic water stop to the top of the joint.
- 2. Use clean and dry high pressure air to remove dust and foreign material, and dry joint.
- 3. Prime surfaces before placing joint filler.
- 4. Avoid damage to water stop.

C. Expansion Joint without Pourable Filler:

- 1. Coat concrete surfaces above and below plastic water stop with bond breaker.
- 2. Do not damage water stop.

D. Control Joint:

- 1. Join water stops at intersections to provide continuous seal.
- 2. Center water stop on joint.
- 3. Secure water stop in correct position to avoid displacement during concrete placement.
- 4. Repair or replace damaged water stop.

5. Place concrete and vibrate to obtain impervious concrete in the vicinity of all joints.
6. Joints in Footings and Slabs:
 - a. Ensure that space beneath plastic water stop is completely filled with concrete.
 - b. During concrete placement, make a visual inspection of the entire water stop area.
 - c. Limit concrete placement to elevation of water stop in first pass, vibrate the concrete under the water stop, lift the water stop to confirm full consolidation without voids, then place remaining concrete to full height of slab.
 - d. Apply procedure to full length of plastic water stops.

3.3 INSTALLATION OF WATER STOPS

A. General:

1. Join water stops at intersections to provide continuous seal.
2. Center water stop on joint.
3. Secure water stop in correct position to avoid displacement during concrete placement.
4. Repair or replace damaged water stop.
5. Place concrete and vibrate to obtain impervious concrete in the vicinity of all joints.
6. Joints in Footings and Slabs:
 - a. Ensure that space beneath plastic water stop is completely filled with concrete.
 - b. During concrete placement, make a visual inspection of the entire water stop area.
 - c. Limit concrete placement to elevation of water stop in first pass, vibrate the concrete under the water stop, lift the water stop to confirm full consolidation without voids, then placing remaining concrete to full height of slab.
 - d. Apply procedure to full length of plastic water stops.

B. Labyrinth Water Stops: Install in accordance with the manufacturer's written instructions. Use heat butt weld splices only.

C. Plastic Water Stop:

1. Install in accordance with manufacturer's written instructions.
2. Splice in accordance with the water stop manufacturer's Written instructions using a thermostatically controlled heating iron. Butt splice unless specifically detailed otherwise.
 - a. Allow at least 10 minutes before the new splice is pulled or strained in any way.
 - a. Finished splices shall provide a cross-section that is dense and free of porosity with tensile strength of not less than 80 percent of the unspliced materials.

3. Wire looped plastic water stop may be substituted for plastic water stop.

3.4 EXPANSION JOINT INSTALLATION

A. General:

1. Place bond breaker above and below water stop when premolded joint filler and pourable joint filler is not used.
2. Premolded Joint Filler:
 - a. Sufficient in width to completely fill the joint space where shown.
 - b. If a water stop is in the joint, cut premolded joint filler to but tightly against the water stop and the side forms.
3. Precut premolded joint filler to the required depth at locations where joint filler or sealant is to be applied.
4. Form cavities for joint filler with either precut, premolded joint filler, or smooth removable accurately shaped material. Entire joint above water stop, in slabs, shall be formed and removed so that entire space down to water stop can be filled with the pourable joint filler.
5. Vibrate concrete thoroughly along the joint form to produce a dense, smooth surface.

B. Bituminous Type Premolded Joint Filler:

1. Drive nails approximately 1-foot 6 inches on center through the form, prior to installing, to provide anchorage embedment into the concrete during concrete placement.
2. Secure premolded joint filler in forms before concrete is placed.
3. Install in walkways, at changes in direction, at intersections, at each side of driveway entrances, and at 45-foot intervals, maximum.

C. Pourable Joint Filler:

1. General: Install in accordance with the manufacturer's written instructions, except as specified below:
 - a. Apply primer prior to pouring joint filler.
 - b. Fill entire joint above the water stop with joint filler as shown.
 - c. Use masking tape on top of slabs at sides of joints ; clean spillage. Remove masking tape afterwards.
2. Rubber Asphalt Type, Hot-Applied:
 - a. Heat filler material in a double-walled boiler.
 - b. Place filler in the joint by means of a nozzle from a portable pouring type container to prevent spillage outside of the joint.
 - c. Begin pouring joint filler at the bottom of the horizontal joint and proceed upwards in a manner that will preclude the possibility of trapping air in the joint.

3. Rubber Asphalt Type, Cold-Applied: Place cold-applied, two-component fillers in accordance with manufacturer's written instructions.
4. Multicomponent Type for Potable Water Structures: Install in accordance with manufacturer's written instructions.

D. Steel Expansion Joint Dowels:

1. Install coated and lubricated bars parallel to wall or slab surface and in true horizontal position perpendicular to the joint in both plan and section view, so as to permit joint to expand or contract without bending the dowels.
2. Secure dowels tightly in forms with rigid ties.
3. Install reinforcing steel in the concrete as shown to protect the concrete on each side of the dowels and to resist any forces created by joint movement.

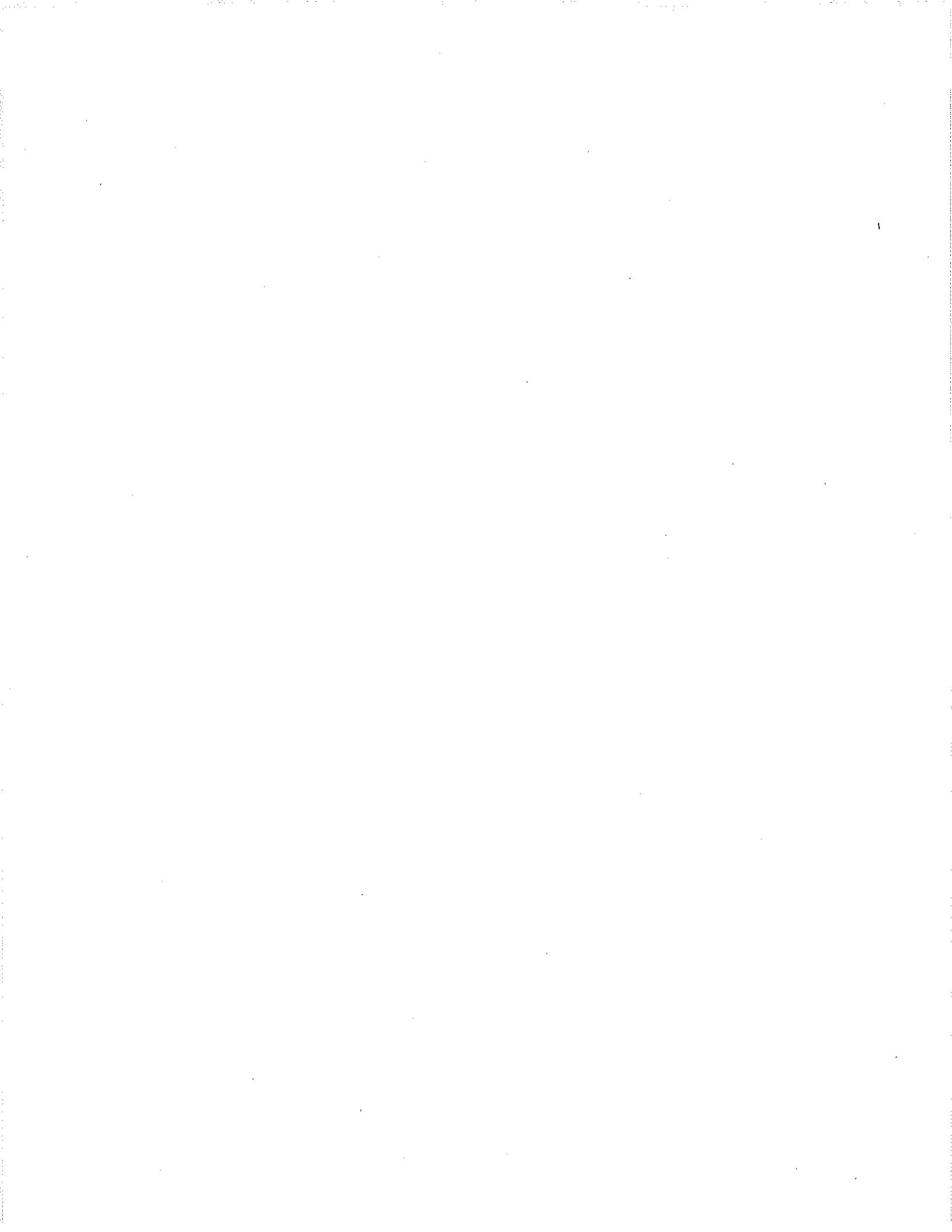
3.5 CONTROL JOINT INSTALLATION

- A. Locate reinforcing and dowels as shown.
- B. Install PVC water stop.
- C. Concrete surfaces shall be dense and smooth.
- D. Install bond breaker to concrete surfaces above and below water stop.

3.6 PREFORMED CONTROL JOINTS

- A. Use only where specifically shown; do not use in water-holding basins.
- B. Locate flush, or slightly below the top of slab.
- C. Install in accordance with manufacturer's written instructions in straight, full length unspliced pieces.
- D. Steel Strip Type with Preformed Groove: Brace to withstand pressure of concrete during and after placement.

END OF SECTION 03251



SECTION 03310
CONCRETE WORK

1.0 GENERAL

1.1 DESCRIPTION

- A. Work Included: Extent of concrete work is shown on drawings.
- B. Related Work:
 - 1. Documents affecting work of this Section include, but are not limited to, General Conditions, Supplementary Conditions, and Division 1 of these Specifications.
 - 2. Section 02220: Excavating, Backfilling, and Compacting.
 - 3. Section 03251: Expansion, Construction and Control Joints
 - 4. Section 03400: Precast Concrete
 - 5. Section 03600: Grout

1.2 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
 - 1. ACI 301 "Specifications for Structural Concrete for Buildings"
 - 2. ACI 318 "Building Code Requirements for Reinforced Concrete"
 - 3. ACI 350 R – "Environmental Engineering Concrete Structures"
 - 4. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
- B. Concrete Testing Services
 - 1. Engage a testing laboratory acceptable to ENGINEER to perform material evaluation tests and to design concrete mixes.
 - 2. Contractor will engage testing laboratory to perform sampling and testing during placement of concrete.
 - 3. Contractor will engage a testing laboratory to conduct tests of compression test specimens.
 - 4. Materials and installed work may require testing and retesting as directed by ENGINEER, at any time during progress of work. Allow free access to material stockpiles and facilities. Re-testing of rejected materials and installed work shall be done at Subcontractor's expense.

1.3 SUBMITTALS

- A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by ENGINEER.
- B. Shop Drawings - Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.
- C. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test as specified.
- D. Material Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by ENGINEER. Material certificates shall be signed by manufacturer and Subcontractor, certifying that each material item complies with, or exceeds, specified requirements.

PART 2 - PRODUCTS

2.1 FORM MATERIALS:

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection. Use plywood complying with U. S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

- D. Forms for Textured Finish Concrete: Form textured finish concrete surfaces with units of face design, size, arrangement and configuration as shown on drawings or as required to match ENGINEER's control sample. Provide solid backing and form supports to ensure stability of textured form liners.
- E. Cylindrical Columns and Supports: Form round-section members with fiberglass reinforced plastic, or paper or fiber tubes. Construct paper or fiber tubes of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation.

2.2 REINFORCING MATERIALS:

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed.
- B. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications, unless otherwise acceptable.
 - 1. For slabs-on-grade: Use supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For exposed-to-view concrete surfaces: Where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.3 CONCRETE MATERIALS:

- A. Portland Cement: ASTM C150, Type II, unless otherwise acceptable to ENGINEER. Use one brand of cement throughout project, unless otherwise acceptable to ENGINEER.
- B. Fly Ash: ASTM C618, Type C or Type F. Loss on ignition shall not exceed 3 1/2%. Limit use of fly ash to not exceed 25% of cement content by weight.
- C. Normal Weight Aggregates: ASTM C33, and as herein specified. Provide aggregates from a single source for exposed concrete.
 - 1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
 - 2. For interior slabs-on-grade coarse aggregates shall be graded such that not more than 18 percent nor less than 8 percent of the total aggregate is retained on the 3/4", 1/2", 3/8" and number 4 sieves.

- D. Water: Drinkable.
- E. Admixtures: The amount of water soluble chloride ions added to the mix by the admixtures shall not exceed 0.3% by weight of cement. Provide admixture manufacturer's written certification of weight of added chloride ions per ounce for each admixture.
 - 1. Air-Entraining Admixture: ASTM C260.
 - 2. Water-Reducing Admixture: ASTM C494, Type A
 - 3. High-Range Water-Reducing Admixture (SuperPlasticizer): ASTM C494, Type F or Type G
 - 4. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C494 Type E
 - 5. Water-Reducing, Retarding Admixture: ASTM C494, Type D

2.4 RELATED MATERIALS

- A. Waterstops: Provide waterstops at construction joints as indicated. Size to suit joints.
 - 1. Polyvinyl Chloride Waterstops
- B. Joint Filler: ANSI/ASTM D994, bituminous impregnated fiberboard; closed cell neoprene; self-expanding cork; of the size detailed and in locations indicated on the Drawings. Bituminous impregnated fiberboard shall not be used to fill joints in liquid retaining structures.
- C. Joint Covers: ANSI/ASTM B221; alloy extruded aluminum retainers with resilient neoprene fill strip; extruded aluminum cover plate; 25 shore hardness; to permit plus or minus 50 percent joint movement; of longest manufactured length; mounted as detailed or per manufacturer's recommendations.
- D. Sealants: Specified in Section 03251.
- E. Moisture Barrier: Provide moisture barrier cover over prepared base material where indicated. Use only materials which are resistant to decay when tested in accordance with ASTM E154, as follows:
 - 1. Polyethylene sheet not less than 8 mils thick.
- F. Non-Shrink Grout: CRD-C 621, factory pre-mixed grout.
- G. Smooth Dowels: Provide smooth dowels fabricated from plain steel bars conforming to ASTM A-615 or approved equal.

- H. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound complying with ASTM C309, Type I, Class A with % solids not less than 25%. Moisture loss not more than 0.03 gr./sq. cm. when applied at 300 square ft./gal.
- I. Impervious sheet conforming to ASTM C-171, polyethylene film shall be white opaque.
- J. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type.

2.5 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete as follows:
 - 1. Prepare concrete mixes, other than slab on grade concrete in accordance with ACI 301 Section 4.2.3
 - 2. Prepare slab on grade concrete mixes in accordance with ACI 302 Section 5.2.4 (Method B).
- B. Submit written reports to ENGINEER of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by ENGINEER.
- C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:
 - 1. 4500 psi 28-day compressive strength.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Subcontractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner, and as accepted by ENGINEER. Laboratory test data for revised mix design and strength results must be submitted to and accepted by ENGINEER before using in work.
- E. Admixtures:
 - 1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability. The use of a water-reducing admixture is required for slabs on grade.
 - 2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F. (10 degrees C.).

3. Use air-entraining admixture in exterior exposed concrete. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or-minus 1-1/2% within following limits:
 - a. Concrete structures and slabs exposed to freezing and thawing or de-icer chemicals
 - 5.5% 1-1/2" maximum aggregate.
 - 6.0% 1" maximum aggregate.
 - 6.0% 3/4" maximum aggregate.
 - b. Other Concrete: 2% to 4% air.
 4. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.
- F. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (WC) ratios as follows:
Subjected to freezing and thawing: WC 0.45.
- G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
 1. Ramps, slabs, and sloping surfaces: 4 inches.
 2. Concrete containing HRWR admixture (super-plasticizer): Not more than 8 inches after addition of HRWR to site verified 2 inch to 3 inch slump concrete.
 3. Other Concrete: 4 inches.
- H. Concrete Mixes:
 1. Ready-Mix Concrete: Comply with requirements of ASTM C94 and as herein specified. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.

PART 3 - EXECUTION

3.1 FORMS

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

- C. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.
- H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.
- I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.2 PLACING REINFORCEMENT

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.3 JOINTS

- A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to ENGINEER.
- B. Provide keyways at least 1 1/2" deep in construction joints in walls; keyways in construction joints in slabs to follow ACI recommendations for keyed construction joints.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise noted.
- D. Place dowels perpendicular to construction and expansion joints. Dowels shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during concrete placement. One end of the dowels shall be oiled or coated with high density polyethylene having a minimum thickness of 14 mils.
- E. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions.

- F. Isolation (Expansion) Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs on grade and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.
- G. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown.
 - 1. Contraction joints shall be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
- H. Install joint covers in accordance with manufacturer's instructions.
- I. Joint Filler and sealant materials are specified in Section 03251 of these specifications.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

3.5 PREPARATION OF FORM SURFACES

- A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
- B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
- C. Thin form-coating compounds only with thinning agent of type and in amount and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
- D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.6 CONCRETE PLACEMENT

- A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.
- B. Coordinate the installation of joint materials, perimeter insulation and moisture barriers with placement of forms and reinforcing steel.
- C. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete" and as herein specified.
- D. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
- E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
- F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with recommended practices.
- G. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- H. Maintain reinforcing in proper position during concrete placement operations.
- I. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
 - 1. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C.), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50

- degrees F (10 degrees C), and not more than 80 degrees F. (27 degrees C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
- J. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F (32 degrees C). Mixing water may be chilled or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Subcontractor's option.
 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
 3. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.
 4. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.7 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed to view or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
- C. Smooth Rubbed Finish: Unless noted otherwise, all formed exposed surfaces exposed to view (Limited to one foot below grade and one foot below the

minimum liquid level for open structures that are to contain liquids) shall have a finish conforming to ACI 301. Provide smooth rubbed finish to exposed concrete surfaces, which have received smooth form finish treatment, not later than one day after form removal.

1. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strikeoff smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 MONOLITHIC SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.
1. After placing slabs, plane surface so that depressions between high spots do not exceed 1/2" under a 10' straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified.
1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed to view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint or other thin film finish coating system.
1. After floating, begin first trowel finish operation using a power-driven trowel.

2. Begin final troweling when surface produces a ringing sound as trowel is moved over surface.
 3. Consolidate concrete surface by final troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to a tolerance of Ff 23, Fl 17.
 4. Grind smooth surface defects which would telegraph through applied floor covering system.
- D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
- E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps and elsewhere as indicated.
1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with ENGINEER before application.
- F. Chemical-Hardener Finish: Apply chemical-hardener finish to interior concrete floors where indicated. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Dilute liquid hardener with water (parts of hardener/water as follows), and apply in three coats: first coat, 1/3 strength; second coat, 1/2 strength; third coat, 2/3 strength. Evenly apply each coat and allow 24 hours for drying between coats.
1. Apply proprietary chemical hardeners in accordance with manufacturer's printed instructions.
 2. After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

3.9 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
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 7 days.
 2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

3. Maintain ambient temperature at 70 degrees F for three days after placing concrete.
- B. Curing Methods: Perform curing of concrete by moist curing, moisture-retaining cover curing, or curing and sealing compound as herein specified.
1. Moist curing: Provide moist curing by covering concrete surface with 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 covers.
 2. Moisture-retaining cover curing: Provide moisture-retaining cover curing by covering concrete surfaces and edges 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. Curing and sealing compound: Provide curing and sealing compound to interior slabs and to exterior slabs, walks, and curbs, as follows: Apply specified curing and sealing compound to concrete slabs 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. Re-coat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 4. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting and other coatings and finish materials, unless otherwise acceptable to ENGINEER.
- C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing methods specified above, as applicable.
- D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of curing and sealing compound unless otherwise noted.
1. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover unless otherwise directed.

3.10 SHORES AND SUPPORTS

- A. Comply with ACI 347 for shoring and re-shoring in multistory construction, and as herein specified.
- B. Extend shoring from ground to roof for structures 4 stories or less, unless otherwise permitted.
- C. Extend shoring at least 3 floors under floor or roof being placed for structures over 4 stories. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores. Space shoring in stories below this level in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.
- D. Remove shores and re-shore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate re-shoring to safely support work without excessive stress or deflection.
 - 1. Keep re-shores in place a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.11 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F. (10 degrees C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28-days. Determine potential compressive strength of in place concrete by testing field-cured specimens representative of concrete location or members.
- C. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.12 REUSE OF FORMS

- A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to ENGINEER.

3.13 MISCELLANEOUS CONCRETE ITEMS

- A. **Filling-In:** 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 work.
- B. **Curbs:** Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.
- C. **Equipment Bases and Foundations:** Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.
- D. **Grout base plates and foundations** as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.

3.14 CONCRETE SURFACE REPAIRS

- A. **Patching Defective Areas:** Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to ENGINEER.
 - 1. Cut out honeycomb, rock pockets, and voids over 1/4" in any dimension, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
- B. **For exposed to view surfaces:** Blend white portland cement and pigmented portland cement so that, when dry, patching mortar will match color

surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

- C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of ENGINEER. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
- D. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- E. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.
- F. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.015" wide, spalling, pop-outs, honeycomb, rock pockets and other objectionable conditions.
- G. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
- H. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Fill areas with concrete repair mortar. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- I. Repair isolated random cracks and single holes not over 1" in diameter with concrete repair mortar. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix repair mortar in accordance with manufacturers printed instructions. Place repair mortar after bonding compound has dried. Finish to match existing concrete. Keep patched area continuously moist for not less than 72 hours.

- J. Perform structural repairs with prior approval of ENGINEER for method and procedure, using specified epoxy adhesive and mortar.
- K. Repair methods not specified above may be used, subject to acceptance of ENGINEER.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The contractor will engage a testing laboratory to perform and report compressive strength tests. All concrete sampling and testing shall be performed by an ACI certified level 1 technician.
- B. The contractor will engage an ACI certified level 1 technician to inspect reinforcement placement and soil/rock bearing conditions prior to placing concrete. Notify testing agency at least 24 hours prior to concrete placement.
- B. Sampling and testing for quality control during placement of concrete will include the following:
 - 1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
 - 2. Slump: ASTM C143: one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - 3. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each day's pour of each type of concrete.
 - 4. Concrete Temperature: Test hourly when air temperature is 40 degrees F (4 degrees C) and below, and when 80 degrees F (27 degrees C) and above; and each time a set of compression test specimens made.
 - 5. Compression Test Specimen: ASTM C31; one set of 3 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
 - 6. Compressive Strength Tests: ASTM C39; one set for each day's pour exceeding 5 cubic yards plus additional sets for each 100 cubic yards over and above the first 50 cubic yards of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
- C. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive

strength, and no individual strength test result falls below specified compressive by more than 500 psi.

- D. Test results will be reported in writing to ENGINEER and Contractor within 24 hours that tests are made. Reports of compressive strength tests will contain the project identification name and number, date of concrete placement, slump and temperature at time of sampling, name of concrete testing service, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but will not be used as the sole basis for acceptance or rejection.
- F. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the ENGINEER. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Subcontractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION



SECTION 03600

GROUT

1.0 GENERAL

1.1 REFERENCES

A. The following is a list of standards, which may be referenced in this section:

1. American Society for Testing and Materials (ASTM):
 - a. C230, Standard Specification for Flow Table for Use in Tests of Hydraulic Cement.
 - b. C 10 18, Standard Test Method for Flexural Toughness and First-Crack Strength of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading).
 - c. C 1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 - d. C 1116, Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
 - e. D4580, Measuring Delaminations in Concrete Bridge Decks by Sounding, Practice for.
2. Corps of Engineers (COE):
 - a. CRD-C61 1, Flow of Grout for Preplaced Aggregate Concrete.
 - b. CRD-C621, Specification for Nonshrink Grout

1.2 SUBMITTALS

A. Shop Drawings:

1. Product data of grouts.
2. Proposed method for keeping existing concrete surfaces wet prior to placing grout.
3. Forming method for fluid grout placements.
4. Curing method for grout.

B. Quality Control Submittals:

1. Manufacturer's Written Instructions:
 - a. Adding fiber reinforcing to batching.
 - b. Cement-water ratio of grout topping.
 - c. Mixing of grout.
2. Manufacturer's proposed training schedule for grout work.
3. Manufacturer's Certificate of Compliance:
 - a. Grout free from chlorides and other corrosion-causing chemicals.
 - b. Nonshrink grout properties of Categories H and III, verifying expansion at 3 or 14 days will not exceed the 28 day expansion and nonshrink properties are not based on gas or gypsum expansion.
4. Manufacturer's Certificate of Proper Installation.
5. Statements of Qualification: Nonshrink grout manufacturer's representative.
6. Test Reports:

- a. Test report for 24-hour evaluation of nonshrink grout. Independent testing laboratory to certify that testing was conducted within the past 18 months.
- b. Test results and service report from the demonstration and training session, and from field tests.
- c. Field test reports and laboratory test results for field-drawn samples.

1.3 QUALIFICATIONS

- A. Nonshrink Grout Manufacturer's Representative: Authorized and trained representative of grout manufacturer. Minimum of 1 year experience that has resulted in successful installation of grouts similar to those for this Project.

1.4 GUARANTEE

- A. Manufacturer's guarantee shall not contain disclaimer on the product data sheet, grout bag, or container limiting responsibility to only the purchase price of products and materials furnished.
- B. Manufacturer guarantees participation with CONTRACTOR in replacing or repairing grout found defective due to faulty materials, as determined by industry standard test methods.

2.0 PRODUCTS

2.1 NONSHRINK GROUT SCHEDULE

- A. Furnish nonshrink grout for applications in grout category in the following schedule:

Application	Temperature Range	Maximum Placing Time	
	40 to 100 deg F	20 min	Greater Than 20 min
Filing Tie Holes	I	I	I
Blockouts for Gate Guides	I or II		II
Precast Joints	I or II		II
Through-bolt openings	II	II	II
Machine bases 25 hp or less	II	II	II
Patching concrete walls	II	II	II
Machine bases 26 hp and up	III	III	III
Baseplates and/or soleplates with vibration, thermal movement, etc.	III	III	III

2.2 NONSHRINK GROUT

A. Category I:

1. Nonmetallic and nongas-liberating flowable fluid.
2. Prepackaged natural aggregate grout requiring only the addition of water.
3. Test in accordance with AS TM C 1107:
 - a. Flowable consistency 140 percent, five drops in 30 seconds, in accordance with ASTM C230.
 - b. Flowable for 15 minutes.
4. Grout shall not bleed at maximum allowed water.
5. Minimum strength of grout, 3,000 psi at 3 days, 5,000 psi at 7 days, and 7,000 psi at 28 days.
6. Manufacturers and Products:
 - a. Master Builders Co., Cleveland, OH; SET GROUT.
 - b. Euclid Chemical Co., Cleveland, OH; NS Grout.
 - c. Dayton Superior Corp., Miamisburg, OH; Sure-Grip High Performance Grout.

B. Category II

1. Nonmetallic, nongas-liberating flowable fluid.
2. Prepackaged natural aggregate grout requiring only the addition of water.
3. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures.
4. Test in accordance with COE CRD-C621 and ASTM C 1107, Grade B:
 - a. Fluid consistency 20 to 30 seconds in accordance with COE CRD-C61 1.
 - b. Temperatures of 40, 80, and 100 degrees F.
5. 1 hour after mixing, pass fluid grout through flow cone with continuous flow.
6. Minimum strength of grout, 2,500 psi at 1 day, 4,500 psi at 3 days, and 7,000 psi at 28 days.
7. Maintain fluid consistency when mixed in 1 to 9 yard loads in ready-mix truck.
8. Manufacturers and Products:
 - a. Master Builders Co., Cleveland, OH; Master Flow 928.
 - b. Five Star Products Inc., Fairfield, CT; Five Star 100.
 - c. Euclid Chemical Co., Cleveland, OH; Hi Flow Grout.

C. Category III:

1. Metallic and nongas-liberating flowable fluid.
2. Prepackaged aggregate grout requiring only the addition of water.
3. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures.
4. Test in accordance with COE CRD-C621 and ASTM C 1107, Grade B:
 - a. Fluid consistency 20 to 30 seconds in accordance with COE CRD-C61 1.
 - b. Temperatures of 40 and 100 degrees F.
5. 1 hour after mixing, pass fluid grout through flow cone with continuous flow.
6. Minimum strength of grout, 4,000 psi at 1 day, 5,000 psi at 3 days, and 9,000 psi at 28 days.
7. Maintain fluid consistency when mixed in 1 to 9 yard loads in ready-mix truck.

8. Manufacturers and Products: Master Builders Co., Cleveland, OH; EMBECO 885.

3.0 EXECUTION

3.1 NONSHRINK GROUT

- A. General: Mix, place, and cure nonshrink grout in accordance with grout manufacturer's representative training instructions.
- B. Form Tie or Through-Bolt Holes: Provide nonshrink grout, Category I and II, Fill space with dry pack dense grout hammered in with steel tool and hammer. Through-bolt holes, coordinate dry pack dense grout application with vinyl plug in Section 03 100, CONCRETE FORMWORK and bonding agent in Section 03300, CAST-IN-PLACE CONCRETE.
- C. Grouting Machinery Foundations:
 - 1. Block out original concrete or finish off at distance shown below bottom of machinery base with grout. Prepare concrete surface by sandblasting, chipping, or by mechanical means to remove any soft material.
 - 2. Set machinery in position and wedge to elevation with steel wedges, or use cast-in leveling bolts.
 - 3. Form with watertight forms at least 2 inches higher than bottom of plate.
 - 4. Fill space between bottom of machinery base and original concrete in accordance with manufacturer's representative training instructions.

3.2 FIELD QUALITY CONTROL

A. Evaluation and Acceptance of Nonshrink Grout:

- 1. Provide a flow cone and cube molds with restraining plates onsite. Continue tests during Project as demonstrated by grout manufacturer's representative.
- 2. Perform flow cone and bleed tests, and make three 2-inch by 2-inch cubes for each 25 cubic feet of each type of nonshrink grout used. Restraining caps for cube molds in accordance with COE CRD-C621.
- 3. For large grout applications make three more cubes, one more flow cone test, including bleed test for each additional 25 cubic feet of nonshrink grout placed.
- 4. Consistency: As specified in Article NONSHRINK GROUTS. Reject grout with consistencies outside range requirements.
- 5. Segregation: As specified in Article NONSHRINK GROUTS. Reject grout when aggregate separates.
- 6. Nonshrink grout cubes shall test equal to or greater than minimum strength.
- 7. Strength Test Failures: Reject nonshrink grout work failing strength tests, remove and replace grout.
- 8. Perform bleeding test to demonstrate grout will not bleed.
- 9. Store cubes at 70 degrees F.
- 10. Independent testing laboratory shall prepare, store, cure, and test cubes in accordance with COE CRD-C62 1.

3.3 MANUFACTURER'S SERVICES

A. General:

1. Coordinate demonstrations, training sessions, and applicable site visits with grout manufacturer's representative.
2. Provide and conduct onsite, demonstration and training sessions for leech tests, mixing, flow cone measurement, cube testing, application, and curing for each category and type of nonshrink grout.
3. Coordinate necessary equipment and materials are available for demonstration.

B. Training:

1. Grout manufacturer's representative shall train CONTRACTOR to perform grout work.
2. Establish location at site and schedule time for grout manufacturer's demonstration and training session of proposed nonshrink grouts. Mix nonshrink grouts to required consistency, test, place, and cure on actual Project, e.g., baseplates and tie holes to provide actual on-the-job training.
3. Use minimum of five bags for each grout Category H and Category III. Mix grout to fluid consistency and conduct flow cone and two bleed tests, make a minimum of six cubes for testing of two cubes at 1, 3, and 28 days. Use remaining grout for final Work. Training includes methods for curing grout.
4. Mix sufficient grout Category I for minimum of 15 tie holes.
5. Patching through-bolt holes and blockouts for gate guides, and similar items.
6. Transport test cubes to an independent test laboratory and obtain test reports.

3.4 SUPPLEMENTS

A. The supplement listed below, following "END OF SECTION 03600" is part of this Specification.

1. 24-hour Evaluation of Nonshrink Grout Test Form and Grout Testing Procedures.

END OF SECTION

(Test Lab Name)

(Address)

(Phone No.)

24-HOUR EVALUATION OF NONSHRINK GROUT TEST FORM

OBJECTIVE: Define standard set of test procedures for an independent testing laboratory to perform and complete within a 24-hour period.

SCOPE: Utilize test procedures providing 24-hour results to duplicate field grouting demands. Intent of evaluation is establish grout manufacturer's qualifications.

PRIOR TO TEST: Obtain five bags of each type of grout.

1. From intended grout supplier for Project.
2. Five bags of grout shall be of same lot number.

ANSWER THE FOLLOWING QUESTIONS FOR GROUT BEING TESTED FROM LITERATURE, DATA, AND PRINTING ON BAG:

- | | | |
|--|-----------|----------|
| A. Product data and warranty information contained in company literature and data? | Yes _____ | No _____ |
| B. Literature and bag information meet specified requirements? | Yes _____ | No _____ |
| C. Manufacturer guarantees grout as specified in Article GUARANTEE? | Yes _____ | No _____ |
| D. Guarantee extends beyond grout replacement value and allows participation with CONTRACTOR in replacing and repairing defective areas? | Yes _____ | No _____ |
| E. Water demands and limits printed on bag? | Yes _____ | No _____ |
| F. Mixing information printed on the bag? | Yes _____ | No _____ |
| G. Temperature restrictions printed on bag? | Yes _____ | No _____ |

*Rejection of a grout will occur if one or more answers are noted NO.

GROUT TESTING PROCEDURES

A. Bagged Material:

1. List lot numbers.
2. List expiration date.
3. Weigh bags and record weight.

ENGINEER will disqualify grout if bag weights have misstated measure plus or minus 2 pounds by more than one out of five bags. (Accuracy of weights is required to regulate amount of water used in mixing since this will affect properties.)

B. Mixing and Consistency Determination:

1. Mix full bag of grout in 10 gallon pail.
2. Use electric drill with a paddle device to mix grout (jiffy or jiffiler type paddle).
3. Use maximum water allowed per water requirements listed in bag instructions.
4. Mix grout to maximum time listed on bag instructions.
5. In accordance with COE CRD-C611 (flow cone) determine time of mixed grout through the flow cone. _____ seconds
6. Add water to attain 20 to 30 second flow in accordance with COE CRD-C61 1.
7. Record time of grout through cone at new water demand. _____ seconds
8. Record total water needed to attain 20 to 30 second flow. _____ pounds
9. Record percent of water. _____ percent

C. When fluid grout is specified and additional water is required beyond grout manufacturer's fisted maximum water, COE CRD-C621 will be run at new water per grout ratio to determine whether grout passes using actual water requirements to be fluid. Use new water per grout ratio on remaining tests.

D. Bleed Test:

1. Fill two gallon cans half full of freshly mixed grout at ambient temperatures for each category and at required consistency for each.
2. Place one can of grout in tub of ice water and leave one can at ambient temperature.
3. Cover top of both cans with glass or plastic plate preventing evaporation.
4. Maintain 38 to 42 degrees F temperature with grout placed in ice and maintain ambient temperature for second container for 1 hour.

5. Visually check for bleeding of water at 15-minute intervals for 2 hours.
6. Perform final observation at 24 hours.

If grout bleeds a small amount at temperatures specified, grout will be rejected.

E. Extended Flow Time and Segregation Test (for Category H and 111):

1. Divide the remaining grout into two 3 gallon cans. Place the cans into the 40-degree F and 100-degree F containers and leave for 20, 40, and 60 minutes. Every 20 minutes remove and check for segregation or settlement of aggregate. Use a gloved hand to reach to the bottom of the can, if more than 1/4-inch of aggregate has settled to the bottom or aggregate has segregated into clumps reject the grout.
2. Right after the settlement test mix the grout with the drill mixer for 10 seconds. Take a COE CRD-C611 flow cone test of grout and record flow time. Maintain this process for 1 hour at ambient temperatures of 40 and 100 degrees F.
 - a. 20 min _____ sec. @ 40 degrees F.
 - b. 40 min _____ sec. @ 40 degrees F.
 - c. 60 min _____ sec. @ 40 degrees F.
 - d. 20 min _____ sec. @ 100 degrees F.
 - e. 40 min _____ sec. @ 100 degrees F.
 - f. 60 min _____ sec. @ 100 degrees F.

All Category 11 and III grout that will not go through the flow cone with continuous flow after 60 minutes will be disqualified.

Qualified

Disqualified

F. 24-hour Strength Test:

1. Using grout left in mixing cans in accordance with COE CRD-C621 for mixing and consistency determination test and for extended time flow test, make minimum of nine cube samples.
2. Store cubes at 70 degrees F for 24 hours.
3. Record average compressive strength of nine cubes at 24 hours.

Grout will be disqualified if 24-hour compressive strengths are under 2,500 psi for grouts claiming fluid placement capabilities.

Grouts that have not been disqualified after these tests are qualified for use on the Project for the application indicated in Nonshrink Grout Schedule.

Signature of Independent Testing Laboratory

Date Test Conducted

DIVISION 4

MASONRY

SECTION 04051

WATER REPELLENT CONCRETE MASONRY UNIT WALLS

1.0 GENERAL

The concrete masonry unit (CMU) wall shall be constructed with the DRY-BLOCK System as manufactured by Grace Construction Products, Cambridge, MA or approved equal. The DRY-BLOCK system consists of 3 separate products:

- DRY-BLOCK Block Admixture, a liquid polymeric admixture, is mixed into the concrete during manufacture of the CMU.
- DRY-BLOCK Mortar Admixture is added to the mortar mix.
- INFINISEAL DB Sealer is then either sprayed, rolled or brush applied to the outside surface of the walls.

2.0 CONCRETE MASONRY UNITS

The CMU's shall be produced only by qualified producers who are subjected to annual qualifications of their mix designs and admixture dosage rates to ensure the ability to manufacture water repellent units. **The units shall be heavy weight.**

3.0 MORTAR

Mortar Admixture is added at the recommended dosage rate, which is dependent on the type of mortar being used.

Agitate Mortar Admixture before using. Mortar admixture should be added to the mix water prior to charging the cement and sand. Reduce the initial water used in the mortar. The mortar joints shall have a well tooled concave joint profile.

Excess mortar shall be removed promptly from the face of the masonry units. Strong acids, sand blasting, and high pressure cleaning to remove hardened mortar will not be allowed.

4.0 SEALER

The water repellent sealer shall be applied to the finished water repellent CMU wall. The sealer shall be equal to INFINISEAL DB as manufactured by Grace Construction Products, Cambridge, MA. The preparatory work, surface preparation, protection of surrounding areas, application methods, drying and

curing times, post-application cleaning shall be in strict accordance with manufacture's recommendations and data sheets.

5.0 MANUFACTURER'S RECOMMENDATIONS

The entire CMU water repellent system shall be installed in strict accordance with the manufacturer's recommendations. The contractor shall submit the specifications and data sheets to the engineer for approval prior to construction of the CMU walls.

6.0 PAYMENT

Cost shall be included in the work to which it is subsidiary. No separate measurement and payment will be made.

SECTION 04200

UNIT MASONRY

1.0 GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

Requirements of this section apply to masonry work specified in Division-4 section "Reinforced Unit Masonry".

2.0 DESCRIPTION OF WORK

Extent of each type of masonry work is indicated on drawings and schedule.

Types of masonry work: Concrete unit masonry;
Prefaced concrete unit masonry; and
Pre-insulated concrete unit masonry.

3.0 QUALITY ASSURANCE

3.1 FIRE PERFORMANCE CHARACTERISTICS

Where indicated, provide materials and construction which are identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E 119 by a recognized testing and inspecting organization or by another means, as acceptable to authority having jurisdiction.

3.2 SINGLE SOURCE RESPONSIBILITY FOR MASONRY UNITS

Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

3.3 SINGLE SOURCE RESPONSIBILITY FOR MORTAR MATERIALS

Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.

Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

Protect sills, ledges and projections from droppings of mortar.

6.2 STAINING

Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.

6.3 COLD WEATHER PROTECTION; GENERAL

Do not lay masonry units which are wet or frozen.

Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.

Remove masonry damaged by freezing conditions.

6.4 COLD WEATHER INSTALLATIONS

Perform the following construction procedure while the work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10 deg. F.

6.4.1 40 deg. F. to 32 deg. F.

MORTAR: Heat mixing water to produce mortar temperature between 40 deg. F and 120 deg. F.

GROUT: Follow normal masonry procedures.

6.4.2 32 deg. F. to 25 deg. F.

MORTAR: Heat mixing water and sand to produce mortar temperatures between 40 deg. F. and 120 deg. F.; maintain temperature of mortar on boards above freezing.

GROUT: Heat grout materials to 90 deg. F. to produce in-place grout temperature of 70 deg. F. at end of work day.

6.4.3 25 deg. F. to 20 deg. F.

MORTAR: Heat mixing water and sand to produce mortar temperatures between 40 deg. F. and 120 deg. F.; maintain temperature of mortar on boards above freezing.

GROUT: Heat grout materials to 90 deg. F. to produce in-place grout temperature of 70 deg. F. at end of work day.

Heat both sides of walls under construction using salamanders or other heat sources.

Use windbreaks or enclosures when wind is in excess of 15 mph.

6.4.4 20 deg. F. and below

MORTAR: Heat mixing water and sand to produce mortar temperatures between 40 deg. F. and 120 deg. F.

GROUT: Heat grout materials to 90 deg. f. to produce in-place grout temperature of 70 deg. F. at end of work day.

MASONRY UNITS: Heat masonry units so that they are above 20 deg. F. at time of laying.

Provide enclosure and auxiliary heat to maintain an air temperature of at least 40 deg. F. for 24 hours after laying units.

Do not heat water for mortar and grout to above 160 deg. F.

6.5 COLD WEATHER STORAGE

Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.

6.5.1 40 deg. F. to 32 deg. F.

Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.

6.5.2 32 deg. F. to 25 deg. F.

Completely cover masonry with weather-resistive membrane for at least 24 hours.

6.5.3 25 deg. F. to 20 deg. F.

Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.

6.5.4 20 deg. F. and below

Except as otherwise indicated, maintain masonry temperature above 32 deg. F. for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40 deg. F. for 48 hours.

7.0 CONCRETE MASONRY UNITS

7.1 GENERAL

Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.

Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.

Provide square-edged units for outside corners, except where indicated as bullnose.

7.2 CONCRETE BLOCK

Provide units complying with characteristics indicated below for Grade, Type, face size, exposed face and, under each form of block included, for weight classification.

Grade N unless otherwise specified.

Grade S may be used above grade in exterior walls with weather protective coatings and in walls not exposed to weather.

COLOR AND PATTERN: Provide color and pattern selected by Architect from manufacturer's full range of standard colors and patterns.

AVAILABLE PRODUCTS: Subject to compliance with requirements, prefaced concrete block which may be incorporated in the work include, but are not limited to, the following:

"Astra-Glaze"; Nabco Glazed Products

"Spectra-Glaze II"; manufacturer approved by the Burns and Russell Co.

7.5 PRE-INSULATED CONCRETE BLOCK

Provide units complying with characteristics indicated below for grade, type, face size, exposed face and under each form of block included, for weight classification.

Grade N except Grade S may be used above grade in exterior walls with weather protective coatings.

SIZE: Manufacturer's standard units with nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thickness indicated.

TYPE I: Moisture-controlled units.

EXPOSED FACES: Manufacturer's standard color and texture, unless otherwise indicated.

Provide split-faced units for all exterior surfaces.

HOLLOW LOADBEARING BLOCK: ASTM C90

7.6 INSULATION

Shall be an insulated liner, molded of modified grade expanded polystyrene bead at a nominal density of 1.3 pcf with a maximum vapor transmission factor of 1.2 perms at 75 deg. F, ASTM C578, minimum installed R-value of 7.9.

7.6.1 Available Products: Subject to compliance with requirements, pre-insulated concrete block which may be incorporated in the work include, but are not limited to, the following:

"Insul Block Corp."

8.0 MORTAR AND GROUT MATERIALS

8.1 PORTLAND CEMENT

ASTM C 150, Type I, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.

8.2 MASONRY CEMENT

ASTM C 91, non-staining.

8.2.1 For colored pigmented mortars use premixed colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations.

A. Available Products: Subject to compliance with requirements, masonry cements which may be incorporated in the work include, but are not limited to, the following:

"Atlas Custom Color Masonry Cement"; Lehigh Portland Cement Co.

"Flamingo Color Masonry Cement"; The Riverton Corp.

8.2.2 For colored aggregate mortars use masonry cement of natural color or white as required to produce mortar color indicated.

8.3 HYDRATED LIME

ASTM C 207, Type S

8.4 AGGREGATE FOR MORTAR

ASTM C 144, except for joints less than 1/4" use aggregate graded with 100% passing the No. 16 sieve.

8.4.1 Colored Mortar Aggregates: Ground marble, granite or other sound stone, as required to match Architect's sample.

8.5 AGGREGATE FOR GROUT

ASTM C404

8.6 COLORED MORTAR PIGMENTS

Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.

8.6.1 Available Products: Subject to compliance with requirements, colored mortar pigments which may be incorporated in the work include, but are not limited, the following:

“SGS Mortar Colors”; Solomon Grind-Chem Services, Inc.
“True Tone Mortar Colors”; Davis Colors, A Subsidiary of Rockwood Industries, Inc.

8.7 WATER

Clean and potable.

9.0 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

9.1 MATERIALS

Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:

9.1.1 Zinc-Coated (galvanized) Steel Wire: ASTM A 82 for uncoated wire and with ASTM C 641 for zinc coating of class indicated below:

- A. Class 3 (0.80 oz. per sq. ft. of wire surface).
- B. Application: Use where indicated.
- C. Application: Use for masonry not exposed to exterior or earth.

9.1.2 Hot-Dip Galvanized Steel Wire: ASTM A 82 for uncoated wire and with ASTM A 123, Class B-2 (1.5 oz. per sq. ft. of wire surface) for zinc coating applied after prefabrication into units.

- A. Application: Use for masonry exposed to exterior and in contact with earth.

9.1.3 Hot-Dip Galvanized Carbon Steel Sheet: ASTM A 366, Class 2 of ASTM A 635; hot-dip galvanized after fabrication to comply with ASTM A 153, Class B.

- A. Application: Use for anchors.

9.6 AVAILABLE MANUFACTURERS

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

AA Wire Products Co. Corp.	National Wire Products Products
Dur-O-Wall, Inc.	
Heckman Building Products, Inc.	
Hohmann & Barnard, Inc.	
Masonry Reinforcing Corp. of America	

10.0 **CONCEALED FLASHING MATERIALS**

10.1 VINYL SHEET FLASHING

Flexible sheet flashings especially formulated from virgin polyvinyl chloride with plasticizers and other modifiers to remain flexible and waterproof in concealed masonry applications, black in color and of thickness indicated below:

A. Thickness: 20 mils

10.2 ADHESIVE FOR FLASHINGS

Of type recommended by manufacturer of flashing material for use indicated.

10.3 AVAILABLE PRODUCTS

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

A. Vinyl Sheet Flashing:

"Vi-Seal Plastic Flashing"; Alco Products, Inc.
"BFG" Vinyl Water Barrier; B.F. Goodrich Co.
"Nuflex"; Sandell Manufacturing Co., Inc.
"Wascoseal"; York Manufacturing, Inc.

11.0 **MISCELLANEOUS MASONRY ACCESSORIES**

11.1 REINFORCING BARS

Deformed steel, ASTM A 615, Grade 60 for bars No. 3 to No. 18.

11.2 NON-METALLIC EXPANSION JOINT STRIPS

Premolded, flexible cellular neoprene rubber filler strips complying with ASTM D 1056, Grade RE41E1, capable of compression up to 35% of width and thickness indicated.

11.3 PREMOLDED CONTROL JOINT STRIPS

Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

A. Styrene-butadiene rubber compound complying with ASTM D 2000, Designation 2AA-805.

11.4 BOND BREAKER STRIPS

Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 25 asphalt felt).

11.5 WEEPHOLES

Provide the following for weepholes:

A. Plastic Tubing: Medium density polyethylene, outside diameter and length as indicated below:

3/8" x 4"

12.0 **MASONRY CLEANERS**

12.1 JOB-MIXED DETERGENT SOLUTION

Solution of trisodium phosphate (1/2 cup dry measure) and laundry detergent (1/2 cup dry measure) dissolved in one gallon of water.

12.2 ACIDIC CLEANER

Manufacturer's standard strength general purpose cleaner designed for new masonry surfaces of type indicated; composed of blended organic and inorganic acids combined with special wetting systems and inhibitors; expressly approved for intended use by manufacturer of masonry units being cleaned.

- A. Available Products: Subject to compliance with requirements, a product which may be used to clean unit masonry surfaces includes, but is not limited to, the following:

"Sure Klean" No. 600 Detergent; ProSoCo, Inc.
"Euco Murex"; Euclid Chemical Co.

13.0 MORTAR AND GROUT MIXES

13.1 GENERAL

Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds or other admixtures, unless otherwise indicated.

- A. Do not use calcium chloride in mortar or grout.

13.2 MIXING

Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.

13.3 MORTAR FOR UNIT MASONRY

Comply with ASTM C 270, Proportion Specification, for types of mortar required, unless otherwise indicated.

- A. Limit cementitious materials in mortar to portland cement-lime.
- B. Use Type M mortar for masonry below grade and in contact with earth, and where indicated, and at loadbearing and reinforced masonry walls.
- C. Use Type N mortar for non-loadbearing walls for other applications where another type is not indicated.

13.4 COLORED PIGMENTED MORTAR

Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1-to-10, by weight.

13.5 COLORED AGGREGATE MORTAR

Produce mortar of color required by use of colored aggregates in combination with selected cementitious materials.

- A. Mix to match Architect's sample.

13.6 GROUT FOR UNIT MASONRY

Comply with ASTM C 476 for grout for use in construction of reinforced and non-reinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or course) at time of placement which will completely fill all spaces intended to receive grout. Grout shall have the following properties:

- A. Minimum 28 day compressive strength = 2,500 psi.
- B. Slump: 8" for low absorption units and 10" for high absorption units.
- C. Maximum size of large aggregate shall not exceed 3/8" diameter.

14.0 INSTALLATION, GENERAL

Before placing, remove loose rust, ice and other coatings from reinforcing.

Build cavity and composite walls, floors and other masonry construction to the full thickness shown. Build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness indicated.

Build chases and recesses as shown or required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.

Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible. Use dry cutting saws to cut concrete masonry units.

15.0 CONSTRUCTION TOLERANCES

15.1 VARIATION FROM PLUMB

For vertical lines and surfaces of columns, walls and arrises do not exceed 1/4" in 10 ft. or 3/8" in a story height not to exceed 20 ft., nor 1/2" in 40 ft. or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20 ft. maximum, nor 1/2" in 40 ft. or more. For

vertical alignment of head joints do not exceed plus or minus 1/4" in 10 ft., 1/2" maximum.

15.2 VARIATION FROM LEVEL

For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20 ft. maximum, nor 1/2" in 40 ft. or more.

For top surface of bearing walls to not exceed 1/8" between adjacent floor elements in 10 ft. or 1/16" within width of a single unit.

15.3 VARIATION OF LINEAR BUILDING LINE

For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2" in any bay or 20 ft. maximum, nor 3/4" in 40 ft. or more.

15.4 VARIATION IN CROSS-SECTIONAL DIMENSIONS

For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus 1/2".

15.5 VARIATION IN MORTAR JOINT THICKNESS

Do not exceed bed joint thickness indicated by more than plus or minus 1/8", with a maximum thickness limited to 1/2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

16.0 LAYING MASONRY WALLS

16.1 GENERAL

Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.

Lay-up walls to comply with specified construction tolerances with courses accurately spaced and coordinated with other work.

Lay exposed masonry in the bond pattern shown or, if not shown, lay in running bond with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.

16.2 STOPPING AND RESUMING WORK

Rack back 1/2-unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.

16.3 BUILT-IN WORK

As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

- A. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
- B. At exterior frames insert extruded polystyrene board insulation around perimeter of frame in thickness indicated but not less than 3/4" to act as a thermal break between frame and masonry.
- C. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout with core.
- D. Fill cores in hollow concrete masonry units with grout 3 courses (24") under bearing plates, beams, lintels, posts and similar items, unless otherwise indicated.

17.0 **MORTAR BEDDING AND JOINTING**

17.1 GENERAL

Lay solid concrete masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.

Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.

Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated. Rake out mortar in preparation for application of caulking or sealants.

Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

18.0 HORIZONTAL JOINT REINFORCEMENT

18.1 GENERAL

Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 1/2" elsewhere. Lap reinforcing minimum of 6".

Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

Reinforce walls with continuous horizontal joint reinforcing unless specifically to be omitted.

Provide continuity at corners and wall intersection by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

Space continuous horizontal reinforcement as follows:

For single-wythe walls, space reinforcement at 16" o.c. vertically, unless otherwise indicated.

Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints.

A. In addition to wall reinforcement, provide additional reinforcement at openings
as required to comply with the above.

19.0 ANCHORING MASONRY WORK

19.1 GENERAL

Provide anchor devices of type indicated.

19.2 ANCHOR MASONRY TO STRUCTURAL MEMBERS where masonry abuts or faces structural members to comply with the following:

- A. Provide an open space not less than 1" in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
- B. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
- C. Embed a minimum of the masonry wythe minus two (2) inches. At such anchorages the masonry wall shall be grouted solid. Weld to the perimeter steel framing.
- D. Space anchors as indicated, but not more than 24" o.c. vertically and 36" o.c. horizontally.

20.0 CONTROL AND EXPANSION JOINTS

20.1 GENERAL

Provide vertical and horizontal expansion, control and isolation joints in masonry where shown. Build-in related items as the masonry work progresses.

Build flanges of metal expansion strips into masonry. Lap each joint 4" in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.

Build flanges of factory-fabricated expansion joint units into masonry. See Division-7 section "Elastic Expansion Joints".

Build-in non-metallic joint fillers where indicated.

Build in horizontal pressure relieving joints where indicated; construct joints by either leaving an air space or inserting non-metallic compressible joint filler of width required to permit installation of sealant and backer rod.

Locate horizontal pressure relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

21.0 LINTELS

Install steel lintels where indicated.

Provide masonry lintels where shown and wherever openings of more than 1'-0" for brick size units and 2'-0" for block size units are shown without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Cure precast lintels before handling and installation. Temporarily support formed-in-place lintels.

For hollow concrete masonry unit walls, use specially formed U-shaped lintel units with reinforcement bars placed as shown filled with coarse grout.

Provide minimum bearing of 8" at each jamb, unless otherwise indicated.

22.0 FLASHING OF MASONRY WORK

22.1 GENERAL

Provide concealed flashing in masonry work at, or above, shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar. Extend flashings through exterior face of masonry and turn down to form drip.

Extend flashing the full length of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4", and through the inner wythe to within 1/2" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2". At heads and sills turn up ends not less than 2" to form a pan.

Install flashing to comply with manufacturer's instructions. Provide weep holes in the head joints of the first course of masonry immediately above concealed flashings. Space 24" o.c., unless otherwise indicated.

Install reglets and nailers for flashing and other related work where shown to be built into masonry work.

23.0 INSTALLATION OF REINFORCED UNIT MASONRY

Provide vertical wall reinforcing as shown and specified.

Fully embed reinforcement in concrete fill (grout). Provide all required metal accessories to insure accurate alignment of reinforcement during grout filling operation.

Place grout in cells by either the low-lift or high-lift grouting technique in accordance to NCMA TED Bulletin #23A, "Grouting for Concrete Masonry Walls."

24.0 REPAIR, POINTING AND CLEANING

24.1 GENERAL

Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

24.2 POINTING

During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.

24.3 FINAL CLEANING

After mortar is thoroughly set and cured, clean masonry as follows:

- A. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
- B. Test cleaning methods on sample wall panel; leave 1/2 panel unclean for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
- C. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
- D. Saturate wall surfaces with water prior to application of cleaners' remove cleaners promptly by rinsing thoroughly with clear water.
- E. Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

24.4 PROTECTION

Provide final protection and maintain conditions in a manner acceptable to Installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

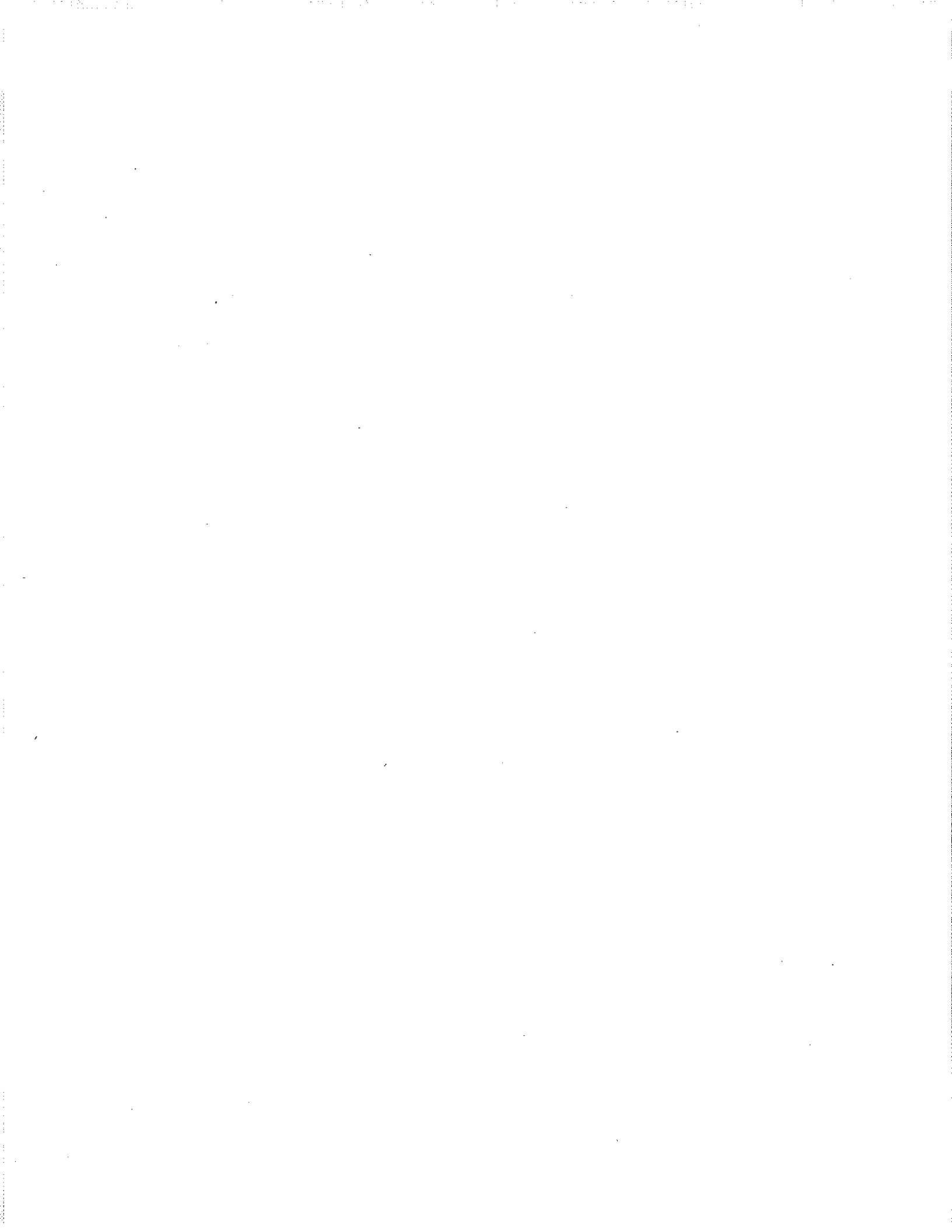
25.0 **PAYMENT**

25.1 MEASUREMENT AND PAYMENT

Payment will be based on one of the following criteria as specified in the Contract Bid Item Descriptions and/or on the Drawings:

- a) Cost shall be included in the work to which it is subsidiary and no separate measurement and payment will be made.
- b) Payment will be based on Plan Quantities or a percentage installed to complete the structure as computed by the Engineer or as shown on the Drawings.

Payment as specified above shall be considered as full compensation for all labor, materials, equipment and incidentals necessary to perform the work as required.



DIVISION 5

METALS

SECTION 05002

ANCHOR BOLTS AND EXPANSION ANCHORS

1. SCOPE. This section covers cast-in-place anchor bolts and expansion anchors to be installed in hardened concrete.

The General Equipment Stipulations set forth additional requirements for anchor bolts for equipment.

2. GENERAL. Unless otherwise specified or indicated on the drawings, all anchor bolts shall be cast-in-place bolts and shall have a minimum 3/4 inch diameter. Anchor bolts and expansion anchors for buried and immersion service and in splash zones shall be galvanized or zinc plated. All other anchor bolts and expansion anchors shall be carbon steel unless otherwise specified or indicated on the drawings.

3. MATERIALS.

Bolts and Nuts

Carbon Steel ASTM A307.

Stainless Steel IFI-104, Grade 303 or 305.

Galvanized Steel Carbon steel bolts and nuts; hot-dip galvanized ASTM A153 and A385, or zinc plated ASTM A164 Type GS.

Flat Washers ANSI B18.22.1; of the same material as bolts and nuts.

Expansion Anchors

For Concrete Fed Spec FF-S-325; wedge type, Group II, Type 4, Class 1 or 2; self-drilling type, Group III, Type 1; or nondrilling type, Group VIII, Type 1 or 2; Phillips, Hilti, Rawlplug, USM< or Wej-It.

4. ANCHOR BOLTS. Anchor bolts shall be delivered in time to permit setting when structural concrete is placed. Anchor bolts which are cast-in-place in concrete shall be provided with sufficient threads to permit a nut to be installed on the concrete side of the concrete form or supporting template.

Two nuts, a jam nut, and washer shall be furnished for anchor bolts indicated on the drawings to have lock nuts; two nuts and a washer shall be furnished for all other anchor bolts.

5. EXPANSION ANCHORS. Expansion anchors shall be installed in conformity with the manufacturer's recommendations for maximum holding power, but in no case shall the depth of hole be less than four bolt hole diameters. Minimum distance between the center of any expansion anchor and an edge or exterior corner of concrete shall be at least 4-1/2 times the diameter of the hole in which the anchor is installed. Unless otherwise indicated on the drawings, the minimum distance between the centers of expansion anchors shall be at least 8 times the diameter of the hole in which the anchors are installed.

Nuts and washers for expansion anchors shall be as specified for anchor bolts.

6. PAYMENT

No separate payment will be made for any anchors. Cost for these items shall be included in the items to which they are subsidiary in the Bid Schedule and no measurement of the quantities will be made.

SECTION 05003

MISCELLANEOUS METALS

1.0 GENERAL

The Contractor shall furnish all labor, materials, equipment and services necessary for fabrication and erection of all miscellaneous steel angles, beams, plates and channels as shown on the Drawings and specified herein and not specifically included under other sections of these Specifications.

2.0 QUALITY ASSURANCE STANDARDS

A. Codes and Standards: All work shall comply with provisions of following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges".
2. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings."
3. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including "Commentary" and Supplements thereto as issued.
4. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
5. AWS D1.1 "Structural Welding Code".
6. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
 - a) If recertification of welders is required, retesting will be Contractor's responsibility.

3.0 SUBMITTALS

Shop drawings, giving complete information necessary for fabrication, layout and installation of all metal work, shall be submitted to the Engineer for approval prior to fabrication.

The preparation of shop drawings for fabricated metal items shall be coordinated by the Contractor with the manufacturers of various equipment in order to comply with details, locations, openings, etc. required by the manufacturers.

Field measurements shall be made to verify all dimensions in the field, which may affect installation of work before shop drawings are made and/or fabrication is performed.

4.0 STRUCTURAL METALS

4.1 Steel shall conform to the requirements of ASTM A 36. (Non-exposed and interior)

4.2 Aluminum shall conform to the requirements of ASTM B209, alloy 6061-T6.

5.0 ANCHORAGE ITEMS

The Contractor shall furnish all bolts, nuts, shims, pins, screws, straps, nails and other anchors, which may be required by the Drawings or job conditions, to secure all items permanently in place, whether or not specifically called for or shown on the Drawings.

6.0 FABRICATION AND INSTALLATION OF METAL WORK

All metal items shall be accurately fabricated and erected with exposed joints close fitting. All joints shall be of such character and so assembled that they will be as strong and rigid as adjoining sections. Joints shall be located where least conspicuous. Items shall have smooth finished surfaces except where otherwise shown or specified.

Where welding is required or permitted, it shall conform to the requirements for shielding metal arc welding of the Standard Code for Arc and Gas Welding in Building Construction of the American Welding Society. Shop drawings shall show welding and shall indicate the size, length, spacing and type of welds. Joints required to be welded shall be continuously welded or spot-welded as specified and face of welds dressed flush and smooth where exposed to view.

Members or parts to be built in with masonry or concrete shall be in a form affording a suitable anchorage or shall be provided with approved anchors, expansion shields or other approved means of securing members.

Ferrous and non-ferrous metals shall be insulated at all contacts with felt washers, strips or sheets, bitumastic paints, or other approved means.

6.1 All required anchors, couplings, bolts, and nuts required to support miscellaneous metal work shall be furnished and installed as required.

6.2 Weights of connections and accessories shall be adequate to safely sustain and withstand stresses and strains to which they will be normally subjected.

6.3 Connections shall be bolted except where welding is called for in the Drawings. Bolts shall have a minimum of 1/2-inch diameter unless noted or required otherwise.

6.4 Accurately place all miscellaneous metal items in the locations and to the required elevations.

6.5 Adequately brace any items which are cast in concrete masonry work.

6.6 Use concealed anchors wherever possible.

7.0 CLEANING

Remove and properly dispose of all debris and litter; leave the work area in a clean condition.

END OF SECTION



SECTION 05120

STRUCTURAL STEEL

1.0 GENERAL

1.1 REFERENCES

A. The following is a list of standards, which may be referenced in this Section:

1. American Institute of Steel Construction (AISC):
 - a. Specification for Structural Steel Buildings-Allowable Stress Design and Plastic Design.
 - b. Allowable Stress Design Specification for Structural Joints using ASTM A325 or A490 Bolts.
 - c. Code of Standard Practice for Steel Buildings and Bridges.
 - d. AISC Quality Certification Program.
2. American Society for Testing and Materials (ASTM):
 - a. A36, Standard Specification for Structural Steel.
 - b. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - c. A242, High-strength Low-alloy Structural Steel.
 - d. A325, Standard Specification for High-Strength Bolts for Structural Steel Joints.
 - e. A490, Standard Specification for Heat-Treated Steel Structural bolts, 150 ksi Minimum Tensile Strength.
 - f. A500, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - g. A501, Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - h. A563, Standard Specification for Carbon and Alloy Steel Nuts.
 - i. F436, Standard Specification for Hardened Steel Washers.
 - j. F959, Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
3. American Society of Nondestructive Testing (ASNT): SNT-TC- I A, Recommended Practice.
4. American Welding Society (AWS):
 - a. B2.1, Standard for Welding Procedure and Performance Qualification.
 - b. D1.1, Structural Welding Code-Steel.
 - c. QC I, Standard and Guide for Qualification and Certification of Welding Inspectors.

1.2 SUBMITTALS

A. Shop Drawings:

1. Provide details showing:

- a. Erection plans.
 - b. Members and their connections.
 - c. Anchor bolt layouts.
 - d. Hardened washer details.
 - e. Joint details for complete penetration welds.
 - f. Schedules for fabrication procedures.
2. Name and address of manufacturer(s).
 3. Product specifications.
 4. Manufacturers' testing procedures and standards.
 5. Preparation and installation or application instructions, as appropriate.

B. Quality Control Submittals:

1. Mill Certificates.
2. High-Strength Bolts (Zinc-Coated):
 - a. Certificates of Compliance that products meet chemical and mechanical requirements of standards specified.
 - b. Manufacturer's inspection test report results for production lot(s) furnished, to include:
 1. Tensile strength.
 2. Yield strength.
 3. Reduction of area.
 4. Elongation and hardness.
 - c. Certified Mill Test Reports for Bolts and Nuts:
 1. Name and address of manufacturer.
 2. Bolts correctly marked.
 3. Marked bolts and nuts used in required mill tests and manufacturer's inspection tests.
3. Direct Tension Indicators: Furnish manufacturer's test report meeting requirements of ASTM F959.
4. Methods proposed to resolve misalignment between anchor bolts and bolt holes in steel members.

C. Fabricator Certification :

1. The structural steel fabrication shop shall be certified by the American Institute of Steel Construction in the categories of Conventional Steel Structures and Complex Steel Structures as minimum and endorsed for Sophisticated Paint Category. Submit a copy of the current certification for ENGINEER's review and approval. At the completion of fabrication, the fabricator shall submit to the ENGINEER a certificate of compliance addressed to the building official stating that the work was performed in accordance with the approved construction documents and Change/Field Orders.

D. Erector Certification:

1. The structural steel erector shall be certified by the American Institute of Steel Construction in the categories of Certified Steel Erector as minimum. Submit a copy of the current certification for ENGINEER's review and approval. At the completion of erection of structural steel, the erector shall submit to the ENGINEER, a certificate of compliance addressed to the building official stating that the work was performed in accordance with the approved construction documents and Change/Field Orders.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Welder/Welding Operator: In accordance with AWS D1.1.1

B. Special Inspection (Kentucky Building Code 2007, Section 1704) :

1. Special Inspections to be performed under this contract is listed under General Provisions of Structural Drawings. If special inspection is required, Owner will retain the services of a Special Inspector and this Contractor is responsible for providing safe access to all areas of His/Her work for inspection at no additional cost to the Owner or His/Her Agents.
2. The extent of special inspection to be performed is listed in Table 1704.3 of the Kentucky Building Code 2007 (KBC 2007).

C. Fabricator Certification :

1. The structural steel fabrication shop shall be certified by the American Institute of Steel Construction (AISC) in the categories of Conventional Steel Structures and Complex Steel Structures as minimum and endorsed for Sophisticated Paint Category. At the completion of fabrication, the fabricator shall submit a certificate of compliance addressed to the building official stating that the work was performed in accordance with the approved construction documents and Change/Field Orders.
2. If the Fabricator is not certified by the AISC, Special Inspection of the fabrication of the structural steel shall be performed, by the ENGINEER approved Special Inspector according to Article 1704.2 of the KBC 2007 and the cost of Special Inspection shall be back-charged to the Steel Fabricator.

D. Erector Certification :

1. The structural steel erector shall be certified by the American Institute of Steel Construction in the categories of Certified Steel Erector as minimum. At the completion of erection of the structural steel, the erector shall submit a certificate of compliance addressed to the building official stating that the work was

performed in accordance with the approved construction documents and Change/Field Orders.

2. If the Erector is not certified by the AISC, Special Inspection of the erection of the structural steel shall be performed, by the ENGINEER approved Special Inspector according to Article 1704.3 of the KBC 2007 and the cost of Special Inspection shall be back-charged to the Steel Erector.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Load structural members in such a manner that they will be transported and unloaded without damage to coatings and without being excessively stressed, deformed, or otherwise damaged.

B. Storage:

1. Protect structural steel members and packaged materials from corrosion and deterioration.
2. Store in dry area and not in direct contact with ground.
3. Protect fasteners from dirt and moisture. Do not remove lubricant from bolts and nuts.

C. Handle materials to avoid distortion or damage to members or supporting structures.

2.0 PRODUCTS

2.1 MATERIALS

A. Rolled Plates, Shapes, and Bars: ASTM A36, Grade 36, unless otherwise shown.

B. Structural Steel Pipe: ASTM A501 or ASTM A53, Type E or S, Grade B.

C. Structural Tubing: ASTM A500, Grade B (fy equals 46 ksi); provide full-length members without splices unless otherwise noted or approved.

D. Welding Materials: AWS D1.1.1, E70XX

2.2 FASTENERS

A. Anchor Bolts: ASTM A-36 or ASTM A-307

B. High-Strength Bolts: ASTM A325 or ASTM A490, bolt type 1, zinc coated. Bolt length and thread length shall be as required for the connection type shown, with hardened washers as required.

C. Direction Tension Indicators (DTIs or Load Indicator Washers):

1. ASTM F959, coating type to match bolt finish.

2. Manufacturer: J&M Turner, Southhampton, PA.

D. Tension-Control Bolts:

1. High-strength, ASTM A325 or ASTM 490.
2. Manufacturers:
 - a. LeJeune Bolt Company, Lakeville, MN.
 - b. Nucor Fasteners, Saint Joe, IN.
 - c. Bristol Machine Co., Walnut, CA.

E. Nuts: ASTM A563, type to match bolt type and finish.

F. Hardened Washers: ASTM F436, type to match bolt finish.

G. Welded Anchor Studs:

1. Headed concrete anchor studs (HAS), deformed bar anchors (DBA), or threaded anchor studs (TAS), as shown.
2. Manufacturer: Nelson Stud Welding Co., Loraine, OH.

2.3 ANCILLARY MATERIALS

A. Surface Preparation and Primer: As specified in Section 9900, PAINTING

B. Grout: Non-shrink grout as specified in Section 03310.

2.4 FABRICATION

A. General:

1. Fabricate as shown and in accordance with AISC Specifications.
2. Mark and match mark materials for field assembly.
3. Complete assembly, including bolting and welding of units, before start of finishing operations.
4. Fabricate to agree with field measurements.

B. Connections:

1. Shop Connections: Weld or bolt, as shown.
2. Develop full strength of members joined and meet requirements of AISC Manual of Steel Construction tables for bolted double-angle shear connections, unless otherwise shown.

C. Welded Construction:

1. Comply with AWS D1.1 for procedures, appearance, and quality of welds, and methods used in correcting welding.

2. Groove and Butt Welds: Complete penetration unless otherwise specified.

D. Interface With Other Work:

1. Holes:

- a. As necessary or as indicated for securing other Work to structural steel framing, and for passage of other Work through steel framing members.
- b. No flame-cut holes will be permitted without prior approval of the ENGINEER.

2. Weld threaded nuts to framing, and other specialty items as shown to receive other Work.

E. Shop Paint Primer:

1. Surface Preparation: Clean and remove slag from welds before painting.
2. Coat members with primer except at future field welds, bolt-ups, and concrete embedment.
3. Apply primer in accordance with Section 9, PAINTING within 8 hours after surface preparation.

F. Slip-Critical Bolted Connections:

1. Mask faying surfaces of slip-critical bolted connections to be shop painted, or blast clean and coat with a Class A paint as specified in Section 9, PAINTING.
2. Roughen galvanized faying surfaces with hand wire brushing.

3.0 EXECUTION

3.1 ERECTION

A. Meet requirements of AISC Code of Standard Practice for Steel Buildings and Bridges.

B. Install CONTRACTOR-designed temporary construction bracing to provide necessary support until all components are in place and construction is complete.

C. High-Strength Bolted Connections:

1. Tighten in accordance with AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts.

2. Hardened Washers:

- a. Provide at locations required by Washer Requirements section of AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts, to include all slip-critical connections using slotted or oversized holes or A490 bolts.
- b. Use beveled style and extra thickness where required by AISC Specification.

- c. Do not substitute Direct Tension Indicators (DTI) for hardened flat washers required at slotted and oversize holes.
3. For bearing-type connections not fully tensioned, tighten to snug-tight condition. Use a hardened washer over slotted or oversize holes in outer plies.
4. Tension-control bolts may be used in snug-tight bearing connections only.

D. Fully Tensioned Bolted Connections:

1. Use DTIs at all slip-critical and fully tensioned bearing-type connections.
2. Position within bolted assembly in accordance with ASTM F959.
3. Install bolts, with DTIs plus hardened washers as required, in all holes of an assembly and tighten until all plies are in firm contact and fasteners are uniformly snug tight.
4. Final tighten all bolts, beginning at the most rigid part of the bolted connection and progressing toward the free edges, until the DTI's have been compressed to an average gap equal to or less than shown in Table 2, ASTM F959.

3.2 ANCHOR BOLTS

- A. Coordinate installation of anchor bolts and other connectors required for securing structural steel to in-place work.
- B. Provide templates and other devices for presetting bolts and other anchors to accurate locations.

3.3 SETTING BASES AND BEARING PLATES

- A. Clean concrete and masonry bearing surfaces of bond reducing materials and roughen to improve bond to surfaces.
- B. Clean bottom surface of base and bearing plates.
- C. Set loose and attached baseplates and bearing plates for structural members on wedges, leveling nuts, or other adjustable devices.
- D. Tighten anchor bolts after supported members have been positioned and plumbed.
- E. Grout Under Baseplates: As specified in Section 03310, prior to placing loads on structure.

3.4 FIELD ASSEMBLY

- A. Set structural frames accurately to lines and elevations shown.
- B. Align and adjust various members forming a part of a complete frame or structure before permanently fastening.

- C. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly.
- D. Perform necessary adjustments to compensate for minor discrepancies in elevations and alignment.
- E. Level and plumb individual members of structure within tolerances shown in AISC Code of Standard Practice for Steel Buildings and Bridges.
- F. Establish required leveling and plumbing measurements on mean operating temperature of structure.
- G. Provide additional field connection material as required by AISC Code of Standard Practice for Steel and Bridges.

3.5 MISFITS AT BOLTED CONNECTIONS

- A. Where misfits in erection bolting are encountered, immediately notify ENGINEER for approval of one of the following methods of correction:
 1. Ream holes that must be enlarged to admit bolts and use oversized bolts.
 2. Plug weld misaligned holes and re-drill holes to admit standard size bolts.
 3. Drill additional holes in the connection, conforming with AISC Standards for bolt spacing and end and edge distances, and add additional bolts.
 4. Reject members containing misfit, incorrect sized or misaligned holes and fabricate a new member to ensure proper fit.
 5. Do not enlarge incorrectly sized or misaligned holes in members by burning or by use of drift pins.

3.6 MISFITS AT ANCHOR BOLTS

- A. Resolve misalignments between anchor bolts and bolt holes in steel members in accordance with approved submittal.
- B. Do not flame cut to enlarge holes.

3.7 GAS CUTTING

- A. Do not use gas cutting torches in field for correcting fabrication errors in structural framing.
- B. Secondary members not under stress and concealed in finished structure may be corrected by gas cutting torches, if approved by ENGINEER.
- C. Finish flame-cut sections equivalent to sheared and punched appearance.

3.8 PAINTING TOUCHUP

- A. Immediately after erection, clean field welds, bolted connections, and abraded areas of slag and shop paint primer.
- B. Apply touchup paint primer by brush or spray of same thickness and material as that used in shop application and as specified in Section 9, PAINTING.

3.9 FIELD QUALITY CONTROL-BOLTED CONNECTIONS

- A. High-Strength Bolted Connections: All high-strength bolted connections will be inspected by an independent testing agency, retained by the Owner in accordance with the AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts and per KBC 2007 and 2003 Supplements as follows:
 - 1. Marking identification and conformance to ASTM standards.
 - 2. Alignment of bolt holes.
 - 3. Placement, type, and thickness of hardened washers.
 - 4. Tightening of bolts.
- B. Bearing-Type Connections Not Fully Tensioned: Snug-tight condition with all plies of the joint in firm contact.
- C. Fully Tensioned Bearing and Slip-Critical Connections:
 - 1. Conduct Pre-Installation Test.
 - 2. Monitor installation and tightening of DTT's.
 - 3. Monitor condition of faying surfaces for slip-critical connections.
- D. Pre-Installation Test:
 - 1. Conduct jobsite test prior to start of work using a bolt tension measuring device.
 - 2. Select representative sample of not less than three bolts of each diameter, length, and grade.
 - 2. Include DTT's and flat hardened washers as required to match actual connection assembly.
 - 3. Conduct test in accordance with the Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- E. Nondestructive Testing (NDT) Report: Prepare and submit a written NDT report identifying location of inspected bolted connections and summary of corrections as required to meet code acceptance criteria.
- F. Defective Connections: All defective and improperly tightened high-strength bolted connections shall be corrected.

3.10 FIELD QUALITY CONTROL -- WELDED CONNECTIONS

- A. All welded connections for structural steel shall be inspected and tested by an independent testing agency, retained by the Owner in accordance with the AWS D1.1 Structural Welding Code.
- B. Selection of Welds to be Tested: As per Special Inspection requirements of the KBC 2007.
- C. Unless otherwise specified, the Special Inspector retained by the Owner will perform nondestructive testing (NDT) of welds in accordance with Chapter 6 of AWS D1.1 and per the Section 1704 of the Kentucky Building Code 2007.
 - 1. Butt Joint Welds: 10 percent randomly radiographically tested and repaired.
 - 2. Groove Welds: 10 percent randomly ultrasonically tested and repaired.
 - 3. Fillet Welds: 10 percent randomly examined and repaired, using either dye penetrant or magnetic particle inspection methods.
 - 4. All Welds: 100 percent visually inspected.
- D. The certified welding Special Inspector shall be present whenever field welding is performed and shall:
 - 1. Verify conformance of specified job material and proper storage.
 - 2. Monitor conformance with approved welding procedure specifications.
 - 3. Monitor conformance of welder/welding operator qualification.
 - 4. Provide 100 percent visual inspection of all welds.
 - 5. Supervise nondestructive testing personnel and evaluate test results.
 - 6. Maintain records and prepare report confirming results of inspection and testing.
- E. Defective Connections: All defective welds shall be repaired and retested until certified acceptable in accordance with AWS D1.1.1

END OF SECTION 05120

DIVISION 7

THERMAL AND MOISTURE PROTECTION

SECTION 07214

FOAMED-IN-PLACE MASONRY WALL INSULATION

1.0 GENERAL

1.1 SUMMARY

- A. Extent of insulation work is shown on drawings and indicated by provisions of this section.
- B. Applications of insulation specified in this section include the following:
 - 1. Foamed-in-Place masonry insulation for thermal, sound and fire resistance values.

1.2 SUBMITTALS

- A. Product and technical presentation as provided by the manufacturer.
- B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including R-values, fire performance and sound abatement characteristics.
- C. Material Safety Data Sheet: Submit Material Safety Data Sheet complying with OSHA Hazard Communication Standard, 29 CFR 1910 1200.

1.3 QUALITY ASSURANCE

- A. Manufacturing Standards: Provide insulation produced by a single and approved manufacturer. The product must come from the manufacturer pre-mixed to ensure consistency.
- B. Installer Qualifications for Foamed-in-Place Masonry Insulation: Engage an experienced dealer/applicator who has been trained and licensed by the product manufacturer and which has not less than ten (10) years direct experience in the installation of the product used.
- C. Warranty: Upon request, a one year product and installation warranty will be issued by both the manufacturer and installer.

- D. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by a testing agency acceptable to authorities having jurisdiction.
- E. Insurance: Insulation Subcontractor shall carry Products and Completed Operations Insurance with minimum liability limits of \$5,000,000.

Product must be classified by Underwriters Laboratory^R ("UL") as to Surface Burning Characteristics

Fire Resistance Ratings:	ASTM E-119
Surface Burning Characteristics:	ASTM E-84
Combustion Characteristics:	ASTM E-136

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers of Foamed-in-Place Masonry Insulation: Subject to compliance with requirements, provide products from the following:
1. "Core-Fill 500TM" – Tailored Chemical Products, P.O. Drawer 4186, Hickory, NC 28663, 800-627-1687.
 2. Air Krete, Inc.
P.O. Box 380
Weedsport, NY 13166
 3. CP Chemical Co. (Tripolymer)
White Plains, NY

2.2 INSULATING MATERIALS

- A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.
- B. Foamed-in-Place Masonry Insulation: Two (2) component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.

1. Fire-Resistance Ratings: Minimum four (4) hour fire resistance wall rating (ASTM E-1 19) for 8-inch (8") and 12-inch (12") concrete masonry units when used in standard two (2) hour rated CMUs.
2. Surface Burning Characteristics: Maximum flame spread, smoke developed and fuel contributed of 0, 5 and 0 respectively.
3. Combustion Characteristics: Must be noncombustible, Class A building material.
4. Thermal Values: "R" Value of 4.91/inch @ 32 degrees F mean; ASTM C-177.
5. Sound Abatement: Minimum Sound Transmission Class ("STC") rating of 53 and a minimum Outdoor Indoor Transmission Class ("OITC") rating of 44 for 8-inch (8") wall assembly (ASTM E 90-90).

3.0 EXECUTION

3.1 INSPECTION AND PREPARATION

A. Application Assemblies:

1. Block Walls: 6", 8", 10" or 12" concrete masonry units
2. Cavity Walls: 2" cavity of greater

3.2 INSTALLATION OF FOAMED-IN-PLACE INSULATION

- ##### A. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions.
- ##### B. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8" on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.

4. MEASUREMENT AND PAYMENT

Payment shall be included in the work to which it is subsidiary unless otherwise shown in the Bid Schedule.

- End of Section -

07214-4

DIVISION 8

DOORS AND WINDOWS



SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Standard hollow metal doors and frames.

- B. Related Sections

- 1. Division 4 Section "Unit Masonry Assemblies" for embedding anchors for hollow metal work into masonry construction.
 - 2. Division 8 Section "Fiberglass Reinforced Plastic (FRP) Doors and Frames" for doors and frames manufactured from Fiberglass Reinforced Plastic (FRP).
 - 3. Division 8 Section "Door Hardware" for door hardware for hollow metal doors.
 - 4. Division 9 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.

- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, and finishes.

- B. Shop Drawings: Include the following:

- 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.

8. Details of moldings, removable stops, and glazing.

C. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity:

1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Ceco Door Products; an Assa Abloy Group company.
 2. Curriés Company; an Assa Abloy Group company.
 3. Security Metal Products Corp.
 4. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Division 8 Section "Glazing."

- I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
1. Design: Flush panel.
 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 3. Vertical Edges for Single-Acting Doors: Beveled edge.
 - a. Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).
 4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
 5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).
 - a. Width: 1-3/4 inches (44.5 mm).
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).
 - a. Width: 1-3/4 inches (44.5 mm).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as full profile welded unless otherwise indicated.
 3. Frames for Level 3 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet.
1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as full profile welded unless otherwise indicated.
 3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
 4. Frames for Level 3 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
 5. Frames for Wood Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
 6. Frames for Borrowed Lights: 0.053-inch- (1.3-mm-) thick steel sheet.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
 2. Stud-Wal' Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 HOLLOW METAL PANELS

- A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- (6.4-mm-thick by 25.4-mm-) wide steel.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

2.9 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/NAAMM-HMMA 861.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 2. Glazed Lites: Factory cut openings in doors.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
 - 5) Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in metal-stud partitions.
 - c. Compression Type: Not less than two anchors in each jamb.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
 7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door

Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install frames with removable glazing stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

- a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
 9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
 - b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).
- D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with hollow metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08110

SECTION 08710

FINISH HARDWARE

1.0 GENERAL

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work of this section.

2.0 DESCRIPTION OF WORK

2.1 DEFINITION

"Finish Hardware" includes items known commercially as finish hardware which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.

2.2 Extent of finish hardware required is indicated in drawings and in schedules.

2.3 Types of finish hardware required include the following:

- Hinges
- Pivots
- Lock cylinders and keys
- Lock and latch sets
- Bolts
- Exit devices
- Push/pull units
- Closers
- Miscellaneous door control devices
- Door trim units
- Protection plates
- Weatherstripping for exterior doors
- Astragals or meeting seals on pairs of doors
- Thresholds

3.0 QUALITY ASSURANCE

3.1 MANUFACTURER

Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

3.2 SUPPLIER

A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 2 years, and who is, or who employs an experienced architectural hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.

3.3 FIRE-RATED OPENINGS

Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware, which has been tested and listed, by UL or FM for types and sizes of doors required and complies with requirements of door and door frame labels.

- A. Where emergency exits devices are required on fire-rated doors, (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".

4.0 SUBMITTALS

4.1 PRODUCT DATA

Submit manufacturers technical product data for each item of hardware in accordance with Division-1 section "Submittals". Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.

4.2 HARDWARE SCHEDULE

Submit final hardware in manner indicated below. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.

- A. Final Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

- 1) Type, style, function, size and finish of each hardware item.

- 2) Name and manufacturer of each item.
- 3) Fastenings and other pertinent information.
- 4) Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
- 5) Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
- 6) Mounting locations for hardware.
- 7) Door and frame sizes and materials.
- 8) Keying information.
- 9) Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.
- 10) Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

4.3 TEMPLATES

Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

5.0 PRODUCT HANDLING

5.1 Tag each item or package separately, with identification related to final hardware schedule, and include basic installation instructions with each item or package.

5.2 Packaging of hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturer's sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

5.3 Inventory hardware jointly with representatives of hardware supplier and the hardware installer until each is satisfied that the count is correct.

5.4 Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

5.5 Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items, which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

6.0 PRODUCTS AND REQUIREMENTS

The work under this heading includes the furnishing of all hardware to the respective trades. The hardware supplier will promptly furnish templates to all other manufacturers furnishing materials necessary to completion of this part.

The following specifications are a guide and a description of the quality materials required. No material of quality or weight less than that outlined in this specification will be accepted. The contractor will be responsible for supplying the correct quantity of all materials, whether or not specifically mentioned in this specification. Any additional items that may be required shall be furnished and be of type, quality and utility consistent with other hardware specified.

No consideration will be granted for any alleged misunderstanding of the material to be furnished or work to be done, it being fully understood that the tender of a proposal carries with it the agreement to all items and conditions referred to herein or indicated on Plans, whether specifically mentioned herein or not.

It shall be the responsibility of the hardware supplier to provide the proper hardware for door function and to meet the proper codes. No additional compensation will be allowed for hardware changes required to meet the proper door function or to meet the proper codes.

Hardware supplier shall receive and check all hardware at his warehouse. All hardware shall be delivered to the job site by the hardware supplier in one shipment. Drop shipments to the job site from the various hardware manufacturers will positively not be permitted. All hardware shall be properly wrapped in separate packages complete with trimmings, screws, etc., each plainly labeled and numbered to agree with the door numbers and Contractor's typewritten schedule. The Contractor shall submit his schedules for corrections and approval to the Architect before proceeding with any work. The hardware supplier shall repack all separate boxes and packages of hardware, in cartons or cases, and attach to the outside of each case or carton, a label indicating the manufacturer of the material, contents, quantity, item number on hardware schedule and

door number, before delivery to the job site. Hardware, when required, shall be delivered to the shops of the various door manufacturers properly marked and labeled following the same procedure outlined above for the job site shipment.

6.1 Hardware Schedules:

A. Architect's Hardware Schedule:

1. Architect's Hardware Schedule is by hardware set number. Refer to Drawings for designation of hardware set number applicable to each opening.
2. Certain additional items of hardware and/or hardware accessories specified herein shall be furnished and installed, although not appearing in Architect's Hardware Schedule.

B. Supplier's Hardware Schedule:

1. A complete Hardware Schedule, indicating type, number, location and finish shall be submitted to Architect for approval, together with such samples as may be required for review. Opening numbers shall be same as used in Contract Documents. Schedule shall be prepared according to A.S.A.H.C. recommendations (schedule and sequence format) and shall include degrees of door closer installation.
2. Supplier's Hardware Schedule will be reviewed by Architect for type, quality and finish, and for function (other than hand). Contractor shall be responsible for checking schedule for correct hand of locksets and for supplying quantity of items required by Contract Documents.
3. Provide supplementary or revised hardware schedules if deemed necessary by Architect.
4. Do not ship or deliver hardware to job prior to review of hardware schedules by Architect.

C. Items Not Included:

Hardware for metal windows, toilet partitions, cabinets, access panels, etc. is not included in this Specification. See other sections of the Specifications for hardware to be furnished by others under such section.

D. Applicator:

Finish hardware shall be installed by mechanics skilled in this type of work. Installation shall be in a neat workmanlike manner, in accordance with the

approved Hardware Schedule. All items of hardware shall be secure and free working in the manner intended. Hardware shall be accurately mortised and fitted before painting. Hardware shall not be applied until the painting is finished. After hardware is installed, the General Contractor shall cover all exposed surfaces of kick plates, push plates, pulls, locksets, exit devices, holders, etc. with a suitable covering, such as masking tape and polyethylene film to protect the hardware from scratches, abrasion and tarnishing. This is to be left on until the building is completed and ready for final inspection. Upon completion of application, the Contractor shall deliver to the Architect, for the Owner's maintenance personnel, two copies of all installation instructions, templates, wrenches, installation tools, etc., supplied by the various manufacturers packed with the hardware necessary for installation and maintenance.

E. Application:

1. Installation: Work shall be done by a craftsman skilled and experienced in installation of finish hardware. Mortised items shall be neatly set in and made flush with door or frame surface. Manufacturer's instructions and recommendations shall be strictly followed.
2. Locations: Mortised items shall be installed at frame manufacturer's standard locations. Surface mounted items shall be installed at heights recommended by the Door and Hardware Institute, Arlington, Virginia.
3. Fasteners: Hinges, pivots, locks and exit devices shall be installed with proper wood or machine screws supplied by the manufacturer. Surface closers shall be mounted to door with sex bolts. Door pulls shall be fastened with 1/4 20 machine screws and expansion anchors.

6.2 REQUIREMENTS

Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware is indicated in the Finish Hardware Data Sheet and Hardware Schedule at the end of this section. Products are identified by using hardware designation numbers of the following.

- A. Manufacturer's Product Designations: One or more manufacturers are listed for each hardware type required. Provide either the product designated, or, where more than one manufacturer is listed, the comparable product of one of the other manufacturers, which comply with requirements including those, specified elsewhere in this section.

7.0 MATERIALS AND FABRICATION

7.1 GENERAL

A. Hand of Door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

B. Manufacturer's Name Plate: Do not use manufacturer's products, which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to Architect.

I. Manufacturer's identification will be permitted on rim of lock cylinders only.

C. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

7.2 FASTENERS

Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware, which has been prepared for self-tapping sheet metal screws, except, as specifically indicated.

Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of the type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.

7.3 TOOLS AND MAINTENANCE INSTRUCTIONS FOR MAINTENANCE

Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.

8.0 HINGES, BUTTS AND PIVOTS

8.1 TEMPLATES

Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

8.2 SCREWS

Furnish Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.

8.3 HINGE PINS

Except as otherwise indicated, provide hinge pins as follows:

- A. Steel Hinges: Steel pins.
- B. Non-ferrous Hinges: Stainless steel pins.
- C. Exterior Doors: Non-removable pins.
- D. Interior Doors: Non-rising pins.
- E. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) indicated.
- F. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.

9.0 LOCK CYLINDERS AND KEYING

9.1 GENERAL

Supplier will meet with Owner to finalize keying requirements and obtain final instructions in writing.

9.2 STANDARD SYSTEM

Except as otherwise indicated, provide new master key system for project.

Equip locks with cylinders for interchangeable-core pin tumbler inserts. Furnish only temporary inserts for the construction period, and remove these when directed.

Provide new insert cover each separately keyed, and master keyed for installation into the work by the Contractor, upon approval by the Architect/Owner. Unless otherwise notified or indicated, Contractor shall provide final core/insert installation between Substantial Completion and Final Completion and shall turn over keying to Owner upon approved completion of installation.

Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock, which is not designated to be keyed alike with a group of related locks.

- A. Permanently inscribe each key with number or lock that identifies cylinder manufacturer key symbol, and notation "DO NOT DUPLICATE".

9.3 KEY QUANTITY

Furnish three (3) change keys for each lock; five (5) master keys for each master system.

- A. Furnish one extra blank for each lock.
- B. Deliver keys to Owner's representative

Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of the number of locks required for the project.

- A. Provide complete cross index system set up by key control manufacturer and place keys on markers and hooks in the cabinet as determined by the final key schedule.
- B. Provide hinged-panel type cabinet, for wall mounting.

10.0 LOCKS, LATCHES AND BOLTS

10.1 STRIKES

Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.

- A. Provide dust-proof strikes for flush and foot bolts, except where special threshold and head construction provides non-recessed strike for bolt.

10.2 LOCK THROW

Provide 5/8" minimum throw of latch and deadbolt used on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

A. Provide 1/2" minimum throw on other latch and deadlock bolts.

10.3 FLUSH BOLT HEADS

Minimum of 1/2" diameter rods of brass, bronze or stainless steel, with minimum 12" long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

10.4 EXIT DEVICE DOGGING

Except on fire-rated doors, wherever closers are provided on doors equipped with exit devices, equip the units with keyed dogging device to hold the push bar down and the latch bolt in the open position.

10.5 RABBETED DOORS

Where rabbeted door stiles are indicated, provide special rabbeted front on lock and latch units and bolts.

11.0 PUSH/PULL UNITS

11.1 EXPOSED FASTENERS

Provide manufacturer's standard exposed fasteners for installation; through-bolted for matched pairs, but not for single units.

12.0 CLOSERS AND DOOR CONTROL DEVICES

12.1 SIZE OF UNITS

Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.

A. Provide parallel arms for all overhead closers, except as otherwise indicated.

12.2 Provide grey resilient parts for exposed bumpers.

13.0 DOOR TRIM UNITS

13.1 FASTENERS

Provide manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops and similar units); either machine screws or self-tapping screw.

13.2 Fabricate edge trim of stainless steel, not more than 1/2" nor less than 1/16" smaller in length than door dimension.

13.3 Fabricate protection plates (armor, kick or mop) not more than 1-1/2" less than door width on stop side and not more than 1/2" less than door width on pull side, x the height indicated.

- A. Metal Plates: Stainless steel, .050" (U.S. 18 ga.).
- B. Plastic Plates: Clear acrylic plastic, 1/8" (0.125") thick.

14.0 WEATHERSTRIPPING

14.1 GENERAL

Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf. Provide type, sizes and profiles shown or scheduled. Provide noncorrosive fasteners as recommended by manufacturer for application indicated.

14.2 REPLACEABLE SEAL STRIPS

Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

14.3 WEATHERSTRIPPING AT JAMBS AND HEADS

A. Provide bumper-type resilient insert and metal retainer strips, surface-applied unless shown as mortised or semi-mortised, of following metal, finish and resilient bumper material:

1. Extruded aluminum with color anodized finish as selected by Architect from manufacturer's standard color range; 0.062" minimum thickness of main walls and flanges.

2. Flexible bulb or loop insert of vinyl, conforming to MIL R 6055, Class II, Grade 40.

14.4 WEATHERSTRIPPING AT DOOR BOTTOMS

A. Provide thresholds consisting of contact type resilient insert and metal housing of design and size shown; of following metal, finish, and resilient seal strip:

1. Extruded aluminum with color anodized finish as selected by Architect from manufacturer's standard color range; 0.062" minimum thickness of main walls and flanges.
2. Flexible vinyl wiper or sweep seal strip complying with CS 230-60.

15.0 THRESHOLDS

15.1 GENERAL

Except as otherwise indicated, provide standard metal threshold unit of type, size and profile as shown or scheduled.

15.2 EXTERIOR HINGED/PIVOTED DOORS

Provide units not less than 4" wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames, and as follows:

- A. For in-swinging doors provide units with interlocking lip and interior drain channel; include hook on bottom edge of door and drain pan.
- B. For out-swinging doors provide rabbeted type units with replaceable weatherstrip insert in stop.

16.0 HARDWARE FINISHES

Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or steel forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

Provide finishes which match those established by BHMA or, if none established, match the Architect's sample.

Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.

The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI A156.18 "Materials and Finishes Standard" including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

17.0 INSTALLATION

Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces, which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division 9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

Drill and countersink units, which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

18.0 ADJUST AND CLEAN

Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units, which cannot be adjusted to operate freely and smoothly as intended for the application made.

Clean adjacent surfaces soiled by hardware installation.

18.1 Final Adjustment

Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

18.2 Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

18.3 CONTINUED MAINTENANCE SERVICE

Approximately six months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items, which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

19.0 HARDWARE SCHEDULE

19.1 GENERAL

Materials and products specified herein are deemed equally acceptable. To simplify hardware schedule, however, only one manufacturer's product is listed in hardware sets. Where specific products of each manufacturer are not identified by series or catalog number, most comparable items of each manufacturer named to item specifically identified shall be considered equal of product identified. Where only a series of a manufacturer is named, other characteristics such as function shall be the same as for product specifically identified.

19.2 APPROVED MANUFACTURERS

<u>Product</u>	<u>Manufacturers</u>
Hinges	Hager, McKinney, Stanley
Pivots	Hager, Rixson
Locksets, Mortise Cyl.	Schlage, Sargent, Yale
Surface Bolts	Hager, Trimco, Baldwin
Closers	Horton, Rixson, Sargent
Door Holders	Glynn Johnson, Ives, Reese

(continued...)

Exit Devices	Monarch, Sargent
Push and Pull Plates, Bars	Trimco, Hager, Baldwin
Kickplates, Mop and Armor Plates	Trimco, Hager, Baldwin
Thresholds	National Guard, Hager, Reese
Weatherstripping	National Guard, Stanley
Door Stops	Hager, Glynn Johnson, Sargent
Sweeps	National Guard, Hager, Reese

19.3 HARDWARE SETS

Set No. 1

Lockset	1	Schlage	L9050R x 06L, 26D
Hinge	3	Hager	BB1199, NRP, 32D
Kickplate	2	Hager	193S x 8", 32D
Doorstop	1	Glynn Johnson	US26DGJ45

Set No. 2

Push/Pull Plates	1	Hager	L9050R x 06L, 26D
Hinge	3	Hager	BB1199, NRP, 32D
Kickplate	2	Hager	193S x 8", 32D
Doorstop	1	Glynn Johnson	US26DGJ45
Closer	1	Rixon	RA M2220 DA SA

Set No. 3

Push/Pull Plates	1	Hager	L9050R x 06L, 26D
Hinge	3	Hager	BB1199, NRP, 32D
Doorstop	1	Glynn Johnson	US26DGJ45
Closer	1	Rixon	RA M2220 DA SA
Weatherstrip	1	National Guard	190VA
Sweep	1	National Guard	101VA

Set No. 4

Deadbolt	1	Schlage	L9453R x 06L, 26D
Hinge	3	Hager	BB1199, NRP, 32D
Doorstop	1	Glynn Johnson	US26DGJ45
Closer	1	Rixon	RA M2220 DA SA
Threshold	1	Hager	412SA
Weatherstrip	1	National Guard	190VA
Sweep	1	National Guard	101VA

Set No. 5

Lockset	1	Schlage	L9050R x 06L, 26D
Dummy Handle	1	Schlage	L0172 x 06L, 26D
Hinge	6	Hager	BB1199, NRP, 32D
Doorstop	2	Glynn Johnson	US26DGJ45
Closer	2	Rixon	RA M2220 DA SA
Surface Bolt	1	Hager	275D, 26D

Set No. 6

Lockset	1	Schlage	L9050R x 06L, 26D
Dummy Handle	1	Schlage	L0172 x 06L, 26D
Hinge	6	Hager	BB1199, NRP, 32D
Doorstop	2	Glynn Johnson	US26DGJ45
Closer	2	Rixon	RA M2220 DA SA
Surface Bolt	1	Hager	275D, 26D
Weatherstrip	1	National Guard	190VA
Sweep	2	National Guard	101VA

Set No. 7

Exit Device	1	Monarch	18-M-LE x DANE
Cylinder	1	Schlage	30-138
Hinge	3	Hager	BB1199, NRP, 32D
Doorstop	1	Glynn Johnson	US26DGJ45
Closer	1	Rixon	RA M2220 DA SA
Threshold	1	Hager	412SA
Weatherstrip	1	National Guard	190VA
Sweep	1	National Guard	101VA

Set No. 8

Lockset	1	Schlage	L9050R x 06L, 26D
Hinge	3	Hager	BB1199, NRP, 32D
Doorstop	1	Glynn Johnson	US26DGJ45
Closer	1	Rixon	RA M2220 DA SA
Threshold	1	Hager	412SA
Weatherstrip	1	National Guard	190VA
Sweep	1	National Guard	101VA

Set No. 9

Lockset	1	Schlage	L9050R x 06L, 26D
Dummy Handle	1	Schlage	L0172 x 06L, 26D
Hinge	6	Hager	BB1199, NRP, 32D
Doorstop	2	Glynn Johnson	US26DGJ45
Closer	2	Rixon	RA M2220 DA SA
Surface Bolt	1	Hager	275D, 26D
Threshold	2	Hager	412SA
Weatherstrip	1	National Guard	190VA
Sweep	2	National Guard	101VA

Set No. 10

Push/Pull Plates	2	Hager	L9050R x 06L, 26D
Hinge	6	Hager	BB1199, NRP, 32D
Doorstop	2	Glynn Johnson	US26DGJ45
Closer	2	Rixon	RA M2220 DA SA
Surface Bolt	1	Hager	275D, 26D
Weatherstrip	1	National Guard	190VA
Sweep	1	National Guard	101VA

NOTE: Astragal to be supplied by door manufacturer and installed on all double doors.

END OF SECTION



DIVISION 9

FINISHES

SECTION 09900

GENERAL PAINTING & FINISHES FOR BOOSTER PUMP STATIONS AND EQUIPMENT VAULTS

1.0 GENERAL

1.1 RELATED DOCUMENTS

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

2.0 DESCRIPTION OF WORK

2.1 Extent of painting work is indicated on drawings and as herein specified.

2.2 Work includes painting and finishing of interior and exterior exposed items and surfaces through project, except as otherwise indicated.

Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

2.3 Work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, and exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated.

2.4 "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

2.5 Surfaces to Be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finishes available.

2.6 Following categories of work are not included as part of field-applied finish work.

Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing to specified for such items as (but not limited to) metal toilet enclosures, pre-finished partition systems, acoustic materials, architectural

woodwork and casework, elevator entrance doors and frames, elevator equipment, and finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.

Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.

Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.

Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, and motor and fan shafts will not require finish painting.

2.7 **Shop Priming:** Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.

2.8 Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

3.0 QUALITY ASSURANCE

3.1 **Single Source Responsibility:** Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

3.2 **Coordination of Work:** Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use to ensure compatible prime coats are used.

4.0 SUBMITTALS

4.1 **Product Data:** Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

4.2 **Samples:** Prior to beginning work, Architect will furnish color chips for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of finish sample.

On 12" x 12" hardboard, provide two samples of each color and material, with texture to simulate actual conditions. Re-submit samples as requested by Architect until acceptable sheen, color and texture is achieved.

On concrete masonry, provide two 4" square samples of masonry for each type of finish and color, defining filler, prime and finish coat.

5.0 DELIVERY AND STORAGE

5.1 Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:

- Name or title of material
- Fed. Spec. number, if applicable
- Manufacturer's stock number and date of manufacturer
- Manufacturer's name
- Contents by volume, for major pigment and vehicle constituents
- Thinning instructions
- Application instructions
- Color name and number

5.2 Store materials not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.

Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

6.0 JOB CONDITIONS

6.1 Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 deg. F (10 deg. C) and 90 deg. F (32 deg. C), unless otherwise permitted by paint manufacturer's printed instructions.

6.2 Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 deg. F (7 deg. C) and 95 deg. F (35 deg. C), unless otherwise permitted by paint manufacturer's printed instructions.

6.3 Do not apply paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.

Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

PART 2 – PRODUCTS

1.0 ACCEPTABLE MANUFACTURERS

1.1 Manufacturer: Subject to compliance with requirements, provide products for one of the following:

- TNEMEC
- Rustoleum

2.0 MATERIALS

2.1 Material Quality: Provide best quality grade various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.

Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.

Manufacturer's products which comply with coating qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to Architect. Furnish material data and manufacturer's certificate of performance to Architect for any proposed substitutions.

2.2 Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

Lead content in pigment, if any, is limited to contain not more than 0.06% lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.

This limitation is extended to interior surfaces and those exterior surfaces, such as stairs, decks, porches, railing, window and doors which are readily accessible to children under seven years of age.

PART 3 – EXECUTION

1.0 INSPECTION

1.1 Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and

timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.

1.2 Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.

1.3 Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

2.0 SURFACE PREPARATION

2.1 General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.

Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.

Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.

Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

2.2 Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block, cement plaster and cement-asbestos board to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.

Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

Clean concrete floor surfaces scheduled to be painted with a commercial solution of muriatic acid, or other etching cleaner. Flush floor with clean water to neutralize acid, and allow it to dry before painting.

2.3 Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper

smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.

When transparent finish is required, use spar varnish for backpriming.

Backprime paneling on interior partitions only where masonry, plaster, or other wet wall construction occurs on backside.

Seal tops, bottoms, and cut-outs of unprimed wood doors with a heavy coat of varnish or equivalent sealer immediately upon delivery to job.

2.4 Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

Touch-up shop-applied prime coats wherever damaged or bare, where required by other sections of these specifications.

Clean and touch-up with same type shop primer.

2.5 Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent, followed by an acid wash treatment, before priming.

2.6 Surfaces which cannot be prepared or painted as specified shall be immediately brought to the attention of the Architect in writing. Starting of work without such notification shall be considered acceptance of the surfaces/finishes involved. Contractor shall be responsible for replacement of any unsatisfactory work.

3.0 MATERIALS PREPARATION

3.1 Mix and prepare painting materials in accordance with manufacturer's directions.

3.2 Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

3.3 Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

4.0 APPLICATION

4.1 General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

Paint colors, surface treatments, and finishes, are indicated on the drawings or shall be as directed by the Architect.

Provide finish coats which are compatible with prime paints used.

Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.

Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.

Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.

Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.

Sand lightly between each succeeding enamel or varnish coat.

Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

4.2 Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

4.3 Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, of not indicated, as recommended by coating manufacturer.

4.4 Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to those items exposed in mechanical equipment rooms and in occupied spaces.

4.5 Mechanical items to be painted include, but are not limited to, the following:

- Piping, pipe hangers, and supports.
- Tanks, as directed by Architect.
- Ductwork, insulation, as directed by Architect.
- Motor, mechanical equipment, and supports, as directed by Architect.
- Accessory items.

4.6 Electrical items to be painted include, but are not limited to, the following:

- Conduit and fittings.
- Switchgear.

4.7 Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.

Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

4.8 Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

4.9 Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.

Provide satin finish for final coats, unless otherwise indicated.

4.10 Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

5.0 FIELD QUALITY CONTROL

5.1 The right is reserved by Owner to invoke the following material testing procedure at any time, and any number of times during period of field painting:

Engage services of an independent testing laboratory to sample paint being used. Samples of materials delivered to project site will be taken, identified and sealed, and certified in presence of Contractor.

Testing laboratory will perform appropriate tests for any or all of following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.

5.2 If test results show that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, and remove non-complying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are non-compatible.

6.0 CLEAN-UP AND RESTORATION

6.1 Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.

6.2 Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

6.3 Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Engineer.

Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrapping provided by others for protection of their work, after completion of painting operations.

At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

7.0 PAINT SCHEDULE

7.1 General: Provide the following paint systems for the various substrates.

7.2 COATING SYSTEMS FOR STEEL – STRUCTURAL, TANKS, PIPE, EQUIPMENT, AND MISCELLANEOUS

TNEMEC PRODUCTS

A. Exterior Exposed:

1. Surface Preparation: SSPC-SP-6.
2. Primer: Series 1 Omnithane. DFT 2.5 to 3.5 mils.
3. Intermediate Coat: Series N69 Hi-Build Epoxoline II. DFT 2.0 to 3.0 mils.
4. Finish Coat: Series 1074 Endura-Shield. DFT 2.0 to 3.0 mils.
5. Total DFT: 6.5 to 9.5 mils.

6. Finish Color: As indicated on the drawings.

B. Interior Exposed:

1. Surface Preparation: SSPC-SP 6.
2. Primer: Series 1 Omnithane. DFT 2.5 to 3.5 mils.
3. Finish Coat: Series N69 Hi-Build Epoxoline II. DFT 4.0 to 6.0 mils.
(*May require two coats if brush or roller applied.*)
4. Total DFT: 6.5 to 9.5 mils.
5. Finish Color: As indicated on the drawings.

C. Immersion:

1. Surface Preparation: SSPC-SP 10.
2. Primer: Series 1 Omnithane. DFT 2.5 to 3.5 mils.
3. Intermediate Coat: Series N69 Hi-Build Epoxoline II. DFT 4.0 to 6.0 mils.
4. Finish Coat: Series N69 Hi-Build Epoxoline II. DFT 4.0 to 6.0 mils.
5. Total DFT: 10.5 to 15.5 mils.
6. Finish Color: As indicated on the drawings.

RUSTOLEUM PRODUCTS

A. Exterior Exposed:

1. Surface Preparation: SSPC-SP 6.
2. Primer: Rustoleum 5281. DFT 2.0 to 4.0 mils.
3. Intermediate Coat: Rustoleum 5200. DFT 2.0 to 4.0 mils.
4. Finish Coat: Rustoleum 5200. DFT 2.0 to 4.0 mils.
5. Total DFT: 6.5 to 12.0 mils.
6. Finish Color: As indicated on the drawings.

B. Interior Exposed:

1. Surface Preparation: SSPC-SP 6.
2. Primer: Rustoleum 7400. DFT 3.0 to 4.0 mils.
3. Finish Coat: Rustoleum 7400. DFT 3.0 to 4.0 mils.
(*May require two coats if brush or roller applied.*)
4. Total DFT: 6.5 to 8.0 mils.
5. Finish Color: As indicated on the drawings.

C. Immersion:

1. Surface Preparation: SSPC-SP 10.
2. Primer: Rustoleum 9200. DFT 5.0 to 7.0 mils.
3. Intermediate Coat: Rustoleum 9200. DFT 5.0 to 7.0 mils.
4. Finish Coat: Series Rustoleum 9200. DFT 5.0 to 7.0 mils.
5. Total DFT: 15.0 to 21.0 mils.
6. Finish Color: As indicated on the drawings.

7.3 COATING SYSTEMS FOR GALVANIZED STEEL AND NONFERROUS METAL – PIPE AND MISCELLANEOUS FABRICATIONS

TNEMEC PRODUCTS

- A. Exterior Exposed:
1. Surface Preparation: SSPC-SP 1 – Solvent Cleaning and etch.
 2. Primer: Series N69 Hi-Build Epoxoline II. DFT 2.0 to 3.0 mils.
 3. Finish Coat: Series 1074. DFT 2.0 to 3.0 mils.
 4. Total DFT: 4.0 to 6.0 mils.
 5. Finish Color: As indicated on the drawings.
- B. Interior Exposed:
1. Surface Preparation: SSPC-SP 1 – Solvent cleaning and etch.
 2. Primer: Series N69 Hi-Build Epoxoline II. DFT 2.0 to 3.0 mils.
 3. Finish Coat: Series N69 Hi-Build Epoxoline II. DFT 2.0 to 3.0 mils.
 4. Total DFT: 4.0 to 6.0 mils.
 5. Finish Color: As indicated on the drawings.
- C. Immersion:
1. Surface Preparation: SSPC-SP 1 followed by abrasive blast.
 2. Primer Coat: Series N69 Hi-Build Epoxoline II. DFT 3.0 to 5.0 mils.
 3. Finish Coat: Series N69 Hi-Build Epoxoline II. DFT 4.0 to 6.0 mils.
 4. Total DFT: 7.0 to 11.0 mils.

RUSTOLEUM PRODUCTS

- A. Exterior Exposed:
1. Surface Preparation: SSPC-SP 1 – Solvent Cleaning
 2. Primer: Rustoleum 5281. DFT 2.0 to 4.0 mils.
 3. Finish Coat: Rustoleum 5201. DFT 2.0 to 4.0 mils.
 4. Total DFT: 4.0 to 8.0 mils.
 5. Finish Color: As indicated on the drawings.
- B. Interior Exposed:
1. Surface Preparation: SSPC-SP 1 – Solvent Cleaning
 2. Primer: Rustoleum 9100. DFT 3.0 to 5.0 mils.
 3. Finish Coat: Rustoleum 9100. DFT 3.0 to 5.0 mils.
 4. Total DFT: 6.0 to 10.0 mils.
 5. Finish Color: As indicated on the drawings.
- C. Immersion:
1. Surface Preparation: SSPC-SP 1 followed by abrasive blast.
 2. Primer Coat: Rustoleum 9200 (non-potable 9100). DFT 5.0 to 8.0 mils.
 3. Finish Coat: Rustoleum 9200 (non-potable 9100). DFT 5.0 to 8.0 mils.
 4. Total DFT: 10.0 to 16.0 mils.

7.4 COATING SYSTEMS FOR DUCTILE OR CAST IRON – PIPE, PUMPS, AND VALVES

TNEMEC PRODUCTS

- A. Exterior Exposed:
1. Surface Preparation: NAPF 500-03-03 Power Tool Cleaning.
 2. Primer: Series 1 Omnithane. DFT 2.5 to 3.5 mils.
 3. Intermediate Coat: Series N69 Hi-Build Epoxoline II. DFT 2.0 to 3.0 mils.
 4. Finish Coat: Series 1074 Endura-Shield. DFT 2.0 to 3.0 mils.
 5. Total DFT: 6.5 to 9.5 mils.
 6. Finish Color: As indicated on the drawings.
- B. Below Ground:
1. Surface Preparation: NAPF 500-03-04 Abrasive Blast Cleaning.
 2. Finish Coat: Series 46H-413 Hi-Build Tnemec-Tar. DFT 14.0 to 20.0 mils.
 3. Total DFT: 14.0 to 20.0 mils.
 4. Finish Color: Black
- C. Interior Exposed:
1. Surface Preparation: NAPF 500-03-03 Power Tool Cleaning.
 2. Primer: Series 1 Omnithane. DFT 2.5 to 3.5 mils.
 3. Finish Coat: Series N69 Hi-Build Epoxoline II. DFT 4.0 to 6.0 mils.
(*May require two coats if brush or roller applied.*)
 4. Total DFT: 6.5 to 9.5 mils.
 5. Finish Color: As indicated on the drawings.
- D. Immersion:
1. Surface Preparation: NAPF 500-03-04 Abrasive Blast Cleaning.
 2. Primer: Series 1 Omnithane. DFT 2.5 to 3.5 mils.
 3. Intermediate Coat: Series N69 Hi-Build Epoxoline II. DFT 4.0 to 6.0 mils.
 4. Finish Coat: Series N69 Hi-Build Epoxoline II. DFT 4.0 to 6.0 mils.
 5. Total DFT: 10.5 to 15.5 mils.

RUSTOLEUM PRODUCTS

- A. Exterior Exposed:
1. Surface Preparation: NAPF 500-03-03 Power Tool Cleaning.
 2. Primer: Rustoleum C 9578 Coal tar. DFT – 6.0 to 7.0 mils.
 3. Intermediate Coat: Rustoleum C 9578. DFT – 6.0 to 7.0 mils.
 4. Finish Coat: Series Rustoleum C 9578. DFT – 6.0 to 7.0 mils.
 5. Total DFT: 18.0 to 21.0 mils.
 6. Finish Color: As indicated on the drawings.

- B. Below Ground:
1. Surface Preparation: NAPF 500-03-04 Abrasive Blast Cleaning.
 2. Finish Coat: Rustoleum C 9578. DFT 18.0 to 20.0 mils.
 3. Total DFT: 18.0 to 20.0 mils.
 4. Finish Color: Black.
- C. Interior Exposed:
1. Surface Preparation: NAPF 500-03-03 Power Tool Cleaning.
 2. Primer: Rustoleum C 9100. DFT 5.0 to 8.0 mils.
 3. Intermediate Coat: Rustoleum C 9100. DFT 5.0 to 8.0 mils.
 4. Finish Coat: Rustoleum C 9100. DFT 5.0 to 8.0 mils.
(May require two coats if brush or roller applied.)
 5. Total DFT: 15.0 to 24.0 mils.
 6. Finish Color: As indicated on the drawings.
- D. Immersion:
1. Surface Preparation: NAPF 500-03-04 Abrasive Blast Cleaning.
 2. Primer: Rustoleum 9200. DFT 5.0 to 8.0 mils.
 3. Intermediate Coat: Rustoleum 9200. DFT 5.0 to 8.0 mils.
 4. Finish Coat: Rustoleum 9200. DFT 5.0 to 8.0 mils.
 5. Total DFT: 15.0 to 24.0 mils.

7.5 COATING SYSTEMS FOR PVC

TNEMEC PRODUCTS

- A. Exterior Exposed:
1. Surface Preparation: Scarify.
 2. Primer: Series N69 Hi Build Epoxoline II. DFT 2.0 to 3.0 mils.
 3. Finish Coat: Series 1074 Endura-Shield. DFT 2.0 to 3.0 mils.
 4. Total DFT: 4.0 to 6.0 mils.
 5. Finish Color: As indicated on the drawings.
- B. Interior Exposed:
1. Surface Preparation: Scarify.
 2. Primer: Series N69 Hi-Build Epoxoline II. DFT 2.0 to 3.0 mils.
 3. Finish Coat: Series N69 Hi-Build Epoxoline II. DFT 2.0 to 3.0 mils.
 4. Total DFT: 4.0 to 6.0 mils.
 5. Finish Color: As indicated on the drawings.

RUSTOLEUM PRODUCTS

- A. Exterior Exposed:
1. Surface Preparation: Scarify.
 2. Primer: Rustoleum 9100. DFT 5.0 to 7.0 mils.
 3. Finish Coat: Rustoleum 91000. DFT 5.0 to 7.0 mils.

4. Total DFT: 10.0 to 14.0 mils.
5. Finish Color: As indicated on the drawings.

B. Interior Exposed:

1. Surface Preparation: Scarify.
2. Primer: Rustoleum 9100. DFT 5.0 to 7.0 mils.
3. Finish Coat: Rustoleum 9100. DFT 5.0 to 7.0 mils.
4. Total DFT: 10.0 to 14.0 mils.
5. Finish Color: As indicated on the drawings.

7.6 COATING SYSTEMS FOR INSULATED PIPE

TNEMEC PRODUCTS

A. Interior / Exterior Exposed:

1. Surface Preparation: Clean and dry.
2. Primer: Series 28 Tufcryl. DFT 1.5 to 2.0 mils.
3. Finish Coat: Series 28 Tufcryl. DFT 1.5 to 2.0 mils.
4. Total DFT: 3.0 to 4.0 mils.
5. Finish Color: As indicated on the drawings.

RUSTOLEUM PRODUCTS

A. Interior / Exterior Exposed:

1. Surface Preparation: Clean and dry.
2. Primer: Rustoleum 9100. DFT 5.0 to 7.0 mils.
3. Finish Coat: Rustoleum 9100. DFT 5.0 to 7.0 mils.
4. Total DFT: 10.0 to 14.0 mils.
5. Finish Color: As indicated on the drawings.

7.7 COATING SYSTEMS FOR PRECAST CONCRETE, CAST-IN-PLACE CONCRETE, AND DENSE CONCRETE MASONRY UNITS

TNEMEC PRODUCTS

A. Exterior Exposed:

1. Surface Preparation: SSPC-SP 13/NACE 6. Clean and dry.
2. Primer: Series 156 Enviro-Crete. Spreading Rate 125 sf/gal.
3. Finish Coat: Series 156 Enviro-Crete. Spreading Rate 200 sf/gal.
4. Finish Color: As indicated on the drawings.

B. Below Grade:

1. Surface Preparation: SSPC-SP 13/NACE 6. Clean and dry.
2. Primer: None.
3. Finish Coat: 46H-413 Hi-Build Tnemec-Tar. DFT 14.0 to 20.0 mils.
4. Total DFT: 14.0 to 20.0 mils.

5. Finish Color: Black.

C. Immersion:

1. Surface Preparation: SSPC-SP 13/NACE 6 and ICRI Guideline 03732, CSP-3.
2. Primer: Series N69 Hi-Build Epoxoline II. DFT 3.0 to 5.0 mils.
3. Intermediate Coat: Series N69 Hi-Build Epoxoline II. DFT 4.0 to 6.0 mils.
4. Finish Coat: Series N69 Hi-Build Epoxoline II. DFT 4.0 to 6.0 mils.
5. Total DFT: 11.0 to 17.0 mils.
6. Finish Color: As indicated on the drawings.

D. Interior Exposed:

1. Surface Preparation: SSPC-SP 13/NACE 6 and ICRI Guideline 03732, CSP-3.
2. Primer: Series N69 Hi-Build Epoxoline II. DFT 4.0 to 6.0 mils.
3. Finish Coat: Series N69 Hi-Build Epoxoline II. DFT 4.0 to 6.0 mils.
4. Total DFT: 8.0 to 12.0 mils.
5. Spray apply, or additional coats may be required.
6. Finish Color: As indicated on the drawings.

RUSTOLEUM PRODUCTS

A. Exterior Exposed:

1. Surface Preparation: SSPC-SP 13/NACE 6. Clean and dry.
2. Primer: Rustoleum/Zinser Water Tight as directed.
3. Finish Coat: Rustoleum 5200. DFT 2.0 to 4.0 mils.
4. Finish Color: As indicated on the drawings.

B. Below Grade:

1. Surface Preparation: SSPC-SP 13/NACE 6. Clean and dry.
2. Primer: None.
3. Finish Coat: Rustoleum C 9578. DFT 18.0 to 20.0 mils.
4. Total DFT: 18.0 to 20.0 mils.
5. Finish Color: Black.

C. Immersion:

1. Surface Preparation: SSPC-SP 13/NACE 6 and ICRI Guideline 03732, CSP-3.
2. Primer: Rustoleum 9200. DFT 5.0 to 8.0 mils.
3. Intermediate Coat: Rustoleum 9200. DFT 5.0 to 8.0 mils.
4. Finish Coat: Rustoleum 9200. DFT 5.0 to 8.0 mils.
5. Total DFT: 15.0 to 18.0 mils.
6. Finish Color: As indicated on the drawings.

D. Interior Exposed:

1. Surface Preparation: SSPC-SP 13/NACE 6 and ICRI Guideline 03732, CSP-3.
2. Primer: Rustoleum 9100 (non-potable, 9200 potable). DFT 5.0 to 7.0 mils.
3. Finish Coat: Rustoleum 9100 (non-potable, 9200 potable). DFT 5.0 to 7.0 mils.
4. Total DFT: 10.0 to 14.0 mils.

5. Finish Color: As indicated on the drawings.

7.8 COATING SYSTEMS FOR CONCRETE FLOORS

TNEMEC PRODUCTS

- A. Light Traffic / Low Impact Exposure:
 1. Surface Preparation: SSPC-SP 13/NACE 6 and ICRI Guideline 03732, CSP-3.
 2. Primer: Series 201 Epoxo prime. DFT 6.0 to 8.0 mils.
 3. Intermediate Coat: Series 280 Tnemec-Glaze. DFT 6.0 to 8.0 mils.
 4. Finish Coat: Series 280 Tnemec-Glaze. DFT 6.0 to 8.0 mils.
 5. Total DFT: 18.0 to 24.0 mils.
 6. Finish Color: As indicated on the drawings. (*Limited Color Selection*)

- B. Heavy Traffic and Chemical Exposure:
 1. Surface Preparation: SSPC-SP 13/NACE 6 and ICRI Guideline 03732, CSP-5.
 2. Primer: Series 237 Power-Tread, double broadcast. DFT 1/8 inch.
 3. Intermediate Coat: Series 280 Tnemec-Glaze. DFT 6.0 to 8.0 mils.
 4. Finish Coat: Series 291 CRU. DFT 2.0 to 3.0 mils.
 5. Total DFT: Greater than 1/8 inch.
 6. Finish Color: As indicated on the drawings. (*Limited Color Selection*)

- C. Decorative:
 1. Surface Preparation: SSPC-SP 13/NACE 6 and ICRI Guideline 03732, CSP-5.
 2. Primer: Series 201 Epoxo prime. DFT 4.0 to 6.0 mils.
 3. Intermediate Coat: Series 222 Deco-Tread, double broadcast. DFT 1/8 inch.
 4. Finish Coat: Series 285 Satin glaze. DFT 8.0 to 10.0 mils.
 5. Total DFT: Greater than 1/8 inch.
 6. Finish Color: As indicated on the drawings.

RUSTOLEUM PRODUCTS

- A. Light Traffic / Low Impact Exposure:
 1. Surface Preparation: SSPC-SP 13/NACE 6 and ICRI Guideline 03732, CSP-3.
 2. Primer: Rustoleum 9100. DFT 5.0 to 7.0 mils.
 3. Intermediate Coat: Rustoleum 9100. DFT 5.0 to 7.0 mils.
 4. Finish Coat: Rustoleum 9100. DFT 5.0 to 7.0 mils.
 5. Total DFT: 15.0 to 21.0 mils.
 6. Finish Color: As indicated on the drawings. (*Limited Color Selection*)

- B. Heavy Traffic and Chemical Exposure:
 1. Surface Preparation: SSPC-SP 13/NACE 6 and ICRI Guideline 03732, CSP-5.
 2. Primer: Rustoleum 8200 Overcoat.
 3. Intermediate Coat: Rustoleum 8200 Overcoat.
 4. Finish Coat: Rustoleum 8200 Overcoat.
 5. Total DFT: Not to exceed 1/8 inch.

6. Finish Color: As indicated on the drawings. (*Limited Color Selection*)

C. Decorative:

1. Surface Preparation: SSPC-SP 13/NACE 6 and ICRI Guideline 03732, CSP-5.
2. Primer: Rustoleum Britecast System.
3. Intermediate Coat: Rustoleum Britecast System.
4. Finish Coat: Rustoleum Britecast System.
5. Total DFT: 60.0 to 250.0 mils considering desired service.
6. Finish Color: As indicated on the drawings.

7.9 COATING SYSTEMS FOR POROUS CONCRETE MASONRY UNITS

TNEMEC PRODUCTS

A. Exterior Exposed:

1. Surface Preparation: SSPC-SP 13/NACE 6. Clean and dry.
2. Primer: Series 156 Enviro-Crete. Spreading Rate 80 to 100 sf/gal.
3. Finish Coat: Series 156 Enviro-Crete. Spreading Rate 125 sf/gal.
4. Finish Color: As indicated on the drawings.

B. Interior Exposed:

1. Surface Preparation: SSPC-SP 13/NACE 6. Clean and dry.
2. Primer: Series 130 Masonry Filler. Spreading rate 80 to 100 sf/gal.
3. Intermediate Coat: Series N69 Hi-Build Epoxoline II. DFT 2.0 to 3.0 mils.
4. Finish Coat: Series N69 Hi-Build Epoxoline II. DFT 2.0 to 3.0 mils.
5. Total DFT: 4.0 to 6.0 mils plus filler.
6. Finish Color: As indicated on the drawings.

RUSTOLEUM PRODUCTS

A. Exterior Exposed:

1. Surface Preparation: SSPC-SP 13/NACE 6. Clean and dry.
2. Primer: Rustoleum/Zinser clear block filler as directed.
3. Finish Coat: Rustoleum 5200. DFT 2.0 to 4.0 mils.
4. Finish Color: Rustoleum 5200. DFT 2.0 to 4.0 mils.
5. Total DFT: 4.0 to 8.0 mils plus filler.

B. Interior Exposed:

1. Surface Preparation: SSPC-SP 13/NACE 6. Clean and dry.
2. Primer: Rustoleum/Zinser Water Tight.
3. Intermediate Coat: Rustoleum 5200. DFT 2.0 to 4.0 mils.
4. Finish Coat: Rustoleum 5200. DFT 2.0 to 4.0 mils.
5. Total DFT: 4.0 to 6.0 mils plus filler.
6. Finish Color: As indicated on the drawings.

7.10 COATING SYSTEMS FOR PLASTER, GYPSUM BOARD, AND WOOD

TNEMEC PRODUCTS

- A. Interior Exposed:
1. Surface Preparation: Clean and dry.
 2. Primer: Series 151-1051 Elasto-Grip FC. DFT 1.0 to 1.5 mils.
 3. Intermediate Coat: Series 113 H.B. Tnemec-Tufcoat. DFT 2.0 to 3.0 mils.
 4. Finish Coat: Series 113 H.B. Tnemec-Tufcoat. DFT 2.0 to 3.0 mils.
 5. Total DFT: 5.0 to 7.5 mils.
 6. Finish Color: As indicated on the drawings.

RUSTOLEUM PRODUCTS

- A. Interior Exposed:
1. Surface Preparation: Clean and dry.
 2. Primer: Rustoleum Smart Prime.
 3. Intermediate Coat: Rustoleum Acrylic Perma White (mold resist). DFT 2.0 to 3.0 mils.
 4. Finish Coat: Rustoleum Acrylic Perma White (mold resist). DFT 2.0 to 3.0 mils.
 5. Total DFT: 4.0 to 6.0 mils.
 6. Finish Color: As indicated on the drawings.

8.0 MEASUREMENT AND PAYMENT

Payment for painting is incidental to the work in which it is included. There is no separate payment for painting.

- END OF SECTION -

DIVISION 11

EQUIPMENT

SECTION 11007

ELECTROMAGNETIC FLOW METER

1.0 GENERAL

1.1 SCOPE

This section describes the requirements for a flow sensor.

Under this item, the contractor shall furnish and install the flow measurement equipment and accessories as indicated on the plans and as herein specified.

1.2 QUALITY ASSURANCE

Referenced Standards and Guidelines - Complies with applicable portions of ANSI/AWWA Standards and NSF/ANSI Standard 61, Annex G. There are currently no AWWA standards that specifically address electromagnetic metering.

Flow measurement function complies with Industry Standards

- a. ANSI B16.5 Class 150 RF
- b. AWWA Class B
- c. NEMA 4X/6P (IP66/IP67)
- d. CSA

1.3 SUBMITTALS

The following information shall be included in the submittal for this section:

1. Outline dimensions, conduit entry locations and weight
2. Customer connection and power wiring diagrams
3. Data sheets and catalog literature for microprocessor-based transmitter and transducer
4. Interconnection drawings
5. Installation and operations manual
6. List of spare parts
7. Complete technical product description including a complete list of options provided

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8. Any portions of this specification not met must be clearly indicated or the supplier and contractor shall be liable to provide all additional components required to meet this specification

1.4 SYSTEM DESCRIPTION

Electromagnetic flow meter is intended for fluid metering in industries including water, wastewater, food and beverage, pharmaceutical and chemical. Measures fluid flow of water or fluids which are highly corrosive, very viscous, contain a moderate amount of solids, or require special handling. No moving parts are in the flow stream. Amplifier can be integrally mounted to the detector or can be remote-mounted. Unit is ideally suited for measuring dynamic, non-continuous flow. In applications where a minimum and/or maximum flow rate must be tracked and monitored, the unit provides pulse signals that can be fed to dedicated batch controllers, PLCs and other more specialized instrumentation.

1.5 DEFINITIONS

Amplifier – Device used for increasing the power of a signal. It does this by taking energy from a power supply and controlling the output to match the input signal shape but with larger amplitude.

ANSI – (American National Standards Institute) A private non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States. The organization also coordinates U.S. standards with international standards so that American products can be used worldwide.

AWWA – (American Water Works Association) An international non-profit professional organization founded to improve water quality and supply.

Detector Coils – Also called an “induction loop”, an electromagnetic communication or detection system which uses a moving magnet to induce an electrical current in a nearby wire.

Electrode – An electrical conductor used to make contact with a nonmetallic part of a circuit (e.g. a semiconductor, an electrolyte or a vacuum).

Modbus RTU – a serial communications protocol published by Modicon (now Schneider Electric) in 1979 for use with its programmable logic controllers (PLCs). This is used in serial communication & makes use of a compact, binary representation of the data for protocol communication.

NEMA – (National Electrical Manufacturers Association) Is the 'Association of Electrical Equipment and Medical Imaging Manufacturers' in the United States. Its approximately 450

member companies manufacture products used in the generation, transmission, distribution, control, and end use of electricity. These products are used in utility, industrial, commercial, institutional, and residential applications.

NSF – (National Science Foundation) A United States government agency that supports fundamental research and education in all the non-medical fields of science and engineering.

PLCs – (Programmable Logic Controller) A digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. PLCs are used in many industries and machines.

PTFE – (Polytetrafluoroethylene) A synthetic fluoropolymer of tetrafluoroethylene that finds numerous applications. The best known brand name of PTFE is Teflon by DuPont Co.

Serial Communications – In telecommunication and computer science, serial communication is the process of sending data one bit at a time, sequentially, over a communication channel or computer bus. This is in contrast to parallel communication, where several bits are sent as a whole, on a link with several parallel channels.

2.0 PRODUCTS

1.1 APPROVED MANUFACTURERS

Basis-of-Design Product: Subject to compliance with specifications, provide flow measurement equipment by one of the following:

1. Krohne, Waterflux 3000
2. Toshiba, Series LF654
3. Badger Meter, M-2000

1.2 OPERATING CONDITIONS

A. System Components

1. Metering Tube (Detector)

Consists of stainless steel tube lined with a non-conductive material. Energized detector coils around tube create a magnetic field across the diameter of the pipe. As a conductive fluid flows through the magnetic field, a voltage is induced across two electrodes; this voltage is proportional to the average flow velocity of the fluid.

2. Signal Amplifier

Consists of unit which receives, amplifies, and processes the detector's analog signal. Signal is converted to both analog and digital signals that are used to display rate of flow and totalization. Processor controls zero-flow stability, analog and frequency outputs, serial communications and a variety of other parameters. Integrated LCD display indicates rate of flow, forward and reverse totalizers and diagnostic messages. Display guides user through programmable routines.

B. Operational Requirements

1. Electromagnetic Flow Meter

a. The flow meter system shall operate with a pulsed DC excitation frequency, and shall produce a signal output that is directly proportional and linear with the volumetric flow rate of the liquid flowing through the metering tube. The metering system shall include a metering sensor tube (detector), a signal amplifier, and the necessary connecting wiring. The metering system shall have the ability to incorporate a meter mounted or remote mounted amplifier.

b. Engineering Units:

The signal amplifier shall be program selectable to display the following units of measure: U.S. gallons, imperial gallons, million gallons (U.S.), cubic feet, cubic meters, liters, hector-liters, oil barrels, pounds, ounces or acre feet.

c. Operating Principle: Electromagnetic Induction

d. Metering Tube (Detector)

1. The metering tube (detector) shall be constructed of 316 stainless steel, and rated for a maximum allowable non-shock pressure and temperature for steel pipe flanges, according to ANSI B16.5.
2. The metering tube (detector) shall be available in line size from 1/4" [6 mm] to 54" [1400 mm].
3. The metering tube (detector) end connections shall be carbon steel or 316 stainless steel flanged, according to ANSI B16, Class 150 and AWWA Class B standards.
4. The insulating liner material of the metering tube (detector) shall be made of a hard rubber elastomer and NSF-listed for meter sizes 4" and above, in conformance with manufacturer's recommendation for the intended service or an NSF-listed meter option with PTFE liner.

5. The metering tube (detector) shall include two self-cleaning measuring electrodes. The electrode material shall be corrosion resistant and available in Alloy C or 316 stainless steel.
 6. The metering tube (detector) shall include a third "empty pipe detection" electrode located in the upper portion of the inside diameter of the flow tube in order to detect an empty pipe condition when the flow tube is running partially empty. Empty pipe detection that is not activated until the pipe is 50% empty is not acceptable.
 7. The metering tube (detector) housing shall be constructed of carbon steel, welded at all joints, and rated to meet NEMA 4X/6P (IP66/IP67) ratings.
 8. For remote amplifier applications, the metering tube (detector) junction box enclosure shall be constructed of cast aluminum (powder-coated paint) and shall meet NEMA 4X/6P (IP66/IP67) ratings.
 9. When installed in non-metallic or internally lined piping, the metering tube (detector) shall be provided with a pair of corrosion resistant grounding rings. The grounding ring material shall be 316 stainless steel.
10. Fluid Temperature Range
- i. For remote amplifier applications, the fluid temperature range shall be 32°F to 178°F [0°C to 80°C] at a maximum ambient temperature of 122°F [50°C] for the hard rubber liner material.
- e. Signal Amplifier
1. The signal amplifier shall be microprocessor based, and shall energize the detector coils with a digitally controlled pulsed DC. The excitation frequency shall be program selectable for the following: 1Hz, 3.75Hz, 7.5Hz, or 15Hz. (factory optimized to pipe size and application)
 2. The signal amplifier electrical power requirement shall be 85-265VAC, 45-65Hz. The power consumption shall not exceed 15W.
 3. The signal amplifier shall have an ambient temperature rating of -4°F to 140°F [-20°C to 60°C].
 4. The signal amplifier shall include non-volatile memory capable of storing all programmable data and accumulated totalizer values in the event of a power interruption.

5. Automatic zero stability, low flow cut-off, empty pipe detection and bi-directional flow measurement shall be inherent capabilities of the signal amplifier.
6. All signal amplifier outputs shall be galvanically isolated to 250 volts.
7. The signal amplifier and remote junction enclosures shall be constructed of cast aluminum (powder-coated paint) and shall meet NEMA 4X/6P (IP66/IP67) ratings.

8. Outputs:

The signal amplifier shall provide a total of four digital outputs, one analog output and one digital input.

- i. Up to four open collector digital outputs, program selectable from the following: Forward pulse, reverse pulse, AMR pulse, flow set point, empty pipe alarm, flow direction, reset output, error alarm and 24V supply.
- ii. Up to two active digital (24 Volt) outputs, program selectable from the following: Forward pulse, reverse pulse, AMR pulse, flow set point, empty pipe alarm, flow direction, preset output, error alarm and 24V supply.
- iii. Up to two AC solid-state relay outputs, program selectable from the following: Frequency output, flow set point, empty pipe alarm, flow direction, preset amount and error alarm.
- iv. One digital input, program selectable from the following: Remote reset, batch reset and positive return to zero.
- v. Advanced protocol support using Modbus/RTU.
- vi. One analog output programmable and scalable from the following: 0-10mA, 0-20mA, 2-10mA or 4-20mA. Voltage sourced and isolated. Max. loop resistance = 800 ohms.

f. Control and Programming

1. The signal amplifier shall be programmed via three function buttons. The programming functions shall be available in a user-friendly, menu driven software through the four-line LCD interface. The signal amplifier shall accommodate the following languages: English, German, Czech, French or Spanish.

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2. Programmable parameters of the amplifier include, but are not limited to: calibration factors, totalizer resets, unit of measure, analog and pulse output scaling, flow-alarm functions, language selection, low-flow cutoff, noise dampening factor and excitation frequency selection.
3. The signal amplifier shall have a programming option allowing entry of a selected numeric password value for tamper protection.

g. System Performance

1. The metering system shall operate over a flow range of 0.10 to 39.4 ft/s [0.03 to 12.0 m/s].
2. The metering system shall perform to an accuracy ± 0.50 percent of rate for velocities greater than 1.64 ft/s [0.50 m/s], ± 0.004 ft/s [± 1 mm/s] for velocities less than 1.64 ft/s [0.50 m/s].
3. The metering system shall be capable of measuring the volumetric flow rate of liquids having an electrical conductivity as low as 5.0 micromhos per centimeter.
4. The system measuring repeatability shall be $<0.10\%$ of full scale.

h. Indication

The signal amplifier shall include a four-line, 20-character, backlit LCD interface to display the following values:

Flow rate in selectable rate units
Forward totalizer in selectable volume units
Reverse totalizer in selectable volume units
Net totalizer in selectable volume units
Error or alarm messages
Software revision level

3.0 EXECUTION

1.1 INSTALLATION

Follow manufacturer's recommendation for installation. Installation will conform to the guidelines provided by the Installation & Operation Manual.

The supplier of the electromagnetic flow meter shall be specifically aware of the installation of the flow meter position relative to the configuration of the piping, fittings, valves, etc. as shown in the pump station Drawings. The supplier shall certify the performance of the

metering systems accuracy, as herein specified, relative to the installation of the flow meter within the piping configuration shown on the Drawings.

1.2 CALIBRATION

Each meter shall be hydraulically calibrated in an ISO 9000-certified testing facility, which utilizes a computerized gravimetric testing method with a measuring uncertainty of 0.1%.

Each meter shall be provided with a calibration certificate indicating the measured error (percent deviation) at three different flows, respectively equivalent to 25%, 50% and 75% of the nominal flow rate for each size.

1.3 MANUFACTURER'S WARRANTY

Terms

The manufacturer of the above specified equipment warrants the Product to be free from defects in materials and workmanship appearing within the earlier of either: One (1) year after installation; or one (1) year and six (6) months after shipment from manufacturer.

END OF SECTION

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SECTION 11015

TWO STAGE HORIZONTAL SPLIT CASE PUMPS

1.0 GENERAL

1.1 SCOPE

A. The CONTRACTOR shall furnish and install two (2) two-stage, horizontal split case pumping units as specified herein and shown on the contract drawings and equal to Patterson Pump Model 6X5 DMD.

B. The term "pumping unit" or "units" shall be defined as a pump complete with base plate, coupling, coupling guard, motor, and variable frequency drives.

C. The pump manufacturer shall be responsible for supplying the complete pumping unit as defined above and shall assume complete system responsibility.

The CONTRACTOR shall also provide the services of a qualified technician (factory representative) for performing start-up, checkout and initial operation services. The technician shall have a minimum a five years experience in performing pump start-up operations. Start-up services shall include overseeing the set-up of the motor drive equipment.

1.2 RELATED WORK

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1.3 CODES AND STANDARDS

- A. HI (Hydraulic Institute)
- B. ANSI (American National Standards Institute)
- C. ASTM (American Society of Testing and Materials)
- D. ISO 9001 (International Organization for Standardization)
- E. AFBMA (Antifriction Bearing Manufacturer's Association)

1.4 MANUFACTURER

A. QUALITY ASSURANCE

- a. To ensure unity of responsibility, the complete pump unit shall be supplied, tested, and warranted by the pump manufacturer.
- b. The equipment specified under this section is to be standard pumping equipment manufactured by a company with no less than fifteen (15) years experience in the manufacture of such equipment. Upon request by the engineer, the manufacturer shall provide proof of such experience by providing installation lists, brochures, catalog cuts, etc.

- c. The manufacturer of the pump units shall have a quality management system in place and shall be ISO 9001 certified.
- d. The manufacturer of the pump units shall have an environmental management system in place and shall be ISO 14001 certified.
- e. Pumping units shall be manufactured by Patterson Pump Company or approved equal.

B. ADDITIONAL SUBMITTALS

The CONTRACTOR shall submit, upon request, any additional information that the Engineer may deem necessary to determine the ability of the proposed manufacturer to produce the specified equipment.

C. REPLACEMENT PARTS CAPABILITY AND SERVICE

Pumping units shall be the standard, or typical, product of the pump manufacturer. The manufacturer shall produce evidence of their ability to promptly furnish any and all interchangeable replacement parts as may be needed at any time within the expected life of the pumps. The CONTRACTOR shall submit full details of the proposed manufacturer's ability to promptly fill replacement orders.

D. MANUFACTURER INFORMATION

All manufacturer information required by the specifications shall be submitted by the CONTRACTOR within fourteen (14) calendar days of the date of receipt of the Notice of Award. Any additional information or data, specifically requested by the Engineer, shall be submitted by the CONTRACTOR within fourteen (14) calendar days of the receipt of the written request. Approval of the manufacturer and equipment will not be given until all information required by the specifications, or requested by the Engineer, has been submitted and found acceptable.

E. DISQUALIFICATION OF MANUFACTURER

Failure to successfully comply with the provisions of the Contract, or specifications, will constitute grounds for disqualification of the pump manufacturer and SUPPLIER.

1.5 SUBMITTALS

A. GENERAL

The CONTRACTOR shall comply with the provisions in the specifications regarding submittals, unless otherwise specified herein.

B. CONTENT OF SUBMITTALS

The following shall be included in submittals as a minimum. However, any additional information or data shall be added if and whenever requested by the Engineer. Where applicable, submit separate data for each pump.

1. Descriptive Literature
 - a. Dimensions.
 - b. Materials of construction (including required coatings.)
 - c. Weight of pump and motor
 - d. Installation details

2. Performance data
 - a. Size of pump suction/discharge
 - b. Flowrate, gpm
 - c. Total Dynamic Head, feet
 - d. Power, Brake Hp
 - e. Overall pump efficiency
 - f. Speed, rpm
 - g. Performance curves showing overall pump efficiencies.
 - h. NPSH curve (if applicable).
 - i. Shutoff head.
 - j. Motor data

C. INSTALLATION INFORMATION

Submit dimensional drawings containing adequate information necessary for final layout of foundations, connecting piping and valves, electrical connections, and auxiliary equipment. Drawings shall show location, size and full details of foundation or anchoring bolts.

The dimensional drawings shall outline the complete pump, motor, base, and frame. The drawings shall show plan, and elevation views. The CONTRACTOR and manufacturer shall be responsible for;

1. Verify that the equipment being proposed can be installed within the limited space of the structure.
2. Outline any special procedures required for servicing the pumps.

D. OPERATION AND MAINTENANCE MANUAL

Manual shall contain all information necessary for proper operation and maintenance of pumping units, as well as the location of the nearest permanent service headquarters. Three (3) bound copies of the O&M Manual shall be provided.

2.0 EQUIPMENT

2.1 GENERAL

- A. The pumping units provided under this section shall be supplied by one manufacturer.
- B. Each pumping unit shall be provided with a stainless steel nameplate, which shall contain the following information:
1. Manufacturer's name, address, and telephone number
 2. Model number
 3. Serial number
 4. Head, capacity and rpm at rated condition
 5. Motor horsepower, rpm and frame size
- C. Pumping units within each type of service shall be identical in every respect with all parts being interchangeable.
- D. Pump rotating assemblies shall be balanced in accordance with the requirements of ANSI S2.19, G6.3.
- E. Vibration, when measured at the pump bearing housing shall not exceed the limitations specified by the Hydraulic Institute Standards.

2.2 OPERATING CONDITIONS

The Contractor shall furnish complete horizontal split case pump(s) and appurtenances to meet the requirements specified herein or as shown on the drawing. The pumps at the indicated location shall meet the following minimum requirements:

- A. RATED CONDITION
1. Capacity = US 1400 gpm
 2. Head in Feet = 435 ft
 3. Minimum Efficiency = 84.2%
 4. Maximum NPSHr = 18.5 ft
- B. SECONDARY CONDITION
1. Capacity = US 1750 gpm
 2. Head in Feet = 352 ft
 3. Minimum Efficiency = 81%
 4. Maximum NPSHr = 21 ft
- C. OPERATING CHARACTERISTICS

1. Shut-off Head = 523 ft
2. Maximum Brake Horsepower = 192 hp
3. Maximum Operating Speed = 1800 rpm

D. MOTOR SIZE – 200 hp

2.3 PUMP DESIGN

A. PUMP CASING

1. Pump casing shall be of close grain cast iron type ASTM A48, class 40, designed for heavy duty service. The casing shall be horizontally split; with an interconnecting passage between stages. Suction and discharge flanges cast integrally with the lower half in order that the upper part may be removed for inspection of the rotating element without disturbing pipe connections or pump alignment. Pump mounting feet are to be cast integrally into the lower half casing. The joint between halves of the casing shall be heavily flanged and bolted, and provided with dowel pins to insure accurate alignment. The upper half casing flange shall have tapped holes for jackscrews. The interior shall be smooth and free from surface defects.
2. Thickness, diameter and drilling dimensions of suction flanges shall be rated for 200 psi minimum water working pressure. Discharge flanges shall be rated for 350 psi minimum water working pressure. Pump casings shall have a minimum 6" suction and a 5" discharge. Suction and discharge connections shall be located on opposite sides of the pump.
3. Casings shall be drilled and tapped for vertical priming, gauge, and drain connections. Suitable lifting lugs or eyebolts shall be provided.

B. IMPELLERS

1. Impellers shall be of the single suction enclosed type made entirely of ASTM B148-954 Aluminum Bronze finish smooth all over and of ample strength and stiffness for maintaining the maximum capacity of the unit.
2. Impellers shall be statically and dynamically balanced and shall be keyed to the shaft and securely held in axial position on the shaft by means of ASTM B148-954 bronze sleeves extended through the stuffing box. Rotation of the shaft sleeves shall be prevented by the impeller key, which shall extend beyond the impeller hub and into the shaft sleeve on both sides of the impeller. Shaft sleeves shall be held in position by a locking shaft sleeve nut located outside of the stuffing box and shall have an O-ring seal between the sleeve and the nut to prevent entrance of air or liquid between the shaft and sleeve. Sleeves, which are threaded on to the pump shaft, are not acceptable.

3. Impellers shall be opposed on the shaft to balance hydraulic thrust loads.

C. WEAR RINGS

1. At the running joint between the suction and discharge chambers, there shall be provided wear rings on both the casing impeller.
2. The casing rings shall be of ASTM B505-927 bronze, positioned in the casing and locked against rotation by the upper half of the case.
3. Impeller rings shall be of ASTM B505-932 bronze, so fastened that they cannot rotate or become loose when the pump is subjected to reversed rotation. The rings shall be made to limit gauges, so that they may be renewed without fitting.

D. PUMP SHAFT

1. The shaft shall be of AISI 1141 and of such dimensions that the maximum combined stress due to bending and torsion shall not exceed 8,000 pounds per square inch under the most severe conditions of operation.
2. The shaft shall be accurately machined over its entire length. The first critical speed of the rotating assembly shall occur at not less than 150% of the rated speed.
3. Threads on the pump shaft shall be located outside of the stuffing box.

E. STUFFING BOXES (Mechanically Sealed)

1. Stuffing boxes shall be provided with factory choice mechanical shaft seals.
2. Stuffing boxes shall accept packing or mechanical seals without modification to the stuffing box.
3. Mechanical seals shall be furnished with a carbon seal ring, ceramic mating ring, viton elastomers and 316 stainless steel metal parts.
4. Mechanical seals shall be rated for 350 PSIG pressure. The elastomers shall be rated for temperatures ranging from -20 degrees F to 400 degrees F.
5. Pump shaft sleeves shall be furnished with a pre-machined groove designed to accept a setting ring, which shall eliminate the need for set collars or stop collars. Seals requiring stop or set collars with set-screws are not acceptable.
6. The rotating seal ring shall be provided with a 360 degree rubber encasement to provide a positive drive for the seal face without the need

for metal drive notches which may cause face distortion or notch wear. The seal rings shall be permanently fixed in place and full flatness maintained by a precision crimp in the outer seal case.

7. The mechanical seal shall be of a convoluted design which permits free movements providing constant adjustment for shaft endplay and seal face wear. Positive face contact with the stationary seat shall be maintained at all times.
8. To insure positive sealing by free movement of the seal head, the seal shall feature a hex style outer shell and drive band which shall absorb start-up and running torque and shall eliminate in stress on the diaphragm. Metal components shall freely engage and shall not be subject to lock down due to friction wear.
9. Suitably valved connecting lines or passages shall be provided on the upper half casing leading from the discharge volute to the stuffing box for lubricating the stuffing boxes with the liquid being pumped.

F. BEARINGS

1. Bearings shall be of the anti-friction type grease lubricated ball.
2. The bearing configuration shall consist of one single row deep grooved anti-friction bearing on the inboard side and one or more anti-friction bearings mounted on the outboard side. The inboard bearing shall be designed to take the radial thrust loads. The outboard bearings shall be designed to take a combination of loads, both radial and axial; and hold the rotor in axial alignment.
3. Bearings shall have a minimum rated service life of 40,000 hours in accordance with the standards of the Bearings Manufacturers Association through out the specified operating range. Bearings shall be mounted in dust tight housings and shall be rigidly supported by suitable brackets, which shall be cast integrally with the lower half of the pump casing. Bearing housings or bearing housing supports, which are bolted to the side of the pump casing, are not acceptable.
4. A deflector made of Aluminum shall be provided on the inboard and outboard ends of the pump shaft to prevent product from entering either bearing housing.

G. PUMP BASE

1. The pump and motor shall be mounted on a common base of fabricated ASTM A36 steel. Bent metal or formed bases are not acceptable.
2. The base shall be provided with a coupling guard, ample grout holes and drip lip rim piped to nearest floor drain.

3. All mounting surfaces shall have a machined finish.

H. COUPLINGS

1. The coupling shall be Martin Quadra-flex or approved equal with type S flanges and elastomeric sleeves of Hytrel, EPDM or similar material.
2. The coupling shall be sized to transmit the maximum required horsepower with a 1.5 service factor.

I. MOTOR

The motor shall be a premium efficiency, inverter duty, horizontal ODP type. The motor shall be designed to operate on 480 volt AC, 3 phase, 60 cycle electric current. Coupling guards shall comply with all OSHA standards. Motors shall be AC induction horizontal rigid frame.

1. Motor Requirements

- a. Applicable Codes and Regulations. All motors furnished shall be designed, manufactured, and tested in accordance with the latest applicable standards of NEMA, ANSI, IEEE, and ASTM. As a minimum requirement, all motors shall conform to the latest applicable sections of NEMA Standard No. MG-1. Motors must meet or exceed the Consortium for Energy Efficiency (CEE) Premium Efficiency™ full load efficiencies and have the following minimum features:

1. Inverter Duty labeled
2. Insulated bearings
3. Bi-metallic heat sensors
4. 115v space heaters
5. 200 hp, 1800 rpm
6. ODP (Open Drip-Proof) enclosure
7. 3/60/460v
8. Each motor shall be subject to complete certified test
9. Motor shall include drains and breathers, insulated bearings and grounding lug, space heaters and thermostats for moisture and thermal protection.
10. Acceptable manufacturers include: Nided (USEM), Baldor/Relience, GE, Marathon and WEG.
11. Junction box shall be at least one size longer than NEMA standard.

2. Enclosures

- a. In general, all motors shall be ODP (Open Drip-Proof), NEMA T frame, NEMA F1 assembly for horizontal applications. Motor enclosures shall be equal to the Baldor Super-E™ motor (EM).

3. Electrical & Mechanical Design Requirements

- a. Motors shall be premium efficiency Super-E™ type, NEMA Design B (normal starting torque, full voltage starting), squirrel cage, induction type.
- b. Per CEE Premium Efficiency™ Criteria, minimum efficiencies for ODP motors shall be equal to or greater than those shown below:

Hp	1200 RPM	1800 RPM	3600 RPM
5	89.5	89.5	89.5
7.5	91.7	91.0	89.5
10	91.7	91.7	90.2
15	92.4	93.0	91.0
20	92.4	93.0	92.4
25	93.0	93.6	93.0
30	93.6	94.1	93.0
40	94.1	94.1	93.6
50	94.1	94.5	93.6
60	95.0	95.0	94.1
75	95.0	95.0	94.5
100	95.0	95.4	94.5
125	95.4	95.4	95.0
150	95.8	95.8	95.4
200	95.4	95.8	95.4

- c. Motors shall be wound for 200, 230, 460, 230/460 or 575-volt, three-phase, 60-hertz, 1.15 service factor.
- d. Windings shall be copper magnet wire rated at 200° C and moisture resistant. Magnet wire insulation varnish must be of a type designed to resist transient spikes (such as Inverter Spike Resistant™ ISR), high frequencies, and short time rise pulses produced by inverters. Motor insulation system shall comply with NEMA MG1 Part 31.4.4.2.
- e. Insulation shall be a Class H with class F rise at 40 degrees C ambient, non-hygroscopic varnish.
- f. Windings shall be firmly held in the stator slots to prevent coil shifts. Sharp edges and burs shall be removed from the stator core slots prior to inserting the winding. All coils shall be phase insulated using Nomex paper or equal and laced down such that the windings will not move during repetitive starting. All stator connections will be securely made.
- g. The insulation resistance of the sealed stator winding shall be greater than 100 megohms when measured at 25° C with a megohm bridge having 1000-volt direct current.

- h. The motor design shall use the best available materials and methods to achieve premium efficiency, power factor and long life operation.
- i. Motors shall be designed for operation in either direction of rotation without a physical change in the motor.
- j. All motors shall have anti-friction, vacuum-degassed steel ball bearings electric motor quality. On frames 254-up, grease fittings and reliefs are supplied for external lubrication while machine is in operation. These grease fittings and reliefs are plugged.
- k. The bearings shall have a rated fatigue life of L-10 (B-10) of 150,000 hours. Bearing located on the non-drive end shall be insulated from shaft voltage and induced bearing currents
- i. Shaft Grounding Ring (SGR) shall be installed on the drive end of the motor to meet the requirements of NEMA MG1 31.4.4.3. and protect the motor bearings. The SGR shall be the AEGIS™ SGR as manufactured by Electro Static Technology, or approved equal.
- m. Bearing cavities and greasing passages shall be thoroughly cleaned of all debris before lubricating. Motors shall be lubricated at the factory with Exxon Mobil Polyrex™ EM grease or equal.
- n. Maximum vibration allowed shall be 0.15 inches per second velocity measured at the bearing housings.
- o. Rotor assemblies shall be die cast aluminum for NEMA frames. Rotors shall be keyed and shrunk or pressed to the shaft. Welding will not be acceptable. Keyed rotors shall be press-fitted on a shoulder the full length of the rotor utilizing the full shaft surface diameter.
- p. Each motor design shall receive the testing called out for "Polyphase Induction Motors and Generators", IEEE 112, latest edition. The routine tests shall, as a minimum, conform to the NEMA MG-1 tests.
- q. The following motor information shall be furnished:
 - 1. Model and/or catalog numbers.
 - 2. Motor rated voltage, freq., full load current, Hp and rated speed.
 - 3. Max KVAR allowed for power factor correction.
 - 4. All options in the motor.
 - 5. Induction motor time constants.
 - 6. Outline drawings with all nameplate data clearly identified.
 - 7. Motor weight.
 - 8. Bearing size and type data.
 - 9. Guaranteed efficiency and power factor at various loads.
 - 10. Acceleration time with maximum inertia.
 - 11. Internal winding connection of the motor.

12. Motor Warranty Period

Motors are warranted for 36 months from the date of shipment.

13. Variable frequency drives shall be as specified in Division 16.

2.4 MOTOR CONTROL CENTER (MCC)

The pump manufacturer, and/or SUPPLIER, shall furnish the motor control center as shown on the Drawings. The MCC shall be rated for the required horsepower, 480vac/3ph/60hz. The motor starters/drives shall be as specified under Division 16 – Electrical. The MCC shall include a terminal board for connection of the remote pump start/stop and variable speed control. In addition, the following features shall be incorporated into the design of the MCC:

- A. NEMA 12 lockable enclosure
- B. Main Disconnect
- C. Condensation heater
- D. Pump Hand/Off/Auto Switch
- E. Pump run time meters
- F. Pump running lights
- G. Duplex receptacle
- H. Drive fault lights

SUPPLIER should note that the Drawings show a typical MCC configuration. A pump manufacturer's control panel may be utilized. The control panel shall incorporate all features specified and shown on the Drawings. The control panel shall be UL 508 listed.

2.5 NAMEPLATES

Each piece of equipment shall be provided with a substantial stainless steel nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, and principal rating data.

2.6 FACTORY TESTING

A. Each pump shall undergo a certified hydrostatic test at 150% of the pressure developed at shut-off head.

B. A certified performance test shall be performed on each unit utilizing its specified drive. If variable frequency drives are specified, one drive of each rating shall be shipped to the pump manufacturer's plant for testing as a complete unit. Manufacturer's VFD can be used to provide variable speed test if desired.

C. All tests shall be performed in accordance with the Hydraulic Institute Test Standards for Centrifugal Pumps – latest addition.

D. Six (6) evenly spaced test points shall be taken and shall include conditions at shut-off (zero flow) and the operating points specified herein. Preliminary test data must be submitted to the owner seven (7) days prior to the actual test date.

E. The engineer and/or a representative of the owner shall be given sufficient notice of the testing dates and shall have the opportunity to witness these tests.

3.0 EXECUTION

3.1 TIME OF DELIVERY

The CONTRACTOR shall deliver all specified equipment to the project site no later than one hundred twenty (120) consecutive calendar days after the approval of the equipment by the Engineer.

3.2 PUMP TESTS

The pump manufacturer and/or representative shall perform the following inspections and tests on each pump:

1. Hydraulic Institute Standard, ANSI/HI 1.6 Test, Level A, utilizing motor nameplate efficiencies. Each pump shall be tested with its job motor. Tests shall be certified by the manufacturer.
2. The pump shall be laser aligned after the pump base is grouted in place and piping connections are completed.

3.3 MANUFACTURER' S REPRESENTATIVE

The CONTRACTOR shall furnish the services of an accredited representative of the pump manufacturer for at least two (2) trips. The manufacturer's representative shall provide supervision for the installation of the units and later perform the start-up tests for each pump. The representative shall instruct the Owner on the operation and maintenance of the pumps. Pumping equipment shall be tested for performance according to operating curves and other approved data as soon as practical after installation. Failure of the equipment to perform in accordance to the approved operating curves shall be sufficient cause for rejection. As one condition necessary to final acceptance of any pumping unit, the CONTRACTOR shall submit a certificate from the manufacturer's representative, stating that the installation of the pumping unit is satisfactory, that the unit is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication, and care of the unit.

3.4 WARRANTY

The manufacturer shall warrant the equipment being supplied to the OWNER to be free from defects in workmanship and material, covering part and labor, for a period of eighteen (18) months from the date of shipment or twelve (12) months from the start-up under normal use, operation and service. The manufacturer of the pumping units shall provide a written warranty covering the entire pumping unit.

4.0 ACCEPTANCE

Any defects in the equipment or failure to meet the guaranteed requirements of these specifications shall be promptly corrected by the Contractor by replacement or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligation shall be final and binding on all parties.

5.0 MEASUREMENT AND PAYMENT

Cost shall be included in the work to which it is subsidiary and no separate measurement and payment will be made. Payment shall be considered as full compensation for all labor, materials, equipment and incidentals necessary to perform the work as required.

SECTION 11900

INTEGRATION OF TELEMETRY CONTROLS

1.0 GENERAL

This specification section is for information purposes only to clarify the Contractor's responsibility regarding the telemetry controls.

2.0 INTEGRATION OF TELEMETRY CONTROLS

The Hardin County Water District No. 2 in concert with MicroComm, the supplier of the existing SCADA system, will be responsible for providing the fully wired panel for the telemetry facilities required for the operational control of the pump station, alarms, data acquisition and integration within the current SCADA system.

The pump station Contractor shall be responsible for mounting the telemetry panel, furnishing and installing the conduit, wiring and incidentals for connections from the data collection elements in the pump station to the telemetry panel and continuing as necessary, to the Motor Control Center and other end locations as necessary for a fully operational system.

The Contractor shall coordinate the integration of the telemetry facilities with the Water District and telemetry provider as stipulated in Specification Section 16915.

3.0 PUMP STATION START-UP

The Water District and the telemetry provider will be present during pump station start-up to coordinate the telemetry equipment operation with the operational elements of the pump station.

END OF SECTION

DIVISION 13

SPECIAL CONSTRUCTION

SECTION 13100

IN-PLANT AND VAULT PIPING

1.0 GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, equipment and services required to furnish and install all plant process piping as shown on the Drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Valves: Section 13500.

2.0 PRODUCTS

2.1 DUCTILE IRON PIPE/DUCTILE AND CAST IRON FITTINGS

Unless otherwise noted or required, all inside ductile iron piping shall be flanged pipe with threaded flanges in accordance with ANSI A21.51 (AWWA C151) and ANSI A21.15 (AWWA C115). All piping shall be rated for 350 psi unless otherwise noted and shall have full face gaskets, 1/8-inch thick, equal to TORUSEAL as manufactured by American Cast Iron Pipe Company.

All exposed iron pipe to be field painted shall be furnished with an external coating of rust inhibitive primer, Koppers Pug Primer, Tnemec 77 Chem-Prime, Degracon #91453 Phenolic Primer, or equal. Contractor and pipe manufacturer shall be responsible for compatibility of shop allied coatings with the field paint systems and products specified in Division 9, Section 09900. Do not apply asphalt or bituminous coatings on pipe to be painted.

The interior of all ductile iron pipe shall be cement-mortar lined with bituminous seal coat in accordance with AWWA C 104.80. Thickness of the lining shall be as set forth in Section 4-10.1 of the aforementioned specification unless otherwise directed by the Engineer.

Ductile iron fittings shall conform to ANSI A21.10 AWWA C110 with flanges faced and drilled 125-pound. Fittings shall be 250 psi ductile iron. Fittings shall have interior lining and exterior coating same as the pipe.

2.2 PLASTIC PIPE AND FITTINGS

All inside PVC plastic process piping (unless noted otherwise) shall be ASTM D 1785, Schedule 80, threaded with ASTM D 2464, Schedule 80, threaded fittings. Use threaded flanged connections where required for flanged appurtenances or where indicated on the Drawings. All plastic pipe, fittings and joints shall be suitable for minimum 150 psi operating pressure.

2.3 WALL PIPE AND SLEEVES

All wall pipe shall be furnished with cast or welded collar waterstops. Welding of water stop collars on pipe shall be accomplished by the wall pipe manufacturer in their shop. All centrifugally cast wall pipe shall be ductile iron meeting the requirements of AWWA C151 for the pipe barrel, conforming to the pressure rating of the pipeline in which installed, and in no case be lighter than Class 53. All statically cast wall pipe shall be gray or ductile iron meeting the requirements of AWWA C110 for fittings. Mechanical joint end and cast-on flange end wall pipe shall conform to AWWA C110 and threaded flange wall pipe shall conform to AWWA C115. Where flanged or mechanical joint bell ends are flush with the wall, they shall be drilled and tapped for study bolts which are to be of 300 Series stainless steel. The length of all wall pipe shall be not less than the thickness of the wall in which installed. Wall pipe shall have the same pressure rating as connecting pipe. All wall pipe shall be cement-mortar lined per AWWA C104. The exposed end of wall pipe inside structures shall be shop primed for field painting; embedded portion left uncoated; exterior buried portion coated with standard bituminous coating.

Contractor may have the option to install wall pipe flush face-to-face of wall in lieu of the dimensioned length wall pipe shown on the Drawings, in order to eliminate form penetrations. This option will be subject to Engineer's review at each wall pipe location and covers both flanged and mechanical-joint bell-end wall pipe. Embedded flanged and M.J. bell-end bolt holes shall be tapped for stud bolts; tapped bolt holes in embedded flanges shall be plugged for protection during concrete pouring.

All pipe wall sleeves shall be plain end galvanized steel pipe of diameter noted on Drawings and length to fit flush face-to-face of wall.

2.4 INTERLOCKING LINK PIPE SEALS

In all locations indicated on the Drawings, interlocking link pipe seals shall be used in lieu of lead packing a pipe wall sleeve. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is

positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall sleeve.

The Contractor shall determine the required diameter of each individual wall opening according to the manufacturer's recommendations before ordering and installing the seal. Pipe shall be accurately centered in the sleeve and the link seals shall be sized, installed and tightened in accordance with the manufacturer's instructions.

2.5 COUPLING AND ADAPTERS

Flexible couplings shall be of the sleeve type with a middle ring, two round-wedge shaped rubber gaskets at each end, two following rings together and compress the gasket against the pipe. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed as shown on the Drawings and be designed for 250 psi. Provide reducing couplings where indicated.

Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All flanged adapters shall be harnessed. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. The harness shall be designed for axial thrust due to a working pressure of not less than 250 psi. Not less than four special bolts shall be furnished for each adapter. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.

Flexible couplings and flanged adapters shall be as manufactured by Dresser, Rockwell, or equal, per the following, unless otherwise specified and/or noted on the Drawings:

Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe -

Dresser
Style 38

Rockwell
411

Transition couplings for joining pipe of different outside diameters -

<u>Dresser</u>	<u>Rockwell</u>
Style 162 (4" - 12")	413 steel (2" - 24")
Style 62 (2" - 24")	415 steel (6" - 48")
	433 cast (2" - 16")
	435 cast (2" - 12")

Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment; (use lock pins or anchor studs when noted on Drawings) -

<u>Dresser</u>	<u>Rockwell</u>
Style 127 cast (3" - 12")	912 cast (3" - 12")
Style 128 steel (3"-48" C.I. pipe)	913 steel (3" and larger)
Style 128 steel (2"-96" steel pipe)	

2.6 FLANGED JOINTS

Flange bolts and nuts shall be ASTM A 307, Grade B and shall have hexagonal heads. All bolts, nuts and studs for flanged pipe in submerged locations shall be of 300 Series stainless steel. The flanges shall be drawn together until the joint is perfectly tight, with bolts of a length such that they will not project greater than 1/4-inch from the nut nor fall short of the end of the nut when drawn up. No washer shall be used. Gaskets shall be carefully fabricated prior to installation and must be suitable for pressure rating for the pipe for which it is used.

All flanges (unless otherwise indicated or required) shall be faced and drilled ANSI A21.15 125-pound for ductile iron and rated for 350 psi. Gaskets shall be TORUSEAL as manufactured by American Cast Iron Pipe Company or approved equal.

2.7 METAL PIPE SUPPORTS AND HANGERS

The Contractor shall furnish and install all pipe hangers, inserts, brackets, plates, anchors, and other supports not specifically included under other items. Generally pipe supports are not shown on the Drawings, but shall be supplied as specified herein. However, any bracing or support details shown on the Drawings shall be followed.

Supports and hangers shall be as manufactured by Grinnell, Elcen, or Fee & Mason, or fabricated by the Contractor. Field fabricated supports may be used only for special conditions where manufactured items may not be suitable. In such cases, details of proposed supports shall be submitted to the Engineer for review. All such supports shall be galvanized.

Except as shown on the Drawings or as directed by the Engineer, supports and hangers shall be as follows:

- A. Pipes with centerlines less than 24 inches from a wall shall be supported by a typical wall support bracket. Pipes with centerlines less than 6 feet above a floor shall be supported from below. All other pipes shall be hung from above. Piping shall be supported at no greater than 10 feet 0 inches on centers.
- B. Pipe supported from underneath shall have adjustable pipe saddle supports on properly sized pipe stanchions. The saddle assembly shall be of cast iron.
- C. Hangers are to be suspended from concrete work. Hangers shall be supported from approved metal inserts placed in concrete before the concrete is placed.
- D. All pipe hangers, inserts, clamps, supports and other like items shall be submitted for review by the Engineer prior to installation.
- E. All inside horizontal flanged piping shall be supported with approved split ring type adjustable hangers of malleable iron with suitable hanger rods unless shown otherwise on the Drawings. Special supports shall be constructed in accordance with details shown on the Drawings. Wall supports and/or hangers shall be placed not over 10 feet apart. All piping shall be rigidly supported to prevent loosening under vibration.
- F. Pipe, valve operating stems, fixtures and conduits shall be bracketed or suspended from walls, ceilings, and beams at or near valves and fittings and where needed for firm support, by standard brackets, rods, turnbuckles, and rings made especially for pipe of sizes supported. Perforated strap iron and/or copper will not be acceptable.
- G. Clevis hangers for "iron pipe size" O.D. pipe shall be Grinnell Figure 65, Elcen Figure 12, Fee & mason Figure 239, or equal. Clevis hangers for Cast Iron O.D. pipe shall be Grinnel Figure 260, Elcen Figure 12C, Fee & Mason Figure 104, or equal.

H. Turnbuckles shall be forged steel. Rods shall be of black steel, machine threaded of following sizes:

<u>Pipe Size</u>	<u>Rod Diameter</u>
1/2" - 2"	3/8"
2 1/2" - 3"	1/2"
4" - 5"	5/8"
6"	3/4"
8" - 12"	7/8"
14" - 16"	1"
18"	1 - 1/8"
20" - 24"	1 - 1/4"

- I. Brackets shall be of standard castings of fabricated steel and shall be reviewed by the Engineer.
- J. Column type pipe supports shall consist of pipe columns of size required to carry the full pipe and standard cast iron bases and saddles as required. Saddles shall be of proper size to fit the pipe being supported.

3.0 EXECUTION

3.1 INSTALLATION

- A. All materials shall be new.
- B. Each piece of iron pipe and each fitting shall be plainly marked at the foundry with class number and weight.
- C. Where indicated on the Drawings, plain-end pipe shall be joined by means of flanged adapters or flexible couplings which shall be Rockwell, Dresser, or equal.
- D. All pipe couplings shall be designed to safely withstand the operating pressure of the lines in which they are installed. All couplings shall be shop primed with an approved rust inhibitive primer.
- E. Taps and connections to piping shall be made as required to connect equipment, sample lines, etc., and where otherwise shown on the Drawings.

- F. Piping shall be installed straight and true, parallel or perpendicular to walls, with approved offsets around obstructions. Standard pipe fittings shall be used for changing direction of piping. No mitered joints or field fabricated pipe bends are permitted unless accepted by the Engineer.
- G. All piping, fittings, valves and other accessories shall be thoroughly cleaned of dirt, chips and foreign matter before joint connections are made.
- H. All plastic pipe shall be adequately supported and braced. Support spacing shall not exceed the recommendations of the Plastics Pipe Institute.
- I. Teflon tape shall be used on all plastic pipe threaded connections.
- J. Field cut male threads on plastic pipe shall be made with plastic pipe threading dies.
- K. The annular space of plain wall sleeves shall be packed tight with lead wool to within 3/4" of wall face and then patch grouted flush to wall face with non-staining non-shrink grout, masterflow 713 by Master Builders, SonogROUT by Sonneborn-Contech, or equal.
- L. All pipe sleeves passing through walls or floors of chlorine feed and storage areas shall be provided with gas tight seals.
- M. All pipe threads shall conform to ANSI B2.1.
- N. Piping shall be erected to provide for expansion and contraction.
- O. Screwed or soldered unions shall be provided in all small piping as required to permit convenient removal of equipment, valves and piping accessories from the piping system.
- P. Dielectric insulating couplings or brass adapters shall be used whenever the adjoining materials being connected are of dissimilar material such as connections between copper tubing and steel pipe.
- Q. All inside piping shall be color coded, stenciled and label tagged for identification as specified in Section 09900.

4.0 MEASUREMENT AND PAYMENT

No measurement of this item will be made. Payment will be included in the work to which it is subsidiary as described in the bid documents.

SECTION 13104

YARD PIPING AND VALVES

1.0 GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, equipment and services required for furnishing and installing all yard piping and appurtenances specified herein.

2.0 PRODUCTS

2.1 DUCTILE IRON PIPE

Ductile iron pipe shall conform to AWWA C151-76, (ANSI A21.51), Class 350, with push-on or mechanical joints.

The interior of the pipe shall be cement-mortar lined with bituminous seal coat in accordance with AWWA C104-80 (ANSI A21.4). Thickness of the lining shall be set forth in Section 4.10.1 of the aforementioned specification unless otherwise directed by the Engineer. The exterior of all pipe, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.

Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or the word "DUCTILE". Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.

Fittings shall be 350 psi rated (through 24" size) ductile iron in accordance with AWWA C110-77 (ANSI A 21.10) and shall conform to the details and dimensions shown therein. Fittings shall have mechanical joints meeting the requirements of AWWA C111- 80 (ANSI A 21.11). Fittings shall have the same interior cement-mortar lining and exterior coating as specified for the pipe.

Joints shall be of the mechanical joint type conforming to AWWA C111-72 (ANSI A21-11). Mechanical joints shall be bolted and of the stuffing box type and shall consist of a bell, with exterior flange and interior recess for sealing gasket, a pipe or fitting plain end, a sealing gasket, a follower gland, tee-head bolts and hexagon nuts. Below floor slabs and on all high pressure lines, the mechanical joints shall also be fitted with retainer glands.

The cleaning and assembly of pipe and fitting joints shall be in accordance with the manufacturer's recommendations.

2.2 PVC SEWER PIPE

P.V.C. gravity sewer pipe shall be ASTM D 3034, SDR 35, with ASTM D 32123 integral bell and spigot rubber gasketed joints.

2.3 POLYVINYLE CHLORIDE (PVC) PIPE AND FITTINGS

Polyvinyl chloride plastic pipe shall be Class 200 (SDR 21) pressure rated pipe. All PVC pipe shall conform to the latest revisions of the following:

ASTM Specification D2241

Department of Commerce PS22-70 (SDR-PR) (pressure rate pipe)

National Sanitation Foundation Testing Laboratories (NSF)

Standard Dimensional Ratio SDR-21 (200 psi)

Health Properties - The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe.

Cast or ductile iron mechanical joint or push-on type fittings shall be used with PVC pipe. Fittings shall conform to the Section 15100, Article 2.1,D of these Specifications.

Adapters or specials shall be furnished, as required, to connect the plastic pipe to the cast iron mechanical joint valves, fittings and pipe.

Jointing material shall be non-toxic. Joints shall be made with the use of rubber gasket couplings. Couplings shall be supplied with the pipe (not a pay item).

Pipe and fittings shall be visually inspected on the project site for proper markings which shall include manufacturer's name or trademark, nominal pipe size, class pressure rating for water at 73.4°F, plastic pipe material designation (e.g. PVC 1120), ASTM Designation D2241 and the NSF Logo.

2.4 POST HYDRANTS

Post hydrants shall be Dresser/M & H Style 133 or equal. Hydrants shall be 2-1/4" post type designed for 150 PSI working pressure. Hydrants shall have 3-9 inch mechanical joint bottom connection and 1-1/2" hose nozzle with cap and cap chain.

2.5 FIRE HYDRANTS

The Contractor shall furnish and install fire hydrants where shown on the Drawings or directed by the Engineer. Hydrants are specified in specifications Section 15105.

2.6 BUTTERFLY VALVES

Butterfly valves shall conform to the specifications of Section 13500 except be designed for buried service, have mechanical joint ends, have all exterior surfaces shop painted with two coats of Fed. Spec. TT-V-51F Asphalt Varnish, with 2-inch square AWWA Class 150B nut operator in a vertical position for use in a valve box.

2.7 GATE VALVES

Gate Valves shall conform to the specifications of Section 13500 except be designed for buried service, have mechanical joint ends, have all exterior surfaces shop painted with two coats of Fed. Spec. TT-V-51F Asphalt Varnish, with 2-inch square nut operator in a vertical position for use in a valve box.

2.8 FLAP VALVES

Flap valves shall be flanged (or other suitable connection for headwall mounting), iron body, bronze mounted, Mueller A-2540-6, M & H Style 47-02, Clow F-3012 or equal.

2.9 PLUG VALVES

Plug valves shall conform to the specifications of Section 13500 except be designed for buried service; have mechanical joint ends; have all exterior surfaces shop painted with two coats of Fed. Spec. TTV-51F Asphalt varnish, with 2-inch square nut operator in a vertical position for use in a valve box.

2.10 SWING PIPES

The swing pipes in size shown on the Drawings are to be fabricated from Class 50, ductile cast iron pipe. The swing connection shall be a flanged stainless steel 90° swivel joint Style 30 as manufactured by Chicksan Weco, or equal. The swing pipes shall be controlled by 1000 lbs. capacity enclosed worm gear winches with 1/4" stainless steel cable, as manufactured by Standard Handling Devices, Inc., (Model T4-62), or equal. The winch supports shall be fabricated from structural steel and shall be equipped with 1/4" winch support plates.

2.11 VALVE BOXES

Valve boxes shall be of 5-1/4 inch standard cast iron, two-piece, screw type valve box with drop cover marked "WATER", "SEWER", "DRAIN", as applicable. Valve boxes shall be accurately centered over valve operating nut, and backfill thoroughly tamped about them. Valve box bases shall not rest on the valves but shall be supported on crushed stone fill. They shall be set vertically and properly

cut and/or adjusted so that the tops of boxes will be at grade in any paving, walk or road surface, and 2 to 3 inches above ground in grass plots, fields, woods or other open terrain. In grass areas, provide concrete pad around valve box; slightly crown in all directions to shed water.

3.0 EXECUTION

3.1 LINES AND GRADES

The Contractor will be required to accomplish any detailed layout, including that required for establishing the grade of the pipe line.

3.2 TRENCH EXCAVATION

3.2.1 General. The Contractor shall include in his bid, all trenching necessary for installation of all pipelines as planned and specified. Trenching shall include all clearing and grubbing, including all weeds, briars, small trees, stumps, etc. encountered in the trenching. The Contractor shall dispose of any such material by burning, burial, or hauling away (or as noted on the drawings), at no extra cost to the Owner. It shall be the Contractor's responsibility to notify the appropriate State and local Air Pollution Control agencies when he conducts open burning of refuse.

The Contractor shall protect existing facilities against danger or damage while pipeline is being constructed and backfilled, or from damage due to settlement of this backfill. In case of damage to any existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structures will be in as good condition and serve its purpose as completely as before and such restoration and repair shall be done without extra cost to the Owner. The use of trench-digging machinery will be permitted except where its operations will cause damage to trees, buildings or existing structures above or below the ground. At such locations hand methods shall be employed to avoid such damage. All excavated material shall be piled in a manner that will not endanger the work or cause obstruction.

All excavation shall be open trenches, except where the drawings call for tunneling, boring, or jacking under structures, railroads, sidewalks and roads.

3.2.2 Clearing. The Contractor shall accomplish all clearing and/or grubbing as required for the construction under this contract. Clearing and grubbing shall include the cutting and removal of trees, stumps, brush, roots, logs, fences and other loose or projecting material and natural obstructions which, in the opinion of the Engineer, must be removed to properly prosecute the construction and operate the facilities upon completion of construction. Trees, unless designated otherwise on the plans, shall remain and be properly protected. Ornamental

shrubs, plantings, fences, walls, etc. shall be removed and replanted or replaced or protected from the construction activity. Clearing and/or grubbing shall be incidental to the various bid items and no additional compensation will be paid for same.

3.2.3 Trench Depth. Trenches shall be excavated to the line and grade required for the installation of pipe at the elevations indicated on the plans. The minimum depth of cover shall be 30 inches above the top of the pipe, unless shown otherwise on the plans or on the Standard Details. When the pipe is laying in or on solid rock, the minimum depth of cover shall also be 30 inches above the top of the pipe. No additional compensation will be made for extra depth where required by the plans or due to Contractor error. Excavation, except as required for exploration, shall not begin until the proposed work has been staked out. Materials which are not required for backfill and site grading shall be removed and disposed of as directed by the Engineer. Hauling, bedding, and backfilling shall be considered incidental to the various bid items and will not be paid for directly. Excavation shall be of sufficient depth to allow the piping to be laid on the standard pipe bedding in accordance with the Section 6 of this section. The trenches shall be excavated to a minimum of six (6) inches below the bottom of the pipe barrel in rock. In all cases where lines are under traffic a minimum cover of thirty-six (36") inches shall be provided. Should it be necessary to avoid existing utilities, culverts, outlets, or other structures, the water line shall be carried deeper at no additional expense to the Owner.

Where the plans call for extra trench depth, this extra depth shall be provided at no extra cost.

3.2.4 Trench Width. Trench widths shall exceed the minimum width that will provide free working space on each side of the pipe and to permit proper backfilling around the pipe as shown in the accompanying table and unless specifically authorized by the Engineer, shall not be excavated to wider than two (2) feet plus the nominal diameter of the pipe at the top of the trench. Before laying the pipe, the trench shall be opened far enough ahead to reveal any obstruction that may necessitate changing the line and grade of the pipe. Should the CONTRACTOR fail to accomplish this, and changes are required, they shall be at his sole expense. In rock, all ledge rocks, boulders and large stones shall be removed to provide six (6) inches of clearance on each side and below all pipe and fittings.

MINIMUM TRENCH WIDTH
IN EARTH AND PAY WIDTH
FOR ROCK EXCAVATION

Size	Width	Size	Width
Up to 4" Pipe	1'-6"	16" Pipe	2'-8"
6" Pipe	2'-0"	18" Pipe	3'-0"
8" Pipe	2'-0"	20" Pipe	3'-2"
10" Pipe	2'-4"	24" Pipe	3'-8"
12" Pipe	2'-6"		
14" Pipe	2'-6"		

3.2.5 Shoring, Sheeting, and Bracing of Excavation. Where unstable material is encountered, or where the depth of the excavation in earth exceeds five (5) feet, the sides of the trench or excavation shall be supported by substantial sheeting, bracing, or shoring. The design and installation of all sheeting, sheet piling, bracing or shoring shall be based on computations of pressure exerted by the materials to be retained under retaining conditions. Adequate and proper shoring of all excavations will be the entire responsibility of the Contractor. The Standards of the Federal Occupational Safety and Health Act and the Kentucky Department of Labor shall be followed.

3.2.6 Removal of Water. The Contractor shall provide for adequate removal of all water and the prevention of surface water from entering the excavation. The Contractor shall maintain dry conditions within the excavations until the backfill is placed. No additional compensation will be paid for replacement and/or stabilization of prepared excavations due to flooding and/or deterioration from extended exposure. All water pumped or drained from the excavation shall be disposed of in a suitable manner without damage to adjacent property or to other work under construction.

3.2.7 Pavement Removal. Pavement removal shall be as indicated on the plans or directed by the Engineer. When so required, or when directed by the Engineer, only one-half (1/2) of the street crossings or road crossings shall be excavated before placing temporary bridges over the side excavated, for the convenience of the traveling public. All backfilled ditches shall be maintained in such a manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and the property Owners abutting the improvements shall be taken into consideration. All public or private drives shall be promptly backfilled or bridged at the direction of the Engineer. Pavement replacement shall be in accordance with Standard Drawings of these specifications. Excavated materials shall be disposed of so as to cause the least interference and in every case the disposition of excavated materials shall be satisfactory to the Engineer.

3.2.8 Traffic Maintenance. The Contractor must "red light" and guard all open trenches or obstructions placed on the streets or sidewalks. The lights must be burning from sunset to sunrise in order to effectually warn and safeguard the public against dangers connected with open trenches, excavations and other obstructions. The Contractor shall be held responsible for any damage that may occur to persons or property by reason of the failure of the Contractor to properly "red light" and guard all open trenches or obstructions along the routes of the water lines. This Contractor at his own expense shall also maintain warning signs, barricades and a watchmen or flagmen to control traffic at such times as his work would interfere with the flow of traffic. No excavation shall begin that may present a safety hazard unless the signs, barricades, lights, etc. are available to protect the open excavation at the conclusion of the day. The Contractor will comply with all Federal and State Occupational Safety and Health requirements for this type of construction. The Contractor shall also comply with all local and Kentucky Department of Highways requirements for signing and traffic control.

3.2.9 Line Location. The location of pipelines and their appurtenances as shown are those intended for the final construction. However, conditions may present themselves before construction on any line is started that would indicate desirable changes in location. In such cases, the Owner reserves the right to make reasonable changes in line and structure locations without extra cost, except as may be determined by extra units of materials and construction actually involved. The OWNER is under no obligation to locate pipelines so they can be excavated by machine.

3.2.10 Solid Rock Excavation. No extra payment will be made for rock excavation. Cost shall be included in the work to which it is subsidiary.

4.0 BEDDING OF PIPELINE

In all cases the foundation for pipe shall be prepared so that the entire load of the backfill on top of the pipe will be carried uniformly on the barrel of the pipe. The bells of the pipe shall not carry any of the load of the backfill. The Contractor should refer to the Standard Details for pipe bedding shown in the plans. The bedding specifications shall govern the backfill from the bottom of the trench up to the centerline or spring line of the pipe.

4.1 STABLE EARTH FOUNDATION

On all galvanized or copper lines, the Contractor may use either the "solid trench bottom method" or the "undercutting method" as shown in the Standard Details. The solid trench bottom method allows support of the pipe barrel by the trench bottom with holes dug out for the bells. The bottom must be leveled with soil and free of irregularities. The undercutting method calls for 4 inches of excavation

below the barrel and then refill with evenly spread earth cushion or other standard bedding.

On all PVC pipelines, the trench bottoms shall be smooth and free of frozen material, clodded dirt and stones over 1/2" diameter. Bottom dirt left by trenching equipment will usually provide adequate material to level the trench bottom and provide bedding support for the pipe barrel. If the trench bottom is free of dirt, soft material may be shoveled off the side walls or shoveled under the pipe to insure proper pipe barrel bedding. In areas where the trench bottom is hard, a layer of soft backfill must be provided to insure the pipe barrel is properly cushioned. See the plans for proper bedding material depth.

If the foundation is good firm earth the pipe may be laid directly on the undisturbed earth provided the pipe barrel is supported for its full length.

Bedding of No. 9 stone, fine gravel, sand or compacted finely graded select earth shall be used to correct irregularities in the subgrade. Where bell and spigot is involved, bell holes shall be excavated to prevent the bells from being supported on undisturbed earth.

As an alternative to the above method, excavation in earth may be undercut to a depth below the required invert elevation that will permit laying the pipe on a bed of granular material or finely graded select earth to provide continuous support for the pipe barrel. Bedding depth shall be as shown on the plans.

All ductile iron pipe will be installed using the undercutting method and a crushed stone or clean earth refill bedding in accordance with the Standard Details. The bedding is not a separate pay item and shall be included as incidental expense in the unit price for the pipe bid per foot of pipe or lump sum cost for the item to which it is subsidiary.

4.2 TRENCHES IN ROCK

All installation in rock will utilize the undercutting method. Bedding will be with 6 inches crushed stone as shown in the Standard Details. The only exception to this will be with PVC, copper, or galvanized iron pipe 4 inches in diameter or smaller. These may be bedded on 6 inches of evenly spread earth backfill.

4.3 UNSTABLE TRENCHES

If unstable material is encountered which may not provide a suitable foundation for the pipe, the unstable material will be removed and an adequate layer of encasement concrete or other special bedding shall be placed for the pipe foundation in accordance with the Standard Details in the plans. Such "special pipe foundation" shall only be installed if directed by the Engineer in writing or on

the plans. This special pipe foundation shall be considered a pay item and shall be paid for at the unit contract price for the type of bedding required.

5.0 PIPE LAYING

5.1 GENERAL

Proper instruments, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. Each pipe manufacturer shall have an experienced representative on the job for at least one day at the commencement of jointing and laying operations.

Before any length of pipe is placed in the trench, a careful inspection shall be made of the interior of the pipe to see that no foreign material is in the pipe. In order to properly remove any foreign materials, a swab of necessary length is to be available at all times.

All pipe shall be lowered carefully into the trench, properly aligned and properly jointed by use of suitable tools and equipment, in such a manner as to prevent damage to water line materials and protective coatings and linings. Excessive scratching of the exterior surface of the pipe will be cause for rejection of the pipe.

Under no circumstances shall pipeline materials be dropped or dumped into the trench. The pipe and fittings shall also be inspected for the purpose of determining if they are sound and free from cracks. Laying of pipe shall be commenced immediately after excavation is started. Pipe shall be laid with bell ends facing in the direction of laying.

When pipe laying is not in progress, the open ends of pipe shall be closed by approved means to prevent entrance of trench water into the line. Whenever water is excluded from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent floating. Any pipe which has floated shall be removed from the trench and relaid as directed by the Engineer. No pipe shall be laid in water or on frozen trench bottom, or whenever the trench conditions or the weather are unsuitable for such work.

If any defective pipe and fittings shall be discovered after the pipeline is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge to the Owner. Open ends of unfinished pipe lines shall be securely plugged or closed at the end of each day's work or when the line is left temporarily at any other time.

5.2 LAYING DUCTILE IRON PIPE

Ductile iron bolted joint, rubber ring slip joint, and ball and socket river crossing pipe shall first be thoroughly cleaned at joints, then joined according to instructions and with tools recommended by the manufacturer. Three (3) copies of instructions shall be furnished the Engineer and one (1) copy shall be available at all times at the site of the work. The lining inside ductile iron pipe must not be damaged by handling.

All pipes must be forced and held together, or "homed" at the joints, before sealing or bolting. Pipe must be aligned as each joint is placed, so as to present as nearly true, straight lines and grades as is practical, and all curves and changes in grades must be laid in such a manner that the manufacturer's recommended maximum deflection is not exceeded at any joint.

Cutting of pipe may be done by wheeled pipe cutters or saws, or by hammer and chisel, as the Contractor may elect, but the Contractor will be held responsible for breakage or damage caused by careless cutting or handling.

Ductile iron pipe shall be laid in accordance with Standard ANSI/AWWA C150/A21.50 Laying Conditions, Type 3 as shown in the Standard Drawings in these Specifications. Six (6") inches crushed stone bedding shall be used in rock. Sufficient space (limited to 2 feet longitudinally) shall be left out of 4 or 6 inch cushion for tightening of bolts where bolted joints are used. No pipe shall be laid resting on rock, blocking, or other unyielding objects. Jointing before placing in trench, and subsequent lowering of more than one section jointed together may be allowed, subject to the Engineer's approval and direction.

When using pipe with push-on joints care must be exercised to make certain that the correct gasket is being used for the type of joint installed and that the gasket faces the proper direction. Before inserting the gasket, the groove and bell socket should be carefully cleaned of all dirt. If sand or dirt is permitted to remain in the groove, leaks may occur. Lubricant must be applied to bell socket, gasket and plain- end of pipe as required by manufacturer. Plain-end must be beveled before joint is made. Deflection required at the joint shall be obtained after the joint is made.

Cut pieces of ductile iron pipe 18 inches or more in length, shall be used in fitting to special conditions, and valves and fitting changes in grade and alignment, provided cutting is even enough to make first class joints and no cracks are evident.

Bell and spigot pipe with caulked joints may be used for special cases only. Where this type of pipe is required the joints shall be made as described in this paragraph. After placing a length of pipe on the prepared grade in the trench, the yarning material shall be held around the bottom of the spigot end of the next

length so that it will enter the bell of the previously laid pipe as the pipe is shoved into position. The spigot shall be centered there with earth carefully tamped under and on each side of it, excepting at the bell holes. Care shall be taken to prevent dirt from entering the joint space. Two or more joints of pipe shall be in place ahead of each joint before it is poured. Yarning material for bell and spigot joints shall be rubber rings, asbestos rope, or treated paper rope. Joint material for bell and spigot pipe, unless otherwise shown on the drawings, shall be of the sulphur compound type "Leadite," "Mineralead", or approved equal. Jute shall not be used for joint material. Yarning material shall be thoroughly caulked into the joint to insure centering of the spigot and within the ball and prevent loss of molten joint material into the interior of the pipe, but in no event shall a depth of less than 2-1/2 inches be left for the joint compound. Each length of material shall be such as to pass completely around the pipe and provide a lap of two inches. Joint compound shall be heated in accordance with the directions of the manufacturer, care being taken to prevent under and over heating and burning. Joints shall be run with the aid of a runner and metal pouring gate thoroughly clayed to the pipe to prevent the molten compound from breaking out of the joint. Each joint shall be run full to the top of the pouring gate in one continuous pour. Material contained in the pouring gate when it is cut free from the joint may be reused. No joint shall be run in a wet trench and no water shall be allowed to come in contact with the joint until it is thoroughly hardened. If, upon inspection by the Engineers, imperfect joints are disclosed, the compound shall be cut out or otherwise removed and the joint re-run.

5.3 LAYING PLASTIC PIPE

The trench bottom must be smooth and uniform and the alignment must conform to the plans. Bedding and cover as specified herein and shown in the Standard Details is required.

To make a clean and unobstructed joint, it is necessary to wipe the ring, groove and pipe spigot free from all foreign materials at the time of assembly (welded joints will be allowed only in special cases and will be required as shown on the plans). The ring must be positioned properly in the fitting to receive the pipe by a worker who is not in contact with the lubricant. In general, the lubricant is applied to the spigot (not the ring or groove). However, the manufacturer's instructions are to be followed in all cases. Only an approved lubricant may be used in accordance with the manufacturer's recommendations. All plastic pipe shall be joined by hand.

Where good bedding conditions are attained PVC pipe smaller than 4 inches may be assembled outside the trench in longer sections (as conditions allow) and then lowered into the trench. At any time when improper bedding is discovered or the pipe is severely deflected the pipe will be removed from the trench and the condition corrected. Pipe in sizes 4 inch and above may be assembled outside the trench but must be lowered into the trench as each joint

is assembled. Regardless of installation methods all couplings must be inspected after laying in trench for proper insertion and alignment. Field cuts and bevels will be allowed in accordance with the manufacturer's recommendations for these operations. A new reference mark shall be installed before joining any field cut pipe. The same requirements for clearance from rock or other objects, thrust blocking and deflections shall apply to PVC pipe as for other pipe materials.

Municipal PVC pipe of all sizes must be assembled in the trench in strict accordance with the manufacturer's requirements.

6.0 BACKFILLING

Backfilling must be started as soon as practicable after pipe has been laid and joints hardened sufficiently, and jointing and alignment approved. Spading of crushed rock, sand, or mechanical tamping of earth, around pipe (as specifically required) between joints shall be the usual procedure as the laying progresses. This is in order to avoid danger or misalignment from slides, flooding or other causes. The Engineer shall be given a minimum of 24 hours for inspection before backfilling. The backfill shall be crushed rock, sand, or finely divided earth free from debris, organic material and stones, placed simultaneously on both sides of pipe to the same level by hand.

In backfilling of the lower part of the trench beginning at the top of the bedding, the backfill material shall be carefully and solidly tamped by hand or approved mechanical methods in 6" layers around the pipe and up to a point 8 inches higher than the top of the pipe. For PVC only the backfill shall be select material and may be walked-in. Walking or working on the completed pipe line, except as necessary in tamping or backfilling, shall not be permitted until the trench has been backfilled to a point one diameter higher than the top of the pipe. The filling of the trench and the tamping of the backfill shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipe line will not be disturbed and injurious side pressures do not occur.

After the above specified backfill is hand placed, rock may be used in the backfill in pieces no larger than 18 inches in any dimension and to an extent not greater than one-half (1/2) the backfill materials used. If additional earth is required, it must be obtained and placed by the Contractor. Filling with rock and earth shall proceed simultaneously, in order that all voids between rocks may be filled with earth. Above the hand placed backfill, machine backfilling may be employed without tamping, (if not contrary to specified conditions for the location) provided caution is used in quantity per dump and uniformity of level of backfilling. Backfill material must be uniformly ridged over trench and excess hauled away, with no excavated rock over 1-1/2 inch in diameter or pockets of crushed rock or gravel in top 6 inches of backfill. Ridged backfill shall be confined to the width of the trench and not allowed to overlap onto firm original earth and its height shall not

be in excess of needs for replacement of settlement of backfill. All rock, including crushed rock or gravel from construction, must be removed from yards and fields. Streets, roadways and walks shall be swept to remove all earth and loose rock immediately following backfilling.

In the case of street, highway, railroad, sidewalk and driveway crossings or within any roadway paving or about manholes, valve and meter boxes, the backfill must be machine tamped in not over 4-inch layers, measured loose in accordance with the standard details. Where backfill is under paved driveways, streets, highways, railroads, sidewalks, paved parking areas and other areas where settlement is not allowed, crushed stone or coarse sand backfill only shall be used up to the paving surface. Crushed stone shall be Kentucky Department of Highways Standard Specification No. 78 or finer. Coarse sand backfill shall be spread in layers not over 4 inches thick and thoroughly compacted. Sand may be moistened to aide compaction. Tunnels shall be backfilled in not over 3-inch layers, measured loose, with selected material suitable for mechanically tamping. If material suitable for tamping cannot be obtained, sand, gravel or crushed rock (No. 78) shall be blown, packed or sluiced to complete fill all void spaces.

Where local conditions permit, pavement shall not be placed until 30 days have passed since placing backfill. Crushed stone is specified for roads and parking areas and sidewalks or their bases, shall be placed and compacted to the top of trench. Backfills shall be maintained easily passable to traffic at original ground level, until acceptance of project or replacement of paving or sidewalks.

Where the final surfacing is to be crushed stone, compacted earth backfill may be used in the trench to within 6 inches of the top as shown in the Standard Details.

Railroad Company and Highway Department requirements in regard to backfilling will take precedence over the above general specification where they are involved.

Excavated materials from trenches and tunnels in excess of quantity required for trench backfill shall be disposed as shown on the plans or as directed by the Engineer.

The Contractor shall protect all sewer, gas, electric, telephone, water and drain pipes or conduits, power and telephone poles and guy wires from danger of damage while pipelines are being constructed and backfilled, or from danger due to settlement of his backfill.

In case of damage to any such existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structure will be in as good

condition and serve its purpose as completely as before uncovering and such restoration and repair shall be done without extra charge.

No extra charge shall be made for backfilling of any kind, except as provided in the Bid. Backfilling shall be included as a part of the unit price bid for which it is subsidiary. No extra charge shall be made for supplying outside materials for backfill.

Before completion of contract, all backfills shall be reshaped, holes filled and surplus material hauled away, and all permanent walks, street, driveway and highway paving, and sod, replaced (if such surface replacement items are included in the contract) and reseeding performed.

Any deficiency in the quantity of material for backfilling the trenches or for filling depressions caused by settlement, shall be supplied by the Contractor.

7.0 TIE-INS TO EXISTING PIPELINES

This work shall consist of connecting new water pipes to the existing system where shown on the plans and shall include the necessary fittings, tapping sleeves, valves and necessary equipment and material required to complete the connection.

Knowledge of pipe sizes in the existing system may not be accurate. Therefore, it is recommended that the Contractor check outside diameters of existing pipe and types of pipe prior to ordering the required accessories. No additional payment will be allowed for matching pipe and/or accessories when the proper size is not ordered.

Neither the Owner nor the Engineer can guarantee the location of the existing lines. The Contractor shall verify the location of all existing water mains and valves pertaining to the proposed improvements, before excavation is started.

The necessary regulation or operation of the valves on existing mains, to allow for the connections being made, shall be supervised by the Engineer. Before shutting down an existing water main or branch main for a proposed connection, prior approval for a specific time and time interval shall be obtained from a representative of the Owner. At no time shall an existing main be shut down without the Owner's knowledge and permission.

Excavation to existing water mains shall be carefully made, with care being exercised not to damage the pipe. The excavation shall not be of excessive size or depth beneath the pipe. The sides of the excavation shall be as nearly vertical as possible.

The Contractor shall be responsible for any damage to the existing system and any such damage shall be repaired to the satisfaction of the Engineer at the Contractor's expense.

The Contractor shall verify, by field inspection, the necessary sizes, lengths and the types of fittings needed for each inter-connection. Typical connections are shown on the plans and any modifications or changes shall be subject to the approval of the Engineer. The exact length of the proposed water main needed for this work shall also be determined by field measurement as required.

The probing required to locate existing mains is not a separate pay item.

8.0 PIPE ENTERING STRUCTURES

Ductile iron, steel or PVC pressure pipe, 4-inch diameter or larger, entering structure below original earth level, unsupported by original earth for a distance of more than six (6') feet, shall be supported by Class B concrete, where depth of such support does not exceed three (3') feet, and by Class B Concrete piers where depth exceeds three (3') feet. All other pressure pipe entering buildings or basins below original earth level, which have more than 3 feet span between wall and original earth and having a cover of more than 24 inches of earth, or under roadway, shall be supported on compacted granular fill, in order to prevent breakage from settlement of backfill about the structure. Concrete and reinforcing steel for such supports are to be included in the unit price of work to which it is subsidiary, and not as extra concrete, in order to discourage excessive excavation outside the limits of structures. Pipe entering structures shall have flexible joint within 16 inches of exterior of structure.

9.0 OWNERSHIP OF OLD MATERIALS

- A. Pipe - Unless otherwise indicated, all existing pipe that is to be abandoned that interferes with construction or is easily removed shall become the property of the Contractor. All pipe that is not easily removed or not required to be removed as a result of the new construction, shall be abandoned in place by this Contractor.
- B. Pipe Line Fittings and Appurtenances - All pipe line fittings, valves, hydrants and other like appurtenances that are removed as a result of new construction shall be removed by this Contractor but shall become the property of the Owner. All such fittings and appurtenances shall be delivered to a point by the Contractor. Said point shall be on the Owner's property and shall be designated by the Engineer.
- C. Other Materials - All other materials or items that are to be removed, demolished, or abandoned as a part of this contract shall become the property of the Contractor and shall be disposed of by him.

10.0 THRUST BLOCKING AND ANCHORAGE

All angles or bends in the pipe line, either vertical or horizontal, shall be braced or anchored against the tendency of movement with concrete thrust blocking per the Standard Details, or approved equivalent joint harness or anchors to the satisfaction of the Engineer. Where joint harness is used, all component parts shall be stainless steel. Concrete thrust blocking or joint harness materials shall be considered incidental to the expense of installing the line and shall be included in the cost for the pipe line. No separate payment will be made for these items.

Thrust blocks for plastic pipe will not be attached to couplings.

Where thrust blocks are used for extra fittings ordered by the Engineer, payment shall be made using the bid price for Class "B" concrete and the thrust block dimensions shown in the Standard Details. This payment shall cover all work required for extra thrust blocks.

11.0 TESTING PRESSURE LINES

The Contractor will be required to test all pipelines and appurtenances, with water, at pressure class of pipe installed.

The pipe shall be slowly filled with water, care being taken to expel all air from the pipes. If necessary, the pipe shall be tapped at high points to vent the air. Pressure at least equal to 200 PSIG (or the operating pressure if higher) as measured at the point of lowest elevation shall be applied.

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. No pipe shall be accepted unless or until the leakage, determined by this test, is less than 0.08 U.S. gallons per hour, per 1,000 feet, per inch nominal diameter of pipe. The leakage test shall be applied to the pipe for a period of not less than 4 hours.

To determine the rate of leakage, the Contractor shall, as required, furnish a suitable pump, pressure gauge and water meter or other appliance for measuring the amount of water pumped. The instrument used to measure leakage shall be tested for accuracy as frequently as directed by the Engineer. The Contractor shall furnish all necessary labor and materials to make the test and to perform any work incidental thereto. Where it is impractical to test between the valves, the Contractor shall as directed, at his own expense and cost, temporarily place caps and plugs on the lines and test sections of the new line.

Where any section of the main is provided with concrete reaction blocking, the hydrostatic pressure test shall not be made until at least five days have elapsed after the concrete reaction blocking was installed. If high early strength cement is used in the reaction blocking, the hydrostatic pressure test shall not be made until at least two days have elapsed.

Should there be leakage over the allowable amount, the Contractor will be required to locate and repair the leaks and retest the section. It is suggested, but not required, that the Contractor have a geophone (underground listening device) on the job at the time of testing.

If the leakage of the section of pipeline being tested is below the allowable amount, but leakage is obvious in the opinion of the Engineer, due to water at the surface of the ground, or by listening the leak can be heard underground with a geophone, or any other means of determining a leak, the Contractor will be required to repair these leaks.

The Contractor shall furnish a meter or suction tank, pipe test plugs and by-pass piping and make all connections for conducting the above tests. The pumping equipment used shall be centrifugal pump, or other pumping equipment which will not place shock pressures on the pipeline. Power plunger or positive displacement pumps will not be permitted for use on closed pipe systems for any purpose.

Inspection of pipe laying shall in no way relieve the Contractor of the responsibility for stopping leakage or correcting poor workmanship.

12.0 DISINFECTION OF POTABLE WATER LINES

The new potable water lines shall not be placed in service either temporarily or permanently--until they have been thoroughly disinfected in accordance with the following requirements and to the satisfaction of the Engineer.

After testing, a solution of hypochlorite using HTH or equal shall be introduced into the section of the line being disinfected sufficient to insure a chlorine dosage of at least 50 ppm in the main. While the solution is being applied, the water should be allowed to escape at the ends of the line until tests indicate that a dosage of at least 50 ppm has been obtained throughout the pipe. Open and close all valves and cocks while chlorinating agent is in the piping system. The chlorinated water shall be allowed to remain in the pipe for 24 hours, after which a residual of at least 25 ppm shall be obtained. The disinfection shall be repeated until 25 ppm is obtained after which time the main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 ppm, and then may be connected to the system.

13.0 MAINTENANCE OF FLOW OF DRAINS AND SEWERS

Adequate provision shall be made for the flow of sewers, drains and water courses encountered during construction. Any structures which are disturbed shall be satisfactorily restored by the Contractor.

14.0 INTERRUPTION OF UTILITY SERVICES

No valve, switch or other control on any existing utility system shall be operated for any purpose by the Contractor without approval of the Engineer and the Utility. All consumers affected by such operations shall be notified by the Contractor as directed by the Engineer and utility before the operation and advised of the probable time when service will be restored.

15.0 CLEAN-UP

Upon completion of the installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line. Cleanup shall be in accordance with Section 15102 of these Specifications.

16.0 MEASUREMENT AND PAYMENT

Yard piping and valves are generally not a separate pay item. The cost for this work shall be included in the work to which it is subsidiary unless otherwise shown in the Bid Schedule.

SECTION 13500

HOUSED VALVES

1. GENERAL

1.1 Scope of Work. Provide all materials, labor, equipment and services required to furnish and install all valves shown on the Drawings and specified herein.

1.2 Related Work Specified Elsewhere.

- A. Piping is included in 13100.
- B. Hangers and supports are included in 13100.
- C. Valves associated with yard piping (buried service) are included in Section 13104.

2. PRODUCTS

2.1 Shear Gates. Shear gates shall be iron body bronze mounted double wedge type with pull rod and handle. Rod length is as shown on plans. Shear gates shall be M & H Figure No. 44, Clow Model F-3002 or approved equal.

2.2 Air and Vacuum Valve for Vertical Turbine Pumps. Air valves for Vertical Turbine Pumps shall be designed to allow large quantities of air to escape out the orifice when the pump is started and close water tight when the liquid enters the valve. The air valve shall also permit large quantities of air to re-enter thru the orifice when the pump is stopped to prevent a vacuum from forming in the pump column.

The valve shall consist of body, cover, baffle, float and seat. The baffle will be designed to protect the float from direct contact of the rushing air and water to prevent the float from closing prematurely in the valve. The seat shall be fastened into the valve cover, without distortion, and shall be easily removed, if necessary.

The entire float and baffle assembly must be shrouded with a perforated water diffuser to prevent the water column entering the valve, from slamming the float shut and eliminate water hammer in the system.

The discharge orifice shall be fitted with an adjustable throttling device to regulate the flow of air escaping to establish a pressure loading on the rising column of water to minimize shock to the pump and check valve.

The float shall be stainless steel, designed to withstand a minimum of 1000 psi. The float shall be center guided and not free floating for positive seating.

Valve may have either threaded or flanged inlet and outlet. The outlet shall be piped to clearwell or atmosphere as shown on the DRAWINGS.

Valve exterior to be painted with Red Oxide Phenolic Primer Paint as accepted by the FDA for use in contact with Potable Water.

All materials of construction shall be certified in writing to conform to ASTM specifications as follows:

Body, cover & baffle	Cast iron	ASTM A48 Class 30
Float	Stainless Steel	ASTM A240
Seat	Buna-N	
Water diffuser	Brass	Commercial
Throttling device	Malleable iron	Commercial

Valve to be APCO Air & Vacuum Valve for Vertical Turbine Pumps, as manufactured by Valve & Primer Corp., Schaumburg, Illinois.

An automatic air release valve shall be provided on the high service pumps to exhaust small pockets of air which may collect in the Air and Vacuum Valve. The automatic air release valve shall have a 1/2" threaded inlet and be equal to APCO Model No. 55.

2.3 Combination Air Release Valves. Combination air release valves (single body, double orifice) shall be designed to allow large volumes of air to escape out the large air vacuum orifice when filling a pipeline and to close water tight when the liquid enters the valve. During large orifice closure, the small air release orifice shall open to allow small pockets of air to escape automatically and independently of the large orifice. The large air vacuum orifice shall also allow large volumes of air to enter through the orifice during pipeline drainage to break the vacuum. The body inlet must be baffled to protect the lower float from direct contact of the rushing air and water to prevent premature valve shut off. The top float must be protected in similar manner for the same purpose. The Buna-N seat must be fastened to the valve cover without distortion for drop tight shut off. All floats shall be heavy stainless steel, hermetically sealed; designed to withstand 1000 psi or more. The upper float shall be center guided for positive shut off. Valve exterior to be painted red lead TT86B Type IV for high resistance to corrosion. Materials certified to ASTM specifications as follows:

Body & Cover & Baffle - Cast Iron
Stainless Steel Float
Buna-N Seat & Needle

Plug & Bronze Forging
Delrin Level Frame
ASTM A48 Class 30
ASTM A240
Nitrile Rubber ASTM SB 800
ASTM D638

Combination air release valves shall be as shown in the valve schedule manufactured by APCO or equal.

2.4 Check Valves.

A. Swing Check Valves. Check valves shall be iron body, bronze mounted, horizontal swing check type, spring loaded suitable for horizontal or vertical service, American Darling, M&H, Clow or equal.

B. Double Door Check Valves. Double door check valves shall be APCO Series 9000 as manufactured by Valve and Primer Corporation, Schaumburg, Illinois, or equal. Check valve shall be lug style, pressure class 150 pounds with cast iron body, aluminum bronze doors, T316 stainless steel hinge pin and stop pin, Buna-N set and T316 stainless steel spring.

C. Air Cushion Swing Check. Air Cushion Swing Check Valve body shall be cast iron per AWWA C508 having integral flanges.

The seat shall be centrifugally cast bronze with an o-ring seal and be locked in place with stainless steel lock screws and be field replaceable, without the use of special tools.

The shaft shall be single and continuous stainless steel, extending both sides of the body with a lever and weight, using an air cushion cylinder side mounted.

The air cushion cylinder shall be constructed of corrosion - resistant material and the piston shall be totally enclosed within the cylinder and not open at one end.

The cushion cylinder assembly shall be externally attached to either or both sides of the valve body and will permit adjustability to cushion the closure of the valve. Cushioning shall be by air trapped in the cushion cylinder which shall be fitted with a one way adjustable control check valve to cushion disc contact to the seat at the shut-off point. The bottom cylinder head shall be swivel mounted and not rigid to follow the change of force angles as the lever raises or lowers to open or close the check valve.

This valve shall prevent backflow of the media on normal pump shut-off or power failure, at zero velocity and be water tight.

The disc shall be cast iron utilizing a double clevice hinge connected to a Ductile iron disc arm. The disc arm assembly shall be suspended from a stainless steel shaft which passes thru a seal retainer on both sides of the valve body.

Valve exterior to be painted with Red Oxide Phenolic Primer Paint as accepted by the FDA for use in contact with Potable Water.

Materials shall be certified to the following A.S.T.M. Specifications:

Valve to be APCO Series 6000 Cushion Swing Check Valve - Air Cushion Side Mounted as manufactured by Valve & Primer Corporation, Schaumburg, Illinois, or equal.

D. Rubber Flapper Check Valve. The check valve shall be an APCO Series 100 rubber flapper serving check valve as manufactured by Valve and Primer Corporation, Schaumburg, Illinois, or approved equal. This check valve shall have a cast iron body and cover and the body shall be long pattern design with integrally cast on end flanges. The flapper shall be Buna-N having an "O"-ring seating edge and shall be internally reinforced with steel.

E. Silent Globe Check Valve. The Silent Globe Check Valve shall be a spring loaded poppet that allows the valve to close before flow reversal occurs, resulting in a silent, non-slam closure. The silent globe check valve shall consist of a heavy cast iron body, stainless steel trim and Buna-N resilient seats. The valve disc shall be center guided at both ends with an integral shaft and shall be spring loaded for silent operation. The spring shall be helical or conical and stone tumbled to achieve a micro-finish to resist mineral deposits. For ease of maintenance, the seat and disc shall be replaceable in the field. Check valve shall be capable of silent operation when installed in vertical or horizontal positions with either flow up or flow down. The flow area through the body shall be equal to or greater than the cross section area of the equivalent pipe size. Sizes 2 ½" to 10" shall allow bolting a wafer style butterfly valve directly to the outlet flange without a spool piece. Valve body shall be Cast Iron ASTM A126 Class B, with resilient "Buna" Seat and Bronze Disc ASTM B584. Spring shall be Stainless Steel ASTM A313.5. Valve shall be rated for 300 psi with 125 lb cast iron flanges and up to 400 psi for 250# Flanges. The valve shall be a Cla-Val Series 581 Silent Globe Check Valve or approved equal.

F. Electric Check Valves. Electric solenoid operated check valves shall be of cast iron body, globe pattern, with all bronze or non-corrosive trim construction. The valves shall be flanged, faced and drilled to conform to 250# Stds. B16.1. The electric check valves shall be rated for a normal working pressure of 200 psi. The valves shall be Figure No. 173-D, Globe Body as manufactured by GA Industries, Inc., Cla-val, Bermad 740Q or approved equal as specified herein.

The valves shall be constructed with complete bronze or non-corrosive lining which shall extend down to and form the seat of the valve. The liner shall be provided with cast "V" port openings. The piston shall be bronze. The pilot shall be of the 3-way type and of all bronze construction.

The design of the valve shall be such as to provide air and water cushioning to reduce hammer and shock. Speed of valve closing/opening shall be adjustable by a hand operated regulating valve. Wear on valve moving parts shall be absorbed by renewable leather composition or rubber cups and seat. The design of valve shall be such that the area above the piston shall be approximately twice the area on the small end of the piston.

The valve shall be designed to provide full pipe line flow when open, and it shall shut off tight, when closed.

Valve shall provide for normal automatic opening and closing function, plus emergency closing on electrical outage. It shall also provide for manual-hydraulic control for opening main valve.

The Sequence of operation for the electric check valve shall be as follows:

a. Valve openings:

-Pump motor starter, three-way solenoid pilot, emergency solenoid pilot simultaneously energized by control circuit.

-Valve opens as pump reaches full speed.

-Limit switch contacts close interlocking with motor starter circuit.

b. Valve closing:

-Three-way solenoid pilot de-energized by control circuit.

-Pump motor circuit and emergency solenoid pilot remain energized.

-Valve starts to close, pump running.

-As piston nears its seat, limit switch contacts open, de-energizing pump circuit and emergency solenoid pilot.

In the event of a power failure, the motor starter circuit solenoid operated three-way pilot, and the solenoid operated two-way pilot will become de-energized simultaneously. De-energizing both pilots simultaneously will cause the main valve piston to move rapidly to its seat. The speed of emergency closing is

adjustable by regulating valve. The emergency closing speed is always at a faster rate than that of the normal closing speed.

The emergency sequence of operation would also pertain in the event of motor undervoltage, motor overload, or by depressing the emergency stop button if same is used.

2.5 Pressure Relief and Surge Anticipation Valve.

A. Function. This valve shall control high pressures and power failure surges by bypassing system pressure that exceeds the high pressure control setting and also by opening a preset amount when sensed pressure decreases below a preset minimum in anticipation of a surge.

B. Valve Sizing. The manufacture shall confirm the valve size shown on the Drawings utilizing the following information:

1. Pump Capacity
2. Size and type of pipeline
3. Length of the pipeline
4. Static Head
5. Pump Head

C. Main Valve. The valve shall be hydraulically operated, single diaphragm-actuated and globe or angle body pattern as shown on Drawings. The valve shall consist of three major components: the body with seat installed, the cover with bearings installed and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls.

D. Main Valve Body. No separate chambers shall be allowed between the main valve cover and body. Valve body and cover shall be of cast material manufactured in North America and shall also have NSF 61 approvals. No fabrication or welding shall be used in the manufacturing process.

The valve shall contain a resilient, synthetic rubber disc, with a rectangular cross-section contained on three and one-half sides by a disc retainer, forming a tight seal against a single removable seat insert. No O-ring type disc (circular, square or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one piece design capable of withstanding opening and closing shocks. No hourglass shaped disc retainers shall be permitted and no V-type or slotted type disc guides shall be used.

The diaphragm assembly containing a rifled slotted, 302 non-magnetic stainless steel valve stem shall be of sufficient diameter to withstand high hydraulic pressure and be fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. The seat shall be a solid, one piece design and shall have a minimum of a five degree taper on the seating surface for a positive, drip-tight shut off. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary.

The diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm shall not be used as the seating surface.

The main valve seat and the stem bearing in the valve cover shall be removable. Cover bearing, disc retainer, and seat shall be made of the same material. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline.

The valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three years from date of shipment provided the valve is installed and used in accordance with all applicable instructions.

E. Material Specification.

Valve Size: As shown on Drawings

Main Valve Body and Cover: Ductile Iron ASTM A-536

Main Valve Trim: 303 Stainless Steel

End Detail: 250 # Flg.

Pressure Rating: 400 psi

Temperature Range: -40 to +180 degrees F

Rubber Material: Buna "N"

Coating: FDA approved fusion bonded epoxy resin process applied 5-7 Mils thick

Desired Options: Stainless Steel liquid filled pressure gauge on the inlet

F. Pilot Control System.

The pressure relief pilot shall be an adjustable, spring-loaded, normally closed diaphragm control designed to permit flow when upstream pressure exceeds the control setting. The low pressure pilot shall be an adjustable, spring loaded, normally open diaphragm control designed to open when the sensed pressure falls below the control setting and close when pressures are normal. The pilot system shall contain an adjustable hydraulic limiter to limit valve travel during low pressure opening without affecting high pressure relief valve travel. The contractor shall connect the sensing/pilot supply connection to the main header with minimum 3/4" pipe or tubing.

A direct factory representative shall be made available for start-up service, inspection and necessary adjustments.

Material Specification for Pilot Control:

Pressure Rating: 300 psi
Body: Bronze ASTM B-61
Trim: 303 Stainless Steel
Rubber Material: Buna "N"
High Pressure Adjustment Range: 100-300 psi
Low Wave Adjustment Range: 30-300 psi

The valve shall be a Cla-Val Co. Model No. 52G-03BKCPEK or equal. The valve shall be factory tested to relieve at 300 psi.

2.6 Gate Valves*

A. Housed. Gate valves for fabricated pipe systems shall be resilient seat type, iron body, flanged, fully bronze mounted with O-ring seals, and suitable for working water pressures of not less than 350 PSIG unless otherwise specified on the Drawings. Housed valves shall be left uncoated to allow painting without the use of tar stop. Valves shall be of standard manufacture and of the highest quality both of materials and workmanship and shall conform to the latest revision of AWWA Specification C-500. Unless otherwise shown on the plans, all housed gate valves shall be non-rising stem. Valves shall be rated for a working pressure of not less than 350 psi and shall have flanges drilled 125 lbs. pattern unless otherwise specified on the Drawings. Unless otherwise shown on the Drawings, housed valves and valves in basins shall be handwheel operated. Handwheels shall be ANSI B16.1 Class 125. Handwheels shall have not less than the following diameters:

<u>Size Valves</u>	<u>Diameter</u>
1"	3 1/8"
1 1/2"	4 1/4"
2"	6"
3"	8"

*Buried service gate valves specified in Section 13104.

<u>Size Valves</u>	<u>Diameter</u>
4"	10"
6"	12"
8"	14"
10"	16"

12"	18"
<u>Size Valves</u>	<u>Diameter</u>
14"	20"
16"	22"
18"	24"

Valve stand handwheels and handwheels on extended stems, shall have the same minimum diameters as those shown for handwheels directly on valves. Extension stems for O.S&Y valves shall be non-rising, with clamp to valve handwheel and hollow shaft for rising stem of valve, with adjustable cast iron guides per each eight (8) feet of extension stem length maximum. All extension stems shall be connected with suitable coupling castings for connection to and removal from valves and stands. Nuts and bolts on all extension stem connections shall be stainless steel.

2.7 Plug Valves. Plug valves shall be non-lubricated eccentric type with synthetic rubber faced plugs, corrosion resistant nickel seats, replaceable stainless steel sleeve type bearings in the upper and lower journals. Furnish with flanges faced and drilled ANSI B16.1 125-pound.

Valve shall provide drip-tight shut-off up to the full rated pressure. All plug valves shall be provided with limit stops and rotated 90 degrees from fully opened to fully closed. Plug valves shall be manually operated with worm gear operator handwheel or lever actuated. Plug valves located 6 feet or more above the floor shall be furnished with chainwheel operators.

Eccentric plug valves shall be as manufactured by DeZurik, Clow, or equal.

2.8 Butterfly Valves*. All butterfly valves shall be of tight closing, rubber or synthetic rubber seat type with seats securely fastened to valve body. No metal-to-metal seating surfaces will be permitted. Valves shall be bubble tight at the rated pressure in either direction and shall be satisfactory for applications involving throttling service and/or frequent operation and for applications involving valve operation after long periods of inactivity.

The valve discs shall rotate 90° from the full open position to the tight shut position.

The valve bodies themselves shall be flanged type design except where specifically noted on the Drawings. Valve bodies shall be constructed of cast iron ASTM A 126, Class B, and shall be suitable for use with 125# ANSI flanges unless specifically specified in the Drawings with 250 # flanges. Valves shall meet the full structural requirements of the applicable classes of AWWA C 504-74.

The valve discs shall be cast iron, semi-steel or bronze with a welded nickel edge free of ribbing or protrusions which may collect solids. The disc-to-shaft connections shall be via polished 316 SS pins. Sprayed or plated discs are not acceptable. All disc seating edges shall be smooth and polished.

The shafts shall be turned, ground and polished. They shall be 300 Series or 400 Series Stainless Steel with diameters per AWWA Spec. C504-70, Class 75B. The shafts shall be of one-piece construction.

The shaft seals shall be of Hycar or Hypalon and shall be provided to prevent leakage into the bearing chest areas.

The valve bearings shall be Teflon coated, self-lubricating, stainless steel design and construction.

The valve seats shall be Neoprene or Hypalon and shall be simultaneously molded, vulcanized and bonded to the valve body or a rigid reinforcing ring.

All surfaces of the valve shall be clean, dry and free from grease before painting. The valve surfaces except for disc, seating and finished portions shall be evenly coated at the factory with a suitable rust inhibitive primer. Hydrostatic and leakage tests shall be conducted in strict accordance with AWWA C 504-74, Section 12.

The valves shall be manufactured by M & H, Dresser, Dezurik, Pratt or approved equal and supplied as listed in the valve schedule specified herein.

*Buried service butterfly valves are specified in Section 13104.

A. High Pressure Butterfly Valves. High performance butterfly valves, 2" - 12" in ANSI Class 300 design, shall be of the flanged or lugged wafer body style. Bodies shall be of carbon steel or cast 316 stainless steel construction. ANSI Class 300 valves shall provide drip tight shutoff to 740 psi.

All valves shall be furnished with upper and lower body bearings and with thrust bearings to assure disc centering in the seat. Valves to be furnished with adjustable v-ring packing of PTFE and an adjustable gland. The one piece shaft shall be high strength Condition "B" type 316 stainless steel, and shall be centerless ground and polished to minimize bearing and packing wear.

Valve seats shall be of PTFE with integral titanium control ring capable of service in temperature ranges of -100°F to 300°F.

Discs shall be cast 316 stainless steel with concave face to reduce dynamic torque and decrease turbulence.

Valve actuators shall provide external disc position indication. Actuators to be weather proof, factory lubed and equipped with fully adjustable mechanical open and closed position stops.

Valves shall be as manufactured by DeZURIK, M & H or approved equal.

B. Manually Operated Butterfly Valves. Manually operated valves shall be operated using a cast iron housed handwheel or chain wheel, as required, available in standard weatherproof construction. All units shall have adjustable open and close position stops and valve position indicator with provision to prevent accidental adjustment changes. The operating shaft shall be supported, axially and radially, at the input end by permanently lubricated bronze thrust and sleeve bearings.

Manually operated butterfly valves shall be furnished and installed as listed in the Butterfly Valve Schedule contained herein.

C. Hydraulically Operated Butterfly Valves. All hydraulically operated butterfly valves shall meet the requirements of Section 2.08 contained herein.

The valves supplied with hydraulic cylinder operators shall be designed and sized according to torque requirements of the valve. The method for calculating torques shall be as outlined in AWWA, Appendix A. Operator shall produce the full AWWA Standard C504 Table 1 output torque throughout entire travel. All hydraulically operated butterfly valves shall be furnished with manual override solenoid valves.

Cylinder actuators shall have working mechanisms fully enclosed and shall be sized for operation using water supply at 40 psi to 100 psi. Contractor shall coordinate cylinder pressure requirements and settings on the plant water pressure reducing valve.

Cylinder pivots shall have bearings. All Cylinder actuators shall be provided with stationary supply connections and flexible cylinder supply lines to allow rigid supply piping to the valve.

Cylinder operator shall be of the base mounted configuration. Cylinder barrel shall be of molybdenum-disulfide lined glass fiber reinforced epoxy tubing, to provide a corrosion-free, self-lubricated high strength barrel. Rod seal shall be of urethane, molybdenum-disulfide filled, to provide a self-lubricated, long life seal.

Piston rod shall be of hard chromium plated 18-8 stainless steel, and shall be top and bottom guided in a heavy cast iron mechanism housing for positive alignment. Guiding shall be accomplished by bronze bearings at end of housing straddling all side loads imposed in operation. Entire operator including piston rod shall be fully enclosed.

The open/close valves shall be supplied with 4-way pre-piped solenoid valves with manual override - NEMA 4 115 V coils, energize to operate.

Open/Closed Valves shall be supplied with speed control for both opening and closing speeds.

Solenoids for open/hold/close (backwash) valves shall be dual coil 4-way with manual override.

Hydraulically operated butterfly valves shall be furnished and installed as listed in the Butterfly Valve Schedule contained herein.

D. Electric Motor Operators. Electric motor operators shall be designed to move the valve from fully open to fully closed with operating speeds such that no undue surge or water hammer occurs when electrical power is applied, and hold the valve disc in any intermediate position between full open and fully closed without creeping or fluttering. Valve, gear, reducer, electric motor operator and accessories shall be furnished complete, ready for installation. Accessories shall include pre-wired control stations with indicating lights, controls and integral reversing contactor furnished for remote operation, and a valve position transmitter and feedback potentiometer enclosed in a NEMA IV housing furnished for remote indication of valve disc position. The motors shall be heavy duty, operating from 120 VAC single phase input source and shall be fused locally. Control compartment shall have internal heater to prevent condensation, a thermal cut-out switch in case of motor overload and four (4) limit switches, 2 to prevent disc overtravel in each direction and 2 for signal-controlled intermediate position stop. Limit switches shall be field adjustable, independent of each other. Limit switches gearing shall be totally enclosed, permanently lubricated. Operator housing shall be heavy, cast aluminum, fully gasketed, capable of remaining watertight for 48 hours submersion in 20 feet of water with conduit access ports sealed.

One handwheel operator shall be furnished for each valve. Operator shall have manual over-ride in which the motor is disconnected when handwheel is in use and the handwheel is not engaged when the motor is in operation.

Motor operation and controls shall be Henry Pratt, AUMA Actuators, or equal.

All valves to be integrated to a flow tube to provide means of rate of flow control shall be equipped with a proportional positioning system to be internally wired to the electric operator for remote indication and control of position of the disc. This system shall be capable of converting a DC milliampere output signal from rate of flow controller to actuate the valve operator to the position required. All valves equipped with electric operators for open and close service shall have on and off position indicators and transmitters.

2.9 Solenoid Control Valve. The function of the valve is to open and close via telemetry activation to control the fill/drawdown cycle of a water storage tank.

The valve shall be an on-off control valve which either opens fully or closes drip-tight upon receiving an electrical signal to the solenoid pilot control. The valve shall consist of a Hytrol main valve, a three way solenoid and high capacity three way pilot valve. The solenoid control shall operate the three way valve which alternately applies pressure to or relieves pressure from the diaphragm chamber of the main valve. Furnish normally closed (energize solenoid to open). The minimum pressure class shall be 150.

The materials shall be as follows:

Component	Material
Body and Cover	Ductile Iron
Disc Retainer & Diaphragm Washer	Cast Iron
Trim: Disc Guide, Seat and Cover	Buma-N Rubber
Bearing	
Diaphragm	Nylon Reinforced Buma-N Rubber
Stem, Nut & Spring	Stainless Steel

The valve shall be equal to Cla Val Model 136-03.

3. EXECUTION

3.1 Installation. Installation shall be in accordance with manufacturer's recommendations.

4. MEASUREMENT AND PAYMENT

Valves are included in the fabricated piping of a structure or specific bid item and separate payment will not be made unless provided for in the Bid Schedule. Costs are to be included in the work to which they are subsidiary.



DIVISION 14
CONVEYING SYSTEMS



SECTION 14001

BRIDGE CRANE SYSTEM, HOIST, AND TROLLEY

1.0 GENERAL

1.1 SCOPE OF WORK

The CONTRACTOR shall furnish all labor, tools, equipment, materials, and perform all work and services necessary for or incidental to the furnishing and complete installation of the hoisting equipment as shown on the drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of this work.

This section describes the hoist systems including hoists, trolleys and trolley beams to be installed in the locations shown on the Drawings and described herein. Beams shall be provided and installed as part of the structural steel. The Contractor shall coordinate as required.

1.2 QUALITY ASSURANCE

The overhead hoists shall conform to the following standards.

- A. Hoist Manufacturer's Institute (HMI)
- B. American National Standards Institute (ANSI)
- C. National Electrical Code (NEC)
- D. American Society of Mechanical Engineers (ASME)
- E. Comply with CSA Standards
- F. ASME/ANSI B30.16, Safety Standards for Overhead Hoists (Underhung).
- G. Lifetime warranty against defective material and workmanship

2.0 EQUIPMENT

2.1 TROLLEY BEAM and BRIDGE CRANE

The trolley beams and bridge crane shall be installed as shown on the plans. Coatings for structural metal shall be in accordance with SECTION 09900 of the specifications.

2.2 HOIST

- A. Interior Bridge Crane. The Contractor shall provide and install one (1) 6,000 lb. capacity bridge crane and hoist system and 35 foot power cord. The bridge crane shall be of a compact design allowing minimal clearance between the bridge beam and runner beams. The bridge crane shall utilize push type end trucks. The hoist shall be a single hook, plain trolley, chain/wire rope hoist rated for 3 tons. The bottom hook shall swivel 360 degrees. The hoist's motor shall be totally enclosed, high torque H4 duty class with class F insulation. Electrical power shall be 460 volt 3 phase 60 hertz. Enclosures shall be rated NEMA 4X. The lift length shall be 15 feet minimum and the lifting speed shall be approximately 7 feet per minute minimum. The hoist shall be capable of lifting an object to a point 24 inches below the trolley beam. The hoist shall be as manufactured by Budgit, Coffing Hoist, or approved equal.

2.3 REQUIRED ACCESSORIES

- A. Chain/Wire Rope. Chain/wire rope and hook shall be corrosion resistant, i.e. stainless steel or zinc plated. End stops, where applicable, shall be furnished to prevent run-out. The lower hook blocks shall be of the swivel type and all hooks shall have a spring operated latch kit.
- B. Overload Device. Hoist shall be equipped with Overload Protection Devices.
- C. Chain Container. Chain hoist shall be equipped with plastic chain containers capable of holding designated amount of chain specified above.
- E. Motor Brake. Electric hoist shall be equipped with a motor brake of the heavy duty; three post type, magnetically operated, multiple disc, direct acting, AC type. Brake shall be spring activated and equally effective in both directions of motor rotation. It shall be of sufficient size to stop and hold the rated capacity of the hoist. The brake shall automatically set when current is not flowing to the motor.
- F. Load Brake. Electric hoist shall be equipped with a mechanical load brake in addition to the hoist motor brake. The mechanical load brake shall be of the Weston type and multiple discs, to control load lowering and prevent drift.
- G. Cord Reel. Electric hoist shall be equipped with a cord reel enabling the power cord of the electric hoist to be retracted to prevent looping and snagging of electrical power cord.
- H. Included with the hoist shall be the top running crane bridge kit as recommended by bridge crane manufacturer.

2.4 ELECTRICAL EQUIPMENT

- A. Starter. Electric Hoist shall be equipped with solid state starting switches to provide greater reliability and starting consistency.
- B. Control Station. Electric Hoist shall be equipped with push button controls for all operation of the hoisting system. Controls shall be contained in one common push button control pendant and rated NEMA 4X. Control transformers shall provide low voltage control circuits as standard equipment (24 volts) for operator safety.

2.5 TROLLEYS

- A. Wheels. Trolleys shall be lug mounted for maximum headroom and rigidity when possible. Trolleys shall have tapered or flat tread cast iron permanently lubricated, shielded ball bearings wheels to match the beam or rail on to which they are installed. Trolleys shall have wrap around side plates to act as bumpers or safety lugs.
- B. Trolley Brakes. Electric trolleys shall be equipped with motorized trolley brakes shall be specified for applications, which require little or no drift.

3.0 SUBMITTALS

3.1 SHOP DRAWINGS

- A. Submit shop drawings for hoists showing all accessories with specific dimensions on drawings.
- B. Submit manufacturers informative literature on hoists and accessories, to include standard data sheet, brochures and dimensional drawings of the equipment for approval.
- C. Indicate any required field dimensions.
- D. Submit Operation and Maintenance manuals for hoist systems.

3.3 MAINTENANCE INSTRUCTIONS

Submit information on required maintenance and repair procedures for electric hoist. Include location of nearest repair facilities for equipment.

3.4 ASSEMBLY AND INSTALLATION INSTRUCTIONS

Submit manufacturer's assembly and installation instructions to the Engineer for review.

4.0 INSTALLATION

The Contractor shall furnish and install hoists where indicated on the Drawings. Hoist shall be installed in accordance with the manufacturer's recommendation.

END OF SECTION

DIVISION 15
MECHANICAL



SECTION 15105

FIRE HYDRANTS

1.0 WORK INCLUDED

Under this Item, the CONTRACTOR shall provide all labor, tools, equipment and materials to furnish and install fire hydrants with gate valves as shown on the drawing and as directed by the ENGINEER.

2.0 MATERIALS

The hydrants shall be designated on the DRAWINGS as follows:

- Type 1 one hose outlet
- Type 2 two hose outlets
- Type 3 two hose outlets and one steamer connection

All fire hydrants on lines 6-inch and larger shall have a six inch bell connection and four-inch bell connection on lines smaller than 6-inch. Hydrants shall be designed for 250 psi working pressure and seat tested at 500 psi and shall conform to the latest specifications of the AWWA. All working parts shall be bronze. The hose outlets and steamer nozzle shall be of such size and design that it will fit the present fire fighting equipment. Hydrants shall be designed so that no water will be lost when they are broken off and so they can be repaired with a repair kit. Design, materials, and workmanship shall be similar and equal to the latest stock pattern ordinarily produced by the manufacturer. Length of barrel shall be such to provide ample cover over the connecting line. Working drawings and full description of hydrants shall be submitted to the ENGINEER before ordering. All hydrants shall have a 4 1/4 or 5 1/4 inch valve opening against pressure. The hydrants shall be equal to Kennedy Model K81A or Mueller Model A-423. Four spanner wrenches for operation of the hydrants shall be furnished for the DISTRICT'S use.

3.0 PAINT

Hydrants shall be painted one coat of primer and two finish coats of approved paint of color **Natural Blue**. Painting shall conform to AWWA C902-85, Section 4.2 Painting.

4.0 INSTALLATION

Hydrants shall be set at such elevations that the connecting pipe will have the same depth of cover as the distribution main. The hydrant shall be set upon a

slab of stone or concrete not less than four inches thick and 15 inches square. The back of the hydrant opposite the pipe connection shall be firmly wedged against one and one-half square feet or enough of the vertical face of the trench with concrete to prevent the hydrants from blowing off the line. The entire fire hydrant piping assembly from the main line tee to the hydrant shall be joint restrained. The joint restraints shall be equal to Meg-a-Lug for mechanical joint pipe as manufactured by EBBA IRON and rated for 350 psi minimum.

Not less than seven cubic feet of No. 9 stone shall be placed around the base of the hydrant to insure drainage. Before the No. 9 stone is placed and before it is backfilled the drain hole shall be inspected and thoroughly cleaned if necessary. The backfill around the hydrant shall be thoroughly compacted to the grade line in a manner satisfactory to the ENGINEER. Hydrants shall have the interior cleaned of all foreign matter before installation.

All hydrants will be installed with the pumper connection facing the main access road or as directed by the ENGINEER.

Stuffing boxes shall be tightened and the hydrants shall be inspected in open and closed position to see that all parts are in working condition.

5.0 PAYMENT

The unit price bid shall constitute full compensation for furnishing and installing the fire hydrants and associated gate valve as specified.

SECTION 15222

V-BIO ENHANCED POLYETHYLENE ENCASEMENT FOR DUCTILE IRON PIPE

1.0 GENERAL

Polyethylene encasement shall be installed on ductile iron pipe in area locations and to plan lengths as designated on the project drawings. Polyethylene encasement for use with ductile iron pipe shall meet all the requirements for ANSI/AWWA C105/A21.5, **Polyethylene Encasement for Ductile Iron Pipe Systems** which is included herewith by reference.

2.0 INSTALLATION

Ductile iron pipe and the polyethylene encasement used to protect it shall be installed in accordance with AWWA C600 and ANSI/AWWA C105/A21.5 and also in accordance with all recommendations and practices of the AWWA M41, Manual of Water Supply Practices – Ductile Iron Pipe and Fittings. Specifically, the wrap shall be overlapped one foot in each direction at joints and secured in place around the pipe and any wrap at tap locations shall be taped tightly prior to tapping and inspected for any needed repairs following the tap.

All installations shall be carried out by personnel trained and equipped to meet these various requirements.

The installing contractor shall submit an affidavit stating compliance with the requirements and practices of ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51, ANSI/AWWA C105/A21.5, AWWA C600 and M41.

3.0 MATERIALS

3.1 Linear Low Density Polyethylene Film

Linear low density polyethylene film shall be manufactured from virgin polyethylene material conforming to the following:

- 3.1.1 Raw material requirements, per ASTM D4976
 - Group: 2 (Linear)
 - Density: 0.910 to 0.935 g/cm³
 - Dielectric Strength: Volume resistivity, 10¹⁵ ohm-cm, minimum

3.1.2 Physical Properties of Finished Film

Tensile Strength: 3,600 psi (24.8 MPa), for an 8-mil (200- μ m) minimum thickness, minimum in machine and transverse direction (ASTM D882)

Elongation: 700 percent, minimum in machine and transverse direction (ASTM D882)

Dielectric Strength: 800 V/mil (31.8 V/ μ m) thickness, minimum (ASTM D149)

Impact Resistance: 600 g, minimum (ASTM D1709 Method B)

Propagation Tear Resistance: 2,550 gf (grams force), minimum in machine and transverse direction (ASTM D1922)

3.1.3 Polyethylene encasement for use with ductile iron pipe systems shall consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than 8 mils.

The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of anti-microbial biocide to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.

3.2 Tube Size or Sheet Width

Tube size or sheet width for each pipe diameter shall be as listed in Table 1 contained in ANSI/AWWA C105/A21.5, **Polyethylene Encasement for Ductile Iron Pipe Systems**.

3.3 Marking

3.3.1 Marking Requirements

The polyethylene film supplied shall be clearly marked, at a minimum of every 2 ft along its length, containing the following information:

- a. Manufacturer's name or trademark
- b. Year of Manufacture
- c. ANSI/AWWA C105/A21.5
- d. Minimum film thickness and material type
- e. Applicable range of nominal pipe diameter size(s)
- f. Warning – Corrosion Protection – Repair any damage

3.3.2 Marking Height

Letters and numerals used for marking items a through e in Sec 4.3.1 shall not be less than 1 in. in height. Item f in Sec 4.3.1 shall be not less than 1.5 in. in height.

DIVISION 16

ELECTRICAL

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DIVISION 16 - ELECTRICAL

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SECTION 16000 - ELECTRICAL GENERAL PROVISIONS

1. RELATED DOCUMENTS

A. General Provisions of Contract, General and Supplementary Conditions, and General Requirements, apply to this Section.

B. This Section shall be governed by alternates insofar as they apply to this work.

2. DESCRIPTION OF WORK

A. Provide labor, equipment, materials, supplies and components, including lamps and fuses; and perform all operations including cutting, channeling, chasing, trenching and backfilling necessary for installation of complete electrical system.

B. Appliances, equipment, and fixtures shall be current models for which replacement parts are available. Store and protect materials and equipment delivered to site in such a manner as to effectively prevent damage from climatic conditions, condensation, dust, and physical abuse. Install and connect materials and equipment in accordance with manufacturer's instructions and recommendations. Each major component of equipment shall have manufacturer's name, address, model number, and ratings on a plate securely affixed in a conspicuous place.

C. It is not the intent of this section to make any Contractor, other than the General Contractor alone, the single responsible party to the Owner. All transactions such as submittal of shop drawings, claims for extra costs, requests for equipment or materials substitution, shall be done through the General Contractor. No attempt has been made to arbitrarily assign responsibility of work, material, equipment or services to a particular trade or Contractor. Unless stated otherwise, subdivision and assignment of work shall be General Contractor's responsibility.

D. Facilities and systems of electrical work are described (but not by way of limitation) as follows:

(1) Electrical connecting of equipment not specified to be connected as work of another Division.

(2) Electrical service and distribution including connecting of equipment not specified to be connected as work of another Division.

(3)

(4) Motor starters and control/protection work as indicated.

(5) Electric equipment and motor connections.

(6) Control/monitoring work as indicated.

(7) Lighting systems.

(8) Gas detection systems.

(9) Emergency power system equipment

E. Each CONTRACTOR bidding on the work included in these Specifications shall view the site and carefully examine the Contract Drawings and Specifications, so that he/she may fully understand what is to be done, and to document existing conditions.

3. QUALITY ASSURANCE

A. Minimum standards for all electrical work shall be latest revision of NEC. Whenever and wherever OSHA, Federal and State laws, regulations and design require higher standards than NEC, these laws, regulations, and designs shall be followed.

B. Provide electrical inspection by a licensed and recognized Electrical Inspector. Notify Electrical

(1) Inspector in writing, immediately upon start of work with a copy of notice to Engineer. Schedule inspection for rough as well as finished work. Approval from Electrical Inspector will not be allowed as reason for deviation from Contract Documents. All costs incidental to Electrical Inspection shall be borne by Contractor. Prior to final acceptance of work and release of final payment, deliver to Engineer the certificate of final inspection.

C. Obtain all permits required for entire construction of electrical system from authorities governing such work. Bear all costs of these permits.

D. All materials shall be new and best of their respective kinds unless otherwise specified and shall be listed by UL and shall be so labeled. All equipment shall conform to latest approved standards of I.E.E.E., N.E.M.A., A.N.S.I., U.L. and O.S.H.A. See individual specification sections for other specific requirements.

4. CONTRACT DOCUMENTS

A. Contract Documents are intended to cover furnishing and installing of complete electrical systems (interior and exterior) including miscellaneous systems, all tested and ready for operation.

B. Contract Documents are complementary, each to the other, and work required by either shall be included in the contract as if called for by both. Necessary items or work omitted, not clearly included, specified or indicated and material or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, or rules shall be clarified by a written request to Engineer prior to bidding. In absence of such written notice, Contractor shall be responsible for approved satisfactory functioning of entire system without extra compensation.

C. Drawings other than electrical drawings, and other sections of this specification, may show or specify electrically operated equipment and wiring diagrams. Examine all such drawings and specifications. Determine characteristics and provide necessary wiring and connections for all such equipment.

D. Keep electrical record drawings up to date each day. Record drawings will be reviewed by Engineer each month with Contractor's pay request review. Entries and notes shall be made in a neat and legible manner and these drawings delivered to the ENGINEER after completion of the construction, for use in preparation of Record Drawings.

E. Naming of a certain brand or make or manufacturer in specifications is to establish style or quality standard for articles desired. Contractor is not restricted to use of specific brand of manufacturer named unless so indicated in specifications. However, where a substitution is requested, a substitution will be permitted only with written approval of Engineer. Proposed substitutions prior to bidding shall be submitted prior to bid date. Submit three bound copies of manufacturer's data showing all pertinent data, and samples, if requested.

5. COORDINATION

A. Coordinate work of different trades so that:

(1) Interference between mechanical, electrical, architectural, and structural work including existing services shall be avoided.

(2) Within limits indicated on Drawings, the maximum practicable space for operation, repair, removal, and testing of electrical equipment shall be provided.

B. All electrical materials and equipment shall be kept close as possible to ceiling, walls and columns, to take up a minimum amount of space.

C. Provide all offsets, fittings and similar items necessary in order to accomplish requirements of coordination without additional expense to Owner.

D. Drawings are diagrammatic and indicate general location of material and equipment. Refer to architectural and structural drawings and specifications for general construction of building, for floors and ceiling heights and for locations of walls, partitions, beams, and equipment, and be guided accordingly for setting of all equipment. Do not scale electrical drawings to determine exact locations.

E. Motor horsepower and apparatus wattage ratings indicated on Drawings or specified herein are estimated values, and corresponding sizes of feeders and other electrical equipment indicated to serve them are minimum sizes. Motors of greater horsepower and apparatus with larger wattage ratings may be provided if necessary to meet requirements of various sections of specification in which they are specified. Where larger motors or apparatus with larger wattage ratings are provided, feeders and other electrical equipment serving them shall be increased in capacity to correspond. Increase in capacity of feeder and other apparatus shall be furnished at no additional cost to the Owner.

F. Be responsible for locating all openings required in walls, floors, ceilings or roof, for all materials and equipment provided under Electrical sections.

(1) Check with other trades on scope of their work and coordinate on all locations of various items of equipment and outlets before they are finally placed and connected. Relocation of material or equipment necessitated by failure to coordinate work shall be at no cost to Owner.

(2) Do not cut work of any other trade without first consulting Engineer's representative. Repair work damaged employing services of trade whose work is damaged. Where openings or sleeves have been omitted, they shall be drilled or sawed as directed by Architect. All cutting and patching shall be responsibility of this Section.

(3) Wherever slots, sleeves or other openings are provided in floors or walls, for the passage of conduits or other forms of raceway, including bus ducts, such openings, if unused, or spaces left in such openings after installation of conduit or raceway shall be filled. Filling materials for openings in walls and floors generally shall be fire resistive and constructed and installed so as to prevent passage of water, smoke and fumes. Where conduits passing through openings are exposed in finished rooms, finishes of filling materials shall match and be flush with adjoining floor, ceiling or wall finishes.

(4) Provide exposed conduit passing through floors, walls, or ceilings of finished rooms with chrome plated escutcheons. Plates shall be split, hinged type of sufficient outside diameter to amply cover up sleeve openings for pipe.

6. WARRANTY

A. Contractor shall be responsible for warranting all work, including equipment, materials, and workmanship provided under this section. This warranty shall be against all defects of the above and shall run a minimum period of one (1) year from date of acceptance of the work, concurrent with the one year guarantee period designated for the general construction contract under which electrical work is performed. Date of acceptance shall be considered to be the date on which all "punchlist" items are completed ("punchlist" is defined to be the written listing of work that is incomplete or deficient that must be finished or replaced/repared before the CONTRACTOR receives final payment).

B. Defective work, equipment, materials and workmanship that develops within warranty period, which is not caused by ordinary wear, damage or abuse by others, shall be replaced or corrected without additional cost to Owner.

C. Repair or maintenance for the guarantee period is the responsibility of the CONTRACTOR and shall include all repairs and maintenance other than that which is considered as routine. (That is replacement of lamps, oiling, greasing, etc.)

7. EXCAVATING FOR ELECTRICAL WORK

A. Include whatever excavating and backfilling is necessary to install electrical work. Coordinate work with other excavating and backfilling in same area, including dewatering, flood protection provisions and other temporary facilities. Coordinate work with other work in same area, including other underground services (existing and new), landscape development, paving, and floor slabs on grade. Coordinate with weather conditions and provide temporary facilities needed for protection and proper performance of excavating and backfilling.

B. Except as otherwise indicated, comply with applicable provisions of Section 02200 for electrical work excavating and backfilling. Refer instances of uncertain applicability to Engineer for resolution before proceeding.

C. Where conduit is less than 2' 6" below surface of roadway, provide encasement in Class 2500 concrete, 4" minimum coverage all around.

D. After backfilling has been completed disturbed areas shall be returned to their original condition and shall match adjoining area, or in areas to be covered under site work, area shall be finished as directed by Engineer.

E. Where it is necessary to remove and replace landscape work, pavement, flooring and similar exposed finished work, engage original installer to install replacement work; except where work existed prior to work of this Contract, engage only experienced and expert firms and tradespersons to replace work.

8. CONCRETE FOR ELECTRICAL WORK

A. Work of this article is defined to include whatever concrete work is necessary or indicated specifically to install electrical work. Except as otherwise indicated, comply with applicable provisions of Division 3 for electrical work concrete, including formwork, reinforcement, mix design, materials (use mix designs and materials accepted for Division 3 work where possible), admixtures, accessories (including waterstops), placing of wet concrete, finishing, curing, protecting, testing, submittals, and other requirements of the concrete work. Refer instances of uncertain applicability to Engineer for resolution before proceeding.

B. Except as otherwise indicated, provide strength classes as follows, with the following cement content and water/cement ratios; for the indicated applications and similar required applications.

(1) 4000 psi Class: 565 lbs. cement/yd. (6.0 sacks); 0.57 water/cement ratio. Provide 4000 Class for vaults, beam type foundations and similar structures.

(2) 3000 psi Class: 500 lbs. cement/yd. (5.25 sacks); 0.68 water/cement ratio. Provide 3000 Class for miscellaneous underground structural concrete, reinforced encasement, block type foundations (with smallest dimension at least 0.2 x largest dimension), curbs, pads, and similar structural support work.

(3) 2500 psi Class: 450 lbs. cement/yd. (4.75 sacks); 0.75 water/cement ratio. Provide 2500 Class for plain encasement, filling steel framed units, and similar work.

(4) Rough Grouting Class: 565 lbs. cement/yd. (6.0 sacks); 0.75 water/cement ratio; adjust aggregate sizes to facilitate placement. Use for rough grouting, not for setting equipment bases.

(5) Backfill Class (Lean Concrete): 375 lbs. cement/yd. (4.0 sacks); 0.87 water/cement ratio. Use for backfilling where excavations are extended below point of support for electrical work.

C. Anchor Bolts-Concrete: Provide all anchor bolts required for equipment furnished under Contract. Set anchor bolts in a substantial manner so they will not be displaced. Anchor bolts shall be set in new concrete construction before pouring. Anchor bolts shall be stainless steel.

9. TESTING AND BALANCING

A. Feeders and branch circuits shall have their insulation tested after installation, and before connection to fixtures and equipment. Perform with a 500 volt megger. Conductors shall test free from short circuits and grounds. Test conductors phase to phase and phase to ground. Test readings shall be recorded and delivered to Engineer.

B. Verify rotation of all three phase motors with trade furnishing equipment. Bump or run these motors uncoupled in presence of trade furnishing equipment to insure proper rotation.

C. Circuit numbers are indicated on Drawings for reference; however Contractor shall make corrections as necessary to obtain proper phase balance under operating conditions.

D. After the wiring system is completed, and at such time as the ENGINEER may direct, the CONTRACTOR shall conduct an operating test for acceptance. The equipment shall be demonstrated to operate in accordance with the requirements of these Specifications and the Contract Drawings. The test shall be performed in the presence of the ENGINEER or his authorized representative. The CONTRACTOR shall furnish all instruments and personnel required for the tests, as well as the necessary electrical power.

E. Before energizing the system, the CONTRACTOR shall check all connections and set all relays and instruments for proper operation. He shall obtain all necessary clearances, approvals, and instructions from the serving utility company prior to placing power on the equipment.

1.10 TRAINING

A. All manufacturers supplying equipment for this division shall provide the OWNER'S operations staff with training in the operation and maintenance on the equipment being furnished. The training shall be conducted at the project site by a qualified representative of the manufacturer.

B. The cost of this training shall be included in the bid price.

C. The required training shall consist of both classroom and hands-on situation. Classroom training shall include instruction on how the equipment works, its relationship to all accessories and other related units, detailed review of shop drawings, detailed presentation of written O&M instructions, troubleshooting and record-keeping recommendations. Hands-on training shall include a review of the manufacturer's O&M instructions, check out of each operator to identifying key elements of the equipment, tear down as appropriate, calibration, adjustment, greasing and oiling points, and operating manipulations of all electrical and mechanical controls.

D. The training shall be scheduled through the CONTRACTOR with the OWNER. The timing of the training shall closely coincide with the startup of the equipment, but no training shall be conducted until the equipment is operational.

E. The minimum number of training hours to be provided by manufacturer supplying equipment on this project shall be in accordance with the following tables:

Item	Training Hours	
	Classroom	Hands-on
Motor Control/Telemetry Control Systems	3	3

F. At least 60 days prior to the training the manufacturer shall submit through the CONTRACTOR to the ENGINEER an outline of the training proposed for the ENGINEER'S review and concurrence.

G. The OWNER reserves the right to videotape all training sessions.

1.11 STORAGE AND CLEANING

A. All work, equipment, and materials shall be protected against dirt, water, or other damage during the period of construction.

B. Sensitive electrical equipment such as light fixtures, motor starters and controls, delivered to the job site, shall be protected against damage or corrosion due to atmospheric conditions or physical damage by other means. Protection is interpreted to mean that equipment shall be stored under roof, in a structure properly heated in cold weather and ventilated in hot weather. Provision shall be made to control the humidity in the storage area to 50 percent relative. The stored equipment shall be inspected periodically, and if it is found that the protection is inadequate, further protective measures shall be employed.

C. The CONTRACTOR shall not store submersible pump units in the wet well. If it is absolutely necessary to do so, the open power cable ends are to be suspended above the maximum flood elevation or maximum expected water level. If not stored in this manner, the CONTRACTOR may be called upon to replace the pump motors and cables with new units to ensure that water has not penetrated the cable and entered the motor housing.

D. At completion of work required under this Contract and just prior to acceptance by Owner, thoroughly clean all exposed equipment fittings, fixtures and accessories.

E. During construction, cover all OWNER equipment and furnishings subject to mechanical damage or contamination in any way.

1.12 SUPPORT OF ELECTRICAL ITEMS

A. Unless otherwise indicated, all electrical items or their supporting hardware, including but not limited to, conduits, raceways, cable trays, busways, cabinets, panelboards, wall mounted

transformers, starters, boxes, and disconnect switches shall be securely fastened to building structures with the following methods. Fastening shall be by wood screws or screw type nails on wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; by machine screws, welded threaded studs, or spring tension clamps on steel work. Threaded studs driven in by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts or machine or wood screws. Threaded C clamps with retainers may be used on rigid steel conduit only. Conduits or pipe straps shall not be welded to steel structures. In partitions of light steel construction, sheet metal screws shall be used.

B. Equipment supports at process structures remote from buildings shall be as detailed and/or noted on Drawings. Where a particular support type is not noted, aluminum channel (uni-strut) shall be used. Channel type supports shall not be used in lieu of other supports noted unless approved by Engineer.

(1) All mounting brackets and strut used outside shall be aluminum. Fasteners used to mount equipment outside shall be stainless steel. The only exception to the above shall be anchor bolts for area lightpoles which shall be allowed to have galvanized threads and galvanized nuts.

- a. All mounting brackets and strut used inside shall be aluminum.
- b. All free standing equipment shall be anchored to its foundation using expansion bolts of the size and number recommended by the equipment manufacturer.
- c. The load applied to any fastener shall not exceed one of the proof test load. Fasteners attached to concrete ceilings shall be vibration and shock resistant.

C. Since this project is in Seismic Zone 1, the CONTRACTOR shall be sure that all supports are consistent with the KBC requirements in this regard.

1.13 IDENTIFICATION

A. Equipment disconnect switches, motor starters, pushbutton stations, panels, switchgear, special device plates, and similar material shall be clearly marked. Coordinate size of lettering and wording with Engineer.

B. Mark panels, giving panel designation in one half inch letters and voltage in one quarter inch letters centered above door on exterior trim. Mark equipment mounted remotely from source of power (such as roof exhaust fans) with equipment number and source of power. Where starters are remotely mounted, marking shall include equipment name and number.

C. Except as indicated, mark all equipment with engraved lamacoid plates having black foreground and white letters. Attach interior mounted plates with contact type permanent adhesive and exterior mounted plates with self tapping stainless steel screws except where screws should not penetrate substrate use waterproof contact adhesive. Align plates on equipment being marked in center near top.

(1) All control panels, disconnects, [instruments,] etc., shall be marked to indicate the circuit they control, [or variable monitored.] Marking is to be done with engraved laminated nameplates and shall bear the designation shown on the Contract Drawings where this information is given. Nameplates shall be fastened to equipment with stainless steel screws, minimum of one each side. In no way shall the installation of mounting screws void the NEMA enclosure rating of the equipment in which they are installed. If there are more than one identical unit, they shall be given consecutive

numbers or other descriptions as designated by the ENGINEER. Nameplate background color shall be white, with black engraved letters, unless otherwise noted.

(2) Control panels and disconnect switches shall be labeled with vinyl self-adhesive signs that warn of "High Voltage" (state the specific voltage). Other major equipment such as transformers, transfer switches, pump control panels, etc., shall be labeled as such. The type of labels to be used shall have orange as the basic color to conform with OSHA requirements, letters shall be black. The labels shall be of proper size to fit flatly on the surface of the enclosure to make for a neat appearance and not interfere with the operating functions of the device it is attached to. These labels shall be as manufactured by the Brady Identification Systems Division, Safety Sign Company, Westline Products Company, or equal.

D. Provide warning signs where there is hazardous exposure or danger associated with access to or operation of electrical facilities, such as pad mount transformers. Provide text of sufficient clarity and lettering of sufficient size to convey adequate information at each location; mount permanently in an appropriate and effective location. Comply with recognized industry standards for color and design.

E. Bury a continuous, pre printed, bright colored plastic ribbon cable marker with each underground power or signal circuit, regardless of whether conductors are in conduit or concrete encasement. Locate each directly over cables, 6" to 8" below finished grade.

F. Provide adequate marking of conduits containing conductors operating above 600 volts, which are exposed or concealed in accessible spaces. Except as otherwise indicated use orange banding with black lettering. Provide self adhesive or snap on type plastic markers. Indicate voltage ratings of conductors. Locate markers at ends of conduit runs, near switches and other control devices, near items of equipment served by conductors, at points where conduits pass through walls or floors or enter non accessible construction, and at spacings of not more than 50' along each run of exposed conduit.

1.14 SUBMITTALS

A. Refer to the Division 1 sections for general requirements concerning work related submittals. For electrical work, the following quantities are required for each category of submittal (in lieu of quantities specified in Division 1), unless otherwise indicated in individual work sections (quantity does not include copies required by governing authorities, or by Contractor for its own purpose.)

- (1) Shop Drawings: Minimum 6 sets, including 3 for maintenance manuals.
- (2) Product Data: Minimum 6 sets, including 3 sets for maintenance manuals.
- (3) Samples: 4 sets for final submission.
- (4) Certifications: 3 copies.
- (5) Test Reports: 3 copies.
- (6) Warranties (Guarantees): 6 copies, including 3 for maintenance manuals.
- (7) Maintenance Manuals: 3 final copies, including wiring diagrams, maintenance and operating instructions, parts listings, and copies of other submittals indicated for inclusion.

B. Each submittal shall have Engineer's Project Number, Specification Section Number, Schedule, Material and Date Submitted, indicated on its cover sheet so Engineer may readily determine particular item Contractor proposes to furnish.

C. An example of above requirements is indicated by:

(Job Number)

Division 16 ELECTRICAL

Section 16510 Building Lighting Fixtures

Date Submitted:

D. Operating and Maintenance Manual

(1) Submit to Engineer prior to substantial completion three (3) copies of complete operating and maintenance instructions for equipment provided under this Contract. Provide complete parts lists for all new major equipment items.

(2) Organize each maintenance manual with index and thumb tab marker for each section of information; bind in 2", 3 ring, vinyl covered binder with pockets to contain folded sheets, properly labeled on spine and face of binder with the following:

TITLE: (Project Name)

Electrical System Operation and Maintenance Data

Name and Address of Architect/Engineer

Name and Address of Consultants/Contractors

(3) Index of contents shall include equipment vendor's name and address.

(4) Include Brochures, data, all approved shop drawings, parts lists, warranties, wiring diagrams and manufacturers operating and maintenance instructions.

E. Contractor shall refer to each separate section of these specifications for information on electrical items requirement shop drawing submission and additional maintenance manual documentation.

F. Electronic (PDF) Submittals

Submittals sent electronically shall have a cover sheet with all information as noted in items B. and C. above. Each separate section, i.e. 16120, 16155, etc., shall have a separate cover sheet for the sections submitted. All items covered in a separate section of specs, i.e. 16510, shall be combined within a single PDF submittal file for that section (i.e. Do not submit 5 separate PDF files for 5 different light fixtures as covered in section 16510). Submittals/sections without cover sheets and without information as listed in 1.14, B. above will not be reviewed and returned for resubmittal.

1.15 MATERIALS

A. All materials used shall be new and at least meet the minimum standards as established by the NEC and/or National Electrical Manufacturers Association (NEMA). All materials shall be UL listed for the application, where a listing exists. Additional requirements are found in Division 1. All equipment shall meet applicable FCC requirements and restrictions.

B. The material and equipment described herein has been specified according to a particular trade name or make to set quality standards. However, each CONTRACTOR has the right to substitute other material and equipment in lieu of that specified, other than those specifically mentioned as matching or for standardization, providing such material and equipment meets all of the requirements of those specified and is accepted, in writing by the ENGINEER.

C. The reuse of salvaged electrical equipment and/or wiring will not be permitted unless specified herein or indicated on the Contract Drawings.

D. All salvaged or abandoned electrical materials shall become the property of the OWNER and shall be removed from the job site upon completion of the project as directed by OWNER.

1.16 TEMPORARY FACILITIES

A. Refer to Division 1 sections for general requirements for temporary facilities.

B. The CONTRACTOR is responsible for coordinating all activities onsite by the Power Company

C. The CONTRACTOR shall be responsible for providing temporary electrical power as required during the course of construction and shall remove temporary service equipment when no longer required. Temporary power is also addressed in Division 1.

D. All such equipment shall be removed when permanent connections have been completed. Where it is determined, during construction, that temporary facilities, as installed, interfere with construction operations, relocate said facilities in an approved manner at no cost to Owner. Temporary connections shall be in accordance with NEC and OSHA requirements. Repair damage or injury to equipment, materials, or personnel caused by improperly protected temporary installations. The Contractor shall be responsible for all costs for materials and installation for temporary electrical facilities and energy for their operation.

1.17 ERRORS, CORRECTIONS AND/OR OMISSIONS

A. Should a piece of utilization equipment be supplied of a different size or horsepower than shown on the Contract Drawings, the CONTRACTOR shall be responsible for installing the proper size wiring, conduit, starters, circuit breakers, etc., for proper operation of that unit and the complete electrical system at no extra cost to the OWNER.

B. It is the intent of these Specifications to provide for an electrical system installation complete in every respect, to operate in the manner and under conditions as shown in these Specifications and on the Contract Drawings. The CONTRACTOR shall notify the ENGINEER, in writing, of any omission or error at least 10 days prior to opening of bids. In the event of the CONTRACTOR'S failure to give such notice, CONTRACTOR may be required to correct work and/or furnish items omitted without additional cost. Further requirements on this subject may be found in the General Requirements, Division 1.

(1) Necessary changes or revisions in electrical work to meet any code or power company requirements shall be made by the CONTRACTOR without additional charge.

1.18 MAINTAINING CONTINUOUS ELECTRICAL SYSTEM AND SERVICE

A. Existing service(s) continuity shall be maintained at all times. In no way shall the installation and/or alteration of the electrical work interfere with or stop the normal operation of the existing facilities, except when prior arrangements have been made.

B. When additions and taps to existing service(s) require electrical outages of duration in excess of a few minutes, arrangements shall be made in advance for such outages. All outages shall be held to an acceptable minimum with none exceeding 4 hours continuous duration. If necessary, work shall be performed on premium time. If performed at night, requiring a general outage, the CONTRACTOR shall furnish an auxiliary source of light and power as required. Under no circumstances shall an electrical outage of any duration be initiated until the OWNER and ENGINEER have concurred, and as far as possible in advance.

1.19 SERVICE ENTRANCE

A. Conductors and terminations for service entrances shall be furnished and installed by the CONTRACTOR. Voltage, phase, and number of wires shall be as shown on the Drawings. Clearances for overhead entrance wires shall be per Power Company, NEC, and NESC requirements.

B. Any details not shown on the Drawings or written in the Specifications pertaining to the service entrance shall be per power company requirements. It is the CONTRACTOR'S responsibility to contact the utility prior to bidding and obtain any special requirements or costs they will be imposing. Those costs shall be included in the bid.

C. On underground service entrances from pad mounted transformers, the CONTRACTOR shall be responsible for furnishing and installing all primary, secondary, and metering conduits, as well as secondary service/metering conductors. The CONTRACTOR shall be responsible for furnishing pull wires in primary conduits for use by the power company. The CONTRACTOR shall be responsible for fabricating the required concrete pad that the transformer will be mounted on. The CONTRACTOR shall also mount the meter base furnished by the power company.

END SECTION



SECTION 16051 - BASIC MATERIALS AND METHODS

1. RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions and General Requirements apply to this Section.
- B. Requirements of Electrical General Provision Sections govern this Section, where applicable.
- C. Requirements of the sections govern work specified in this section, where applicable.

2. DESCRIPTION OF WORK

- A. Provide labor, material, equipment and services necessary for complete and proper Basic Materials and Methods.
- B. Requirements of this section apply to electrical work specified elsewhere.

3. BASIC MATERIALS AND METHODS

- A. Unless otherwise indicated, install all wiring in rigid metal conduit, electric metallic tubing, or flexible metallic conduit specified below or as indicated on Drawings. Do not use surface metal raceways on floor. Do not use nonmetallic sheathed cable, or armored cable (Bx or Type AC).
- B. Provide complete wiring from point of service connection to all receptacles, lighting fixtures, devices, utilization equipment and outlets for future extensions, as indicated on Drawings. Provide ample slack wire for connections. Unless otherwise specified, provide No. 12 AWG or larger for all branch circuit conductors. In outlet boxes designated for future use, tape ends of wires and install blank covers. Do not install telephone signal wires unless otherwise specified.
- C. Do not bend cables, either permanently or temporarily during installation, to radii less than 10 times outer diameters, except where shorter radii are approved by engineer for conditions making specified radius impracticable.
- D. All conductors No. 10 and smaller located in branch circuit panelboards, signal cabinets, signal control boards, switchboards and motor control centers shall be neatly and securely bundled. For conductors larger than No. 10 located in switchboards, motor control centers and pull boxes, neatly and securely cable in individual circuits. Use nylon straps made of self extinguishing nylon having a temperature range of 65 degrees F. to + 350 degrees F. Construct each strap with a locking hub or head on one end and a taper on other.
- E. Where two or more conduits have been installed in place of a single conduit because of space conditions, use duplicate conductors in each conduit, including neutrals where required, and total capacity of duplicate conductors shall be not less than capacity of conductors replaced.
- F. Where length of a branch circuit, from panel to first outlet, exceeds 75 feet for a 120 volt, 20 amp. circuit or 175 feet for a 277 volt circuit, use No. 10 AWG conductor size.
- G. Where homerun circuit numbers are indicated on Drawings, follow such numbers in connecting circuits to panelboards. Where homerun circuit numbers are not indicated on Drawings, divide similar types of connected loads among phase buses in such a manner that, in normal usage, phase bus currents will be approximately equal. Connect each branch circuit homerun containing two or more circuits to circuit breakers or switch in a three wire or four wire branch circuit panelboard in such a manner that no two circuits will be fed from same bus. Where panelboard cabinets are recessed, conduits with sufficient

capacity to carry required number and size of future conductors for all spare branch circuit protective devices and spaces in panelboard shall be stubbed up concealed to a junction box for future connections and extensions located as follows:

- (1) In an area with removable ceiling, junction box shall be accessible above suspended ceiling.
- (2) In an area with non-removable ceiling, recess junction box in ceiling directly over panelboard location.
- (3) In an area without finished ceiling but with finished walls, recess junction box in wall directly above panelboard location at ceiling line.
- (4) In an area without suspended ceiling but with unfinished walls, recess junction box on ceiling directly over panelboard location.

H. Provide all junction boxes in accordance with NEC as to conductor capacity for future conductors with adequate knock outs on all four sides and a blank screw cover. Plates shall match those installed in that particular area.

I. Install only one 277 volt circuit in a wall switch outlet box. Where more than one 277 volt circuit (on different phases) is indicated on drawings as being run to multi wall switch units from a ceiling branch circuit outlet box, provide individual conduit with phase and lighting fixture control wiring and separate outlet boxes with separated wall plates to segregate each phase.

END SECTION

SECTION 16110 - ELECTRICAL RACEWAYS

1.1 RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions and General Requirements.
- B. Requirements of Electrical General Provision Sections govern this Section, where applicable.
- C. This section shall be governed by Alternates insofar as they apply to this work.

1.2 DESCRIPTION OF WORK

- A. Provide labor, materials, equipment and services necessary for proper and complete installation of electrical raceways.
- B. The requirements of this section apply to electrical raceway work specified elsewhere in these specifications.

1.3 QUALITY ASSURANCE

- A. Comply with applicable portions of National Electrical Manufacturers Association standards pertaining to metallic and nonmetallic conduit, duct and EMT.
- B. Comply with applicable portions of Underwriters' Laboratories safety standards pertaining to electrical raceways; and provide products which have been UL listed and labeled.
- C. Comply with National Electrical Code (NFPA No. 70) as applicable to construction and installation of electrical raceways.
- D. Raceways shall be marked with the manufacturer's name or trademark as well as type of raceway and size. This marking shall appear at least once every 10 feet and shall be of sufficient durability to withstand the environment involved. All raceways shall be furnished and installed as outlined under the following sections of this Specification.

1.4 SUBMITTALS

- A. Submit manufacturer's standard data sheets for rigid metal conduit, EMT, wireways, rigid PVC conduit, flexible metal conduit, bitumastic coatings and fittings for all types of raceways.

1.5 MATERIAL

- A. Types/acceptable manufacturers of electrical raceways:

Electrical metallic tubing – Allied Tube, Wheatland Tube

Liquid tight flexible metal conduit – Allied Tube, Eastern Wire

Rigid steel conduit – Allied Tube, Maverick Tube

Rigid aluminum conduit – Wheatland Tube, Allied tube, Indalex

Wireways – Square "D"; Cooper B-Line

Rigid PVC conduit – Carlon, Allied Tube, Can Tex

B. For each electrical raceway system indicated, provide assembly of conduit, tubing or duct, and fittings, including, but not necessarily limited to, connectors, couplings, offsets, elbows, straps, bushings, expansion joints, hangers, and other components and accessories needed for a complete system.

(1) Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) for each service indicated. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements, and comply with applicable portions of National Electrical Code for electrical raceways.

a. Provide threaded steel conduit and fittings in accordance with U.L. 6 and ANSI C80.1, zinc coated or coated with and approved corrosion resistant coating on inside. Conduits not completely encased in concrete but laid directly in or in contact with ground or on a vapor barrier shall be field coated on outside with asphaltum before installation or shall have an additional outside factory coating of polyvinyl chloride or phenolic resin epoxy material or other equally flexible and chemical resistant material.

b. Provide electrical metallic tubing, EMT and fittings in accordance with U.L. 797 and ANSI C80.3, zinc coated on outside and either zinc coated or coated with an approved corrosion resistant coating on inside.

c. Liquid tight flexible metal conduit shall consist of a core of flexible galvanized steel tubing over which is extruded a liquid tight jacket of poly vinyl chloride (PVC). Liquid tight flexible conduits not larger than 1 1/4 inch size shall be provided with a continuous copper bonding conductor wound spirally between convolutions. Products shall comply with U.L. 1 and U.L. 360.

d. Flexible metal conduit (commercial Greenfield) and fittings shall be in accordance with U.L. 1 and U.L. 1479.

e. Fittings for threaded steel and thin wall (EMT type) conduit shall be either iron or steel only.

f. Compression type threadless fitting shall not be used with threaded steel conduit. Where it is impractical (due to limited working space when employing normal installation practices) to use common construction tools for installation of threaded steel conduit with standard couplings, locknuts and bushings, steel set screw connectors and couplings will be permitted provided they meet the following requirements: body of steel set screw connector and coupling shall have a wall thickness at least equal to wall thickness of conduit with which it is to be used. Set screws shall be of case hardened steel with hex head, and with cup point to firmly seat in wall of conduit for positive ground. Set screws shall be tightened to embed in conduit wall. Tightening screws with pliers will not be permitted.

1/2 through 2 inch connectors shall have one set screw each.

2 1/2 through 4 inch connectors shall have two set screws each.

1/2 through 2 inch couplings shall have two set screws each.

2 1/2 through 4 inch couplings shall have four set screws each.

Conduit nipples with running threads shall not be used.

g. Couplings and connectors for EMT shall be made of either steel or malleable iron only, shall be "Concretetight" or "Raintight" and shall be of either gland and ring compression

type, or stainless steel multiple point locking type. All connectors shall have insulated throats. Fittings using indentations as a means of attachment shall not be used.

h. Bushings for threaded steel conduit and connectors for EMT shall be insulated type, designed to prevent abrasion of wires without impairing continuity of conduit grounding system. Insulating insert shall be made of thermosetting or fiber material which conforms to flame test requirements of UL 514, molded or locked into metallic body of fitting. Conduit bushings made entirely of nonmetallic material shall not be used.

i. Fittings for liquid tight flexible conduit shall be in accordance with U.L. 1 and U.L. 360 of a type incorporating a threaded grounding cone, a steel, nylon or equal plastic compression ring, and a gland for tightening. Fitting shall be made of either steel or malleable iron only, shall have insulated throats and shall be of a type having a male thread and locknut or male bushing with or without "O" ring seal.

j. Die cast zinc alloy fittings and fittings made of inferior materials, such as "pot metal", shall not be used on any type of rigid or flexible conduit or EMT.

(2) Wireways

a. Provide wireways of sizes indicated. Constructed of galvanized steel with screw on covers and knockouts approximately 6" o.c. Provide raceway fittings indicated which match and mate with raceway. Finish wireways with gray epoxy paint over corrosion resistant primer.

b. Use wireways only where indicated on Drawings.

c. Effectively ground all wireways.

(3) PVC Conduit

a. Provide nonmetallic conduit, ducts and fittings of types, sizes and weights (wall thicknesses) for each service indicated. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements, and comply with applicable portions of National Electrical Code for electrical raceways. Products shall be in accordance with NEMA TC-2 and U.L. 651.

b. PVC Conduit and Tubing Fittings: NEMA Standards Pub. No. TC 3 and U.L. 514B.

c. Except as otherwise indicated, provide conduit, tubing and duct accessories of types, sizes, and materials indicated, including, but not necessarily limited to, hangers, clamps, rollers, traps, fasteners, brackets, expansion and deflection fittings, complying with manufacturer's published product information, and designed and constructed by manufacturer for use in applications indicated.

(4) Provide watertight hub connections at all conduits connecting to NEMA 3R or 4 enclosures. Myers or equal.

(5) Aluminum Conduit

a. Aluminum conduit shall be extruded from alloy 6063 and shall be the rigid type, non-toxic, corrosion resistant, and non-staining. It shall be manufactured per UL standards as well as listed/labeled by same.

b. Fittings, boxes and accessories used in conjunction with aluminum conduit shall be die cast aluminum, copper free type. They shall be resistant to both chemical and galvanic corrosion. All covers shall have neoprene gaskets.

- c. Standard threaded couplings, locknuts, bushings, and elbows made only of aluminum alloy materials. Aluminum fittings containing more than 0.4 percent copper are prohibited.
- d. Locknuts and bushings: As specified for rigid steel conduit, except of aluminum materials.
- e. Set screw fittings: Not permitted for use with aluminum conduit.

C. Conduit Supports

(1) Pipe straps and supports shall be PVC coated steel in pipe galleries and chemical feed rooms. All others shall be zinc coated steel.

(2) Provide individual pipe hangers, multiple (trapeze) pipe hangers, and riser clamps as necessary to support conduits. All parts and hardware shall be zinc coated throughout. Provide all U bolts, clamps, attachments, and other hardware necessary for hanger assembly, and for securing hanger rods and conduits. Design each multiple hanger to support a load equal to or greater than sum of weights of conduits, wires, hanger itself, and 200 pounds.

(3) Fasten pipe straps and hanger rods to surfaces as specified under "Support of Electrical Items" paragraph in the 'ELECTRICAL, GENERAL PROVISIONS' section.

(4) All EMT and conduits not embedded in concrete or masonry shall be securely and independently supported so that no strain will be transmitted to outlet box and pull box supports. Supports shall be rigid enough to prevent distortion of conduits during wire pulling.

(5) Support individual horizontal conduits by one hole pipe straps or separate pipe hangers for sizes 1 1/2 inch and smaller, and by separate pipe hangers for larger sizes. Spring steel fasteners may be used in lieu of pipe straps or hangers for sizes 1 1/2 inch and smaller in dry locations only. Hanger rods used with spring steel fasteners shall be not less than 1/4 inch diameter steel with corrosion resistant finish. Spring steel fasteners shall be specifically designed for supporting single conduits or EMT. Unless otherwise specified, do not use wire as a means of support.

(6) Where two or more horizontal conduits or EMT run parallel and at same elevation, they shall be supported on multiple (trapeze) pipe hangers. Secure each conduit or EMT to horizontal hanger member by a U bolt, one hole strap or other specially designed and approved fastener.

(7) Branch circuit conduits and raceways above suspended ceilings may be supported from floor construction above or from main ceiling support members, however, finished installation shall not interfere with removability of ceiling panels.

1.6 INSTALLATION

A. Install conduit, tubing and wireway products as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and complying with recognized industry practices to ensure that products serve intended functions. Handle conduit and tubing carefully to prevent bending and end damage, and to avoid scoring finish. Store pipe and tubing inside and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, watertight wrapping. Provide color coded end cap thread protectors on exposed threads of metal conduit.

B. Conduit buried in concrete shall be rigid steel unless otherwise indicated. Do not install EMT underground, in slabs on grade, in wet locations, in hazardous areas, or for circuits operating at more than 600 volts. Do not use EMT in concrete placements where vibrators will be used. Metallic conduit buried in concrete shall be threaded steel only. Outside diameter of conduit buried in concrete shall not exceed one third of the thickness of structural slab, wall or beam in which it is placed. Locate conduit

entirely within middle third of member wherever possible. Lateral spacing of conduits buried in concrete slabs shall be not less than three diameters except where drawings definitely indicate that concrete slab has been specially designed to accommodate a closer spacing of conduits entering wire closets, panelboards, or electrical boxes or arrangements is approved by Engineer.

C. Use flexible conduits for connections to motors and other electrical equipment when it is subject to movement, vibrations, misalignment, cramped quarters or where noise transmission is to be eliminated or reduced. Flexible conduit used to meet the above requirements shall in addition be liquid tight type when installed under any of the following conditions:

- (1) Exterior locations
- (2) Moisture or humidity laden atmosphere where it is possible for condensation to accumulate.
- (3) Corrosive atmosphere.
- (4) Where water or spray due to wash down operations is frequent or possible.
- (5) Wherever there is a possibility of seepage or dripping of oil, grease, or water.

D. Run concealed conduit and EMT in as direct lines as possible with a minimum number of bends of longest possible radius. Run exposed conduits and EMT parallel to or at right angles to lines of building. All bends shall be free from dents or flattening.

E. Conduit and EMT runs shall be mechanically and electrically continuous from service entrance to all outlets. Unless otherwise specified, each conduit shall enter and be securely connected to a cabinet, junction box, pull box or outlet box by means of a locknut on outside and a bushing on inside or by means of a liquid tight, threaded, self locking, cold weld type wedge adapter. Where nominal circuit voltage exceeds 250 volts, (1) in rigid conduit, an additional locknut shall be provided, one locknut being inside and one locknut outside and (2) in EMT or flexible metal conduit, the one locknut shall be made wrench tight. All locknuts shall be bonding type with sharp edges for digging into metal wall of an enclosure and shall be installed in a manner that will assure a locking installation. Locknuts and bushings or self locking adapters will not be required where conduits are screwed into tapped connections. All vertical runs of conduit or EMT terminating in bottoms of wall boxes or cabinets shall be protected from entrance of foreign material prior to installation of conductors.

F. The minimum size of threaded conduit, EMT, and flexible metallic conduit shall be 3/4" except as follows:

- (1) Unless otherwise specified or indicated on drawings.
- (2) Unless otherwise indicated on Drawings, telephone, telemetry and control circuit conduits shall be not less than 1 inch trade size.

G. Check size of all raceways to determine that green equipment ground conductor, specified, indicated or required can be installed in same raceway with phase and neutral conductors in accordance with percentage of fill requirements of NEC. If necessary, sizes of duct, conduit, tubing or raceway indicated or specified shall be increased to accommodate all conductors without additional cost to Owner.

H. Unless otherwise specified or indicated on Drawings, all conduit and EMT shall be installed concealed. Unless otherwise indicated on Drawings, conduit and EMT may be run exposed on unfinished walls, on unfurred basement ceilings, in penthouses, attics and roof spaces.

I. In wood construction, run conduits and EMT in rough underflooring, on top of joists or between joists. Furring strips may be notched at any point but joists may be notched only at points not more than one foot from a point of support and notches may not be deeper than 1 3/8". Conduits and EMT may be run exposed on bottoms of joists only in unfinished rooms where permitted by Engineer.

J. Horizontal cross runs of conduit or EMT may be installed in partitions only where explicitly permitted by Architect. Install exposed horizontal runs, where permitted, close to ceiling or ceiling beams and above water, steam or other piping. Run conduits and EMT connected to wall outlets in such a manner that they will not cross water, steam or waste pipes or radiator branches. Do not run conduits and EMT through beams, except where clearly indicated on Drawings or where permitted by Architect.

K. Install every conduit system complete before conductors are drawn in.

L. Expansion Fittings: Each conduit that is buried in or rigidly secured to building construction on opposite sides of a building expansion joint and each long run of exposed conduit that may be subject to excessive stresses shall be provided with an expansion fitting. Expansion fitting shall be made of hot dipped galvanized malleable iron and shall have a factory installed packing, which will prevent entrance of water, a pressure ring, and a grounding ring.

(1) In addition to grounding ring, provide a separate external copper bonding jumper secured by grounding straps on each end of fitting.

(2) Where conduits are buried in concrete, they shall cross building expansion joints at right angles, and expansion fittings shall be installed in accordance with manufacturer's instructions. Provide free ends of conduits with insulated bushings.

M. Sealing Fittings: Sealing fittings for use with threaded steel conduits shall be threaded, zinc or cadmium coated and cast or malleable iron type fittings. Fittings used to prevent passage of water vapor shall be of the continuous drain type.

(1) Install and seal sealing fittings in accordance with manufacturer's recommendations at suitable, approved, accessible locations. In concealed work, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates.

(2) Install sealing fittings at the following points, and elsewhere as indicated.

a. Where conduits enter or leave hazardous areas equipped with explosion proof lighting fixtures, switches or receptacles to prevent passage of explosive vapors.

b. Where conduits pass from warm locations to cold locations, such as refrigerated spaces and air conditioned spaces, to prevent passage of water vapor.

c. Where required by NEC.

N. Expansion and Deflection Couplings

(1) Accommodate 1.9 cm (0.75 inch) deflection, expansion, or contraction in any direction and allow 30 degree angular deflections.

(2) Include internal flexible metal braid sized to guarantee conduit ground continuity and fault currents in accordance with UL, and the NEC code tables for ground conductors.

(3) Watertight, seismically qualified, corrosion-resistant, threaded for and compatible with rigid metal conduit.

(4) Jacket: Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber material and stainless steel jacket clamps.

1.7 SPECIAL INSTALLATION INSTRUCTIONS

A. The following installation requirements are specific to this project and shall be strictly enforced.

(1) All exterior below grade conduits shall be Schedule 80 PVC except as noted on Drawings for telephone and power company circuits. Above grade shall be rigid aluminum. Rigid steel below grade shall be asphaltum coated with minimum two (2) coats Carboline Bitumastic 50 or equal.

(2) All conduit installed within pump station building except chemical feed rooms shall be rigid aluminum.

(3) Aluminum conduit in contact with concrete and/or where installed below grade or in direct contact with concrete shall have polytape applied per Section 16200.

(4) All conduit in Aqua Ammonia room shall be PVC.

(5) All conduit with Chlorine Feed shall be PVC.

END SECTION

SECTION 16120 - CABLE, WIRE AND CONNECTORS

1.1 RELATED DOCUMENTS

A. General provisions of Contract, General and Supplementary Conditions and General Requirements apply to work specified in this section.

B. Requirements of Electrical General Provision Sections govern this Section, where applicable.

C. This section shall be governed by Alternates insofar as they affect this work.

1.2 DESCRIPTION OF WORK

A. Provide labor, materials, equipment and services necessary for proper and complete installation of cable, wire and connectors.

B. Requirements of this section apply to cable and wire work specified elsewhere in these specifications.

1.3 QUALITY ASSURANCE

A. Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of electrical cable, wire and connectors.

B. Provide electrical cable, wire and connectors which have been listed and labeled by Underwriters Laboratories.

C. Comply with National Electrical Manufacturers Association/Insulated Power Cable Engineers Association Standards publications pertaining to materials, construction and testing wire cable, where applicable.

D. Manufacturers offering products complying with requirements include:

- (1) Cable and Wire:
 - Paige Pump Wire
 - Southwire Company
 - Triangle PWC, Inc.
 - Belden
 - Clifford of Vermont

E. Connectors:

- Buchanan
- Burndy Corporation
- 3M Company

Thomas and Betts Co.

King Innovation

1.4 SUBMITTALS

- A. Submit manufacturer's product data on all 4-20MA signal cables and Telemetry System shielded cables.
- B. Submit manufacturer's product data for watertight wire connectors.

1.5 MATERIALS

A. Cable and Wire

(1) Provide factory fabricated cable, wire and connectors of sizes, ratings, materials and types indicated for each service. Where not indicated, provide proper selection as determined by equipment manufacturer to comply with project's equipment installation requirements and NEC standards, including equipment control and instrumentation requirements.

(2) Use single conductor annealed copper type for all wires and cables for secondary service, feeders and branch circuits, unless specified otherwise.

(3) Use No. 12 or No. 10 solid conductor for branch circuit wiring connected to receptacles, lighting switches and snap switches.

(4) Use minimum 75 degrees C rated insulation unless specified otherwise, indicated on Drawings, or required by NEC.

(5) Wire #12 - #1 shall be applied based on a 60 degree Celsius temperature rise. Building wire larger than #1 may be applied at its 75 degree Celsius temperature rise.

(6) Use 600 volt insulation rating unless specified or indicated otherwise. Where operating voltage is less than 100 volts, wires or cables may be insulated for 300 volts provided they are isolated from higher voltage systems.

B. Use (1) 16 ga. twisted/shielded pair cable for 4-20ma signal circuits from flow, level, alarm transmitters, V.F. drives, etc. Cable shall be Belden No. 8719, or General Cable type VNTC with 100% shield coverage and stranded/tinned 18 ga. drain wire, 600V rated.

C. Valves, valve controllers, start-stop selector switches, etc. Use minimum 75 degrees C rated insulation unless specified otherwise, indicated on Drawings, or required by NEC. Use 600 volt insulation rating unless specified or indicated otherwise.

D. Connectors

(1) All power circuit wire connectors for wiring #6 AWG and smaller shall be made using watertight type connectors which have been prefilled with silicone sealant. Connectors shall have lifetime guarantee and be UL 50 raintight/watertight listed. Connectors shall have a temperature rating of 105 degrees C. minimum and silicone sealant shall be rated for -45 to 400 degrees F.

(2) Watertight type wire connectors shall be King Innovation DryConn or equivalent.

E. Electrical Lugs

(1) Lugs from #6 AWG - 1000 MCM shall be compression types with barrels to provide maximum conductor contact and tensile strength. They shall be manufactured from high conductivity copper and entirely tin plated. The lugs must have a current carrying capacity equal to the conductors for which they are rated and must also meet all UL requirements. All lugs above 4/0 shall be 2 hole lugs with NEMA spacing. The lugs shall be rated for operation through 35 KV. The lugs shall be of closed end construction to exclude moisture migration into the cable conductor.

1.6 INSTALLATION

A. Install electrical cable wire and connectors as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure products serve intended functions.

B. Store cable, wire and connectors in factory installed coverings in a clean, dry indoor space which provides protection against weather.

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

D. Use pulling compound or lubricant, when necessary; compound must not deteriorate conductor and insulation.

E. Do not use a pulling means, including fish tape, cable or rope which can damage raceway.

F. Install exposed cable, parallel and perpendicular to surface or exposed structural members and follow surface contours, where possible.

G. Color Code: All secondary service, feeder and branch circuit conductors throughout projects as follows:

208Y/120 volts	Phase	480y/277 volts
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	White
Green	Ground	Green

H. Keep conductor splices to a minimum.

I. Install splices and taps for power wiring which has equivalent or better mechanical strength and insulation as conductor.

J. Use splice and tap connectors on power wiring which is compatible with conductor material.

K. Do not install more than three conductors in any one splice.

L. Install poly pull line in all spare/empty conduits.

M. Prior to energization, check cable and wire for continuity of circuitry and for short circuits. Correct malfunction when detected.

N. Subsequent to wire and cable hook ups, energize circuitry and demonstrate functioning in accordance with requirements.

O. Multi conductor cables shall not be spliced but shall run continuous from point of supply to equipment connection.

P. Shielded pair cable shall be grounded at one end only and as close to signal source as possible.

Q. A minimum separation of 12 inches between analog signal leads and a-c power leads should be maintained. For a-c power leads carrying 100 amps or greater, a 24 inch separation should be maintained. Parallel runs should be limited to less than 500 feet. Perpendicular runs may be as close as 6 inches.

1.7 SPECIAL INSTALLATION INSTRUCTIONS

A. Wire or cable splices for control and instrumentation circuits shall not be accepted.

B. Do not install any control or instrumentation cable or wiring in same conduit or J-box with electrical power wiring, unless otherwise noted.

C. NOTE: Electrical Contractor shall be responsible for providing and installing all power, control and instrumentation wiring and cable from all remote devices to their respective system control panels. This shall include the termination of wires/cables on both ends and installation of wire No. markers.

END SECTION

SECTION 16130 - ELECTRICAL BOXES AND FITTINGS

1. RELATED DOCUMENTS

- A. General provisions of contract General and Supplementary Conditions and General Requirements.
- B. Requirements of Electrical General Provision Sections govern this Section, where applicable.
- C. This Section shall be governed by Alternates insofar as they affect this work.

2. DESCRIPTION OF WORK

- A. Provide labor, materials, equipment, and services for proper and complete installation of electrical boxes and fittings.
- B. Extent of electrical box and electrical fitting work is indicated by drawings and schedules, and requirements of this section.

3. QUALITY ASSURANCE

- A. Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of electrical boxes and fittings.
- B. Provide boxes and fittings which have been listed and labeled by Underwriters' Laboratories.
- C. Comply with National Electrical Manufacturers Association standards as applicable to non-metallic fittings for underground installation.

4. MATERIAL

- A. Provide boxes, cabinets, and fittings as indicated on Drawings, schedules, and as required for job.
- B. Interior Outlet Boxes: Provide galvanized steel interior outlet wiring boxes, of type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices.
- C. Interior Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations. Choice of accessories is Installer's option.
- D. Weatherproof Outlet Boxes: Provide corrosion resistant cast metal weatherproof outlet wiring boxes, of type, shape and size, including depth of box, with threaded conduit ends and cast metal face plate, including face plate gasket and corrosion proof fasteners.
- E. Junction and Pull Boxes: Provide galvanized sheet steel junction and pull boxes, with screw on covers; of type, shape and size, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
- F. Conduit Bodies: Provide galvanized or aluminum cast metal conduit bodies, of type, shape, and size, to suit each respective location and installation, constructed with threaded conduit ends, removable cover, and corrosion resistant screws.

G. Bushings, Knockout Closures and Locknuts: Provide corrosion resistant punched steel box knockout closures, conduit locknuts and malleable iron conduit bushings of type and size to suit each respective use and installation.

H. Acceptable Manufacturers

(1) Appleton, Crouse-Hinds, Hoffman and T&B or equal.

5. INSTALLATION

A. Install electrical boxes and fittings as indicated, or in compliance with NEC requirements, in accordance with manufacturer's written instructions and with recognized industry practices to ensure that boxes and fittings serve intended purposes.

B. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture exposure.

C. Provide knockout closures to cap unused knockout holes where blanks have been removed.

D. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.

E. Avoid using round boxes where conduit must enter box through side of box, which would result in a difficult and insecure connection with a locknut or bushing on rounded surface.

F. Secure boxes rigidly to substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.

G. Do not use sectional (gangable) boxes.

H. Use threaded hub type outlet boxes (NEMA 4X) with gasketed weatherproof covers and stainless steel hardware where surface mounted at following locations:

(1) Exterior locations

(2) Where exposed to moisture laden atmosphere

(3) Where indicated on drawings

(4) At pump station and valve vault areas.

I. Measure mounting height from finished floor or finished grade to center line of cover plate.

J. NEMA 4 junction and pull boxes shall be stainless steel, unless otherwise noted.

K. Junction boxes for use in wet-wells and other hazardous areas shall be water tight, rust proof, corrosion resistant, and explosion proof with threaded conduit openings (5 ½ full threads - minimum) and provided with rust proof hardware.

L. Explosion proof sealing fittings shall be furnished and installed in accordance with NEC requirements.

M. Outlet or junction boxes for use with exposed aluminum conduit shall be copper free, cast aluminum type, or stainless steel.

N. Saw cut openings for boxes in exposed masonry walls.

END SECTION

SECTION 16135 - ELECTRICAL EQUIPMENT SUPPORTS

1. RELATED DOCUMENTS

- A. General provisions of contract General and Supplementary Conditions and General Requirements.
- B. Requirements of Electrical General Provision Sections govern this Section, where applicable.
- C. This Section shall be governed by Alternates insofar as they affect this work.

2. DESCRIPTION OF WORK

- A. Provide labor, materials, equipment, and services for proper and complete installation of electrical equipment supports.

3. QUALITY ASSURANCE

- A. Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of electrical equipment supports.
- B. Provide fittings which have been listed and labeled by Underwriters' Laboratories.
- C. Acceptable Manufacturers: Kindorf, Unistrut, Allied or equal.

4. MATERIALS

- A. All exterior and interior mounting brackets and strut shall be aluminum. Fasteners used to mount equipment where exposed to weather or in corrosive environments shall be non-magnetic stainless steel.

5. INSTALLATION

- A. All electrical equipment shall be rigidly mounted, and installed using supporting devices as indicated on the Contract Drawings, as required by the work, and described herein.
- B. All free standing equipment shall be anchored to its foundation using expansion bolts with stainless steel fasteners of the size and number recommended by the equipment manufacturer.
- C. Where required, seismic restraints shall be provided for electrical equipment.

END SECTION

SECTION 16140 - WIRING DEVICES

1. RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions and General Requirements.
- B. Requirements of Electrical General Provision sections govern this Section, where applicable.
- C. This section shall be governed by alternates insofar as they affect this work.

2. DESCRIPTION OF WORK

Provide labor, material, equipment and services for proper and complete installation of wiring devices.

3. QUALITY ASSURANCE

- A. Comply with National Electrical Code (NFPA No. 70) as applicable to construction and installation of electrical wiring devices.
- B. Provide electrical wiring devices which have been tested, listed and labeled by Underwriters' Laboratories.
- C. Comply with National Electrical Manufacturers Association standards for wiring devices.

4. SUBMITTALS

- A. Submit manufacturer's data on wiring devices and plates.
- B. Device manufacturers other than those listed below must have ten day written prior approval.
- C. It is the responsibility of the contractor to provide data that devices are equal other than by catalog numbers.

5. MATERIAL

A. Provide factory-fabricated wiring devices, in type, color, and electrical rating for service indicated and as described below. Where type and grade are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements, and comply with NEC and NEMA standards for wiring devices.

B. Devices and Plates

(1) All non-weatherproof metal wall plates shall be smooth anodized aluminum, coated to prevent oxidation, unless otherwise noted. Plates a manufactured by Hubbell "A" type or equal.

(2) All devices in dusty and or wet locations shall use weatherproof corrosion resistant cover plates of cast aluminum, rustproof, weatherproof, with spring loaded cover for receptacle and external handle or neoprene cover for switch. Similar to Hubbell 1795 for switches and cast aluminum WP8M or WP26MH in-use type for receptacles.

(3) All switches and standard receptacles in process, control, lab and equipment rooms shall be grey in color with aluminum faceplates unless otherwise noted.

(4) All switches and standard receptacles in offices, reception areas, restrooms, public corridors and conference/meeting rooms shall be grey in color with aluminum faceplates.

(5) All corrosion resistant standard receptacles shall be yellow in color. Corrosion resistant GFCI receptacles shall be grey in color. All faceplates/covers for corrosion resistant devices shall be aluminum.

(6) All device plates in chlorine rooms shall be smooth impact resistant nylon equal to Hubbell "P" Series.

(7) All receptacles installed outdoors shall be "WR" rated and shall bear this mark.

C. Switches

(1) All switches shall be 20 ampere for 120/277 volt AC lighting circuits.

(2) All switches shall be specification grade side wired.

(3) Switches shall be of the following mfg.

	HUBBELL	BRYANT
Single Pole	CS120	1121
Double Pole	1122	1122
Three-Way	C5320	1123
Four-Way	1124	1124
Pilot Light	1121-PL	1121-PL

D. Receptacles

(1) GFCI Receptacles

a. Ground fault shall have solid state sensing circuitry and a circuit interrupter switch. It shall be rated for operation on a 60 Hz, 120V, 20A branch circuit. Device shall have nominal sensitivity to ground leakage current of four to six milliamperes and shall function to interrupt the current supply for any value of ground leakage current above five milliamperes on load side of the device. Device shall have a minimum nominal tripping time of 1/30th of a second. All GFCI receptacles shall meet 2006 UL requirements.

b. Device shall be of the following mfg.

	HUBBELL	BRYANT	PASS & SEYMOUR
15A-125V 5-15R	GF5252	GF5262	1595TRICC4
20A-125V 5-20R	GF5352	GF5362	2095TRI

(2) Duplex Receptacles - Specification Grade

a. All receptacles shall be specification grade unless otherwise noted.

b. Receptacles shall be either 5-15R 15A, 125V 2-pole, 3-wire or 5-20R 20A, 125V, 2 pole, 3-wire as required.

c. Receptacles shall have the following characteristics:

1) "T" type contacts for phase and neutral female connections.

2) Female ground connections shall be riveted to bridge.

- 3) Bridge shall be of hot-dipped steel.
- 4) Face plate shall be impact resistant nylon.
- 5) Receptacle body shall be of heat resistant thermoset material.
- 6) Face plate to bridge connecting rivet shall be spun brass.
- 7) Automatic self grounding clip.
- 8) Receptacles shall be of the following mfg.

	HUBBELL	BRYANT	PASS & SEYMOUR
15A 125V 5-15R	5252	5262	5262
20A 125V 5-20R	5352	5362	5362

(3) **Duplex Receptacles - Corrosion Resistant**

- a. Receptacles shall be 5-20R 20A, 125V, 2 pole, 3-wire as required.
- b. Receptacles shall have the following characteristics:
 - 1) "T" type contacts for phase and neutral female connections.
 - 2) Female ground connections shall be riveted to bridge.
 - 3) Bridge shall be of nickel plated brass.
 - 4) Face plate shall be impact resistant nylon.
 - 5) Receptacle body shall be of heat resistant thermoset material.
 - 6) Face plate to bridge connecting rivet shall be spun brass.
 - 7) Automatic self grounding clip.
 - 8) Receptacles shall be of the following mfg.

	HUBBELL
15A 125V 5-15R	HBL53CM62 (Marine Grade)

(4) **GFCI Receptacles - Corrosion Resistant**

- a. Corrosion resistant GFCI receptacles shall be hospital grade.
 - 1) Hubbell GF8300A or approved equal.

6. **INSTALLATION**

A. Install wiring devices where indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices to ensure that products serve intended function.

- B. Delay installation of devices until wiring is completed.
- C. Install receptacles and switches only in electrical boxes which are clean; free from excess building materials and debris.
- D. Install receptacles with ground pin on top.
- E. All devices and plates shall be of the same manufacturer.
- F. Do not use sectional plates.
- G. Upon installation of wall plates, receptacles and switches, advise Contractor regarding proper and cautious use of convenience outlets. At time of Substantial Completion, replace those items which have been damaged, including those burned and scored by faulty plugs.
- H. Test wiring devices to ensure electrical continuity of grounding connections, and after energizing circuitry, to demonstrate compliance with requirements.
- I. All outlet boxes shall have a cover plate.

END SECTION

SECTION 16150 - MOTORS

1.1 RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions, and General Requirements, apply to this Section.
- B. Requirements of Electrical General Provisions sections govern work specified in this Section.
- C. This section shall be governed by alternates insofar as they affect this work.

1.2 DESCRIPTION OF WORK

- A. Provide labor, materials, equipment and services necessary for proper and complete installation of motors.
- B. Motors are to be furnished with driven equipment. All motors shall conform to the following Specifications and any special requirements of the driven equipment. Special requirements of the driven equipment shall take precedence over these Specifications should a discrepancy occur. Starting torque and slip ratings shall conform to the requirements of the driven equipment. [All motors 15 horsepower and larger (230 volt) or 25 horsepower and larger (480 volt) shall be started via solid state reduced voltage starters unless otherwise noted on the Contract Drawings.]
- C. Polyphase motors shall be of the squirrel cage induction type and single phase of the capacitor start-induction run type except as otherwise noted.

1.3 QUALITY ASSURANCE

- A. Manufacturers offering products complying with requirements include:
 - General Electric
 - Westinghouse
 - U.S. Motors
 - Gould Century
 - Baldor
 - Marathon
 - Reliance
 - Magnatek
 - Siemens
 - Or Equal
- B. Provide motors which have been listed and labeled by Underwriters Laboratories.

- C. Comply with National Electrical Code (NFPA No. 70) as applicable to installation and construction of electrical power/distribution transformers.
- D. Comply with applicable portions of National Electrical Manufacturers Association Standards ST20 pertaining to power/distribution transformers.
- E. Comply with applicable American National Standards Institute (ANSI) standards pertaining to power/distribution transformers.
- F. Comply with applicable portions of Institute of Electrical and Electronic Engineers (IEEE) standards pertaining to motors.

1.4 SUBMITTALS

- A. Shop drawings shall consist of motor dimensions, name-plate data from each motor and tests as outlined above. Also included shall be efficiency and power factor at 100, 75, and 50 percent load. Operation, maintenance, and lubrication information (including bearing catalog numbers) shall be submitted with shop drawings for review.

1.5 EQUIPMENT

- A. Motors 200 Horsepower and Under for Service Under 600 Volts

- (1) Ratings and Electrical Characteristics

- a. Time: All motors shall be rated for continuous duty.
- b. Temperature: Based on NEMA standards for a maximum ambient temperature of 40 degrees Celsius and an altitude of 3,300 feet or less, according to service factor and insulation class employed.
- c. Voltage: All single phase motors shall be rated 120/208/230 volts and all polyphase motors 230/460 volts. All motors shall be capable of normal operation at balanced voltages in the range of ± 10 percent from rated winding voltage.
- d. Frequency: All a-c motors shall be rated for 60 Hz. operation. All motors shall be capable of normal operation at frequencies 5 percent above or below the nominal rating of 60 Hz.
- e. Horsepower: Horsepower of the motors shall be as given in the specification division on the driven equipment or as shown on the Contract Drawings. Submersible motors shall be allowed to be furnished even though the horsepower rating may not be in accordance with standard NEMA assignments. In many cases, the horsepower specified is a minimum requirement and certain alternate manufacturers may require larger horsepower motors. The larger motor shall be furnished at no extra cost to the OWNER.
- f. Locked Rotor Current: Locked rotor current shall be in accordance with NEMA standards.
- g. Efficiency and Power Factor: Efficiency and power factor shall be given consideration during shop drawing review. The ratings at full, 3/4, and 1/2 load shall be compared to similar motors manufactured by acceptable

suppliers listed in these Specifications. Excessive variation shall be considered grounds for rejection.

- h. Speed: Synchronous speed of motors shall correspond to standard NEMA ratings. Actual speed shall be as given in the specification division on the driven equipment. Slip shall not exceed 5 percent at full load.
- i. Service Factor: The service factor shall be 1.0 unless requirements of the driven load necessitate a higher service factor.
- j. Insulation Class: Insulation class for submersible motors shall be NEMA Class F. Motors to be operated at variable speed shall also be Class F. Class F insulated motors shall operate at a Class B rise at nameplate horsepower loading.
- k. Design Level: Motors shall be NEMA design B, except as otherwise noted.
- l. Enclosure: Submersible motors shall be air [or oil filled] and of watertight construction.
- m. Frame Size: Frame designations shall be in accordance with NEMA standards.
- n. Winding Over-temperature Sensors: All submersible motors shall be provided with motor winding thermostats. The devices shall be hermetically sealed, snap-acting thermal switches, actuated by a thermally responsive bi-metallic disk. A minimum of 1 per phase is required; with switches wired into the control circuit of the starter to provide de-energization should overheating threaten.
- o. All submersible pump/motor assemblies shall be equipped to detect presence of moisture and alarm at the controller.
- p. Motors to be controlled by VFD's shall be inverter duty rated, NEMA MG-1.

(2) Mechanical Characteristics

- a. Submersible Motor Construction
 - 1) See Equipment Specifications.

(3) Tests, Nameplates and Shop Drawings

- a. Tests
 - 1) Tests shall be required on integral horsepower motors only. A factory certified test report of "electrically duplicate motors previously tested" shall be supplied on all motors under 200 horsepower. The test shall be certified by the factory and shall contain a statement to the effect that complete tests affirm the guaranteed characteristics published in the manufacturer's catalogs or descriptive literature.

2) Tests will be in accordance with IEEE test procedures.

b. Nameplates

1) Each motor shall have a permanently affixed nameplate of brass, stainless steel, or other metal of durability and corrosion resistance. The data contained on the nameplate shall be in accordance with NEMA standards.

(4) Efficiency Requirements

a. The following motor full load efficiency requirements shall be met as a minimum for premium efficiency totally enclosed 3 phase integral horsepower motors (per NEMA test Methods):

Horsepower	Nominal	Nominal	Nominal	Nominal
	3600 RPM	1800 RPM	1200 RPM	900 RPM
	(Minimum %)	(Minimum %)	(Minimum %)	(Minimum %)
1		77.0	72.0	68.0
1.5	75.5	78.5	80.0	72.0
2	78.5	80.0	80.0	80.0
3	80.0	81.5	81.5	78.5
	82.5	82.5	82.5	81.5
7.5	82.5	85.5	85.5	82.5
10	85.5	85.5	85.5	85.5
15	85.5	86.5	87.5	86.5
20	86.5	88.5	87.5	87.5
25	87.5	89.5	88.5	87.5
30	87.5	89.5	89.5	88.5
40	88.5	90.2	90.2	88.5
50	88.5	91.0	90.2	89.5
60	90.2	91.7	90.2	90.2
75	91.0	91.7	91.7	91.7
100	91.7	92.4	91.7	91.7
125	91.7	92.4	91.7	92.4
150	91.7	93.0	93.0	92.4
200	93.0	93.6	93.0	93.0

b. Where indicated on the Contract Drawings or in the Contract Specifications motors shall be of the energy efficient line offered by the motor manufacturer, having comparable performance characteristics to their standard line as far as torque and horsepower are concerned. Efficiency and power factor however, shall be higher than the manufacturer's standard line of motors and shall be documented in the shop drawings submittal in sufficient detail to allow the ENGINEER complete review of what is offered. Motors shall be referred to simply as "premium efficiency" in Specifications and Contract Drawings.

c. All motors to be installed for connection to V.F. drives shall be inverter duty rated, NEMA MG-1.

1.6 INSTALLATION

- A. All electric motors shall be protected against the accumulation of moisture, dust and debris and physical damage during the course of installation of the job.
- B. Handle motors carefully to avoid damage to components, enclosures and finishes. Do not install damaged equipment; replace and return damaged units to equipment manufacturer.
- C. Store motors in a clean dry place and protect from weather and construction traffic.
- D. Install motors in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that motors comply with requirements of National Electrical Code, and applicable portions of ANSI/NEMA standards pertaining to installation of electrical motors and ancillary equipment.
- E. All motors shall be manufactured and installed in accordance with applicable NEMA standards and NEC provisions, latest revisions.

END SECTION

SECTION 16152 - MOTOR CONTROL CENTERS

1. RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions and General Requirements apply to this Section.
- B. Requirements of Section 16000 General Provisions govern work specified in this section.
- C. This section shall be governed by alternates insofar as they apply to this section.

2. DESCRIPTION OF WORK

- A. Provide labor, materials, equipment and accessories necessary for a complete and proper motor control center system.
- B. Unless otherwise specified, required for a particular application, or indicated by details or control diagrams on Drawings, provide each motor with a motor starter.

3. QUALITY ASSURANCE

- A. Comply with National Electrical Manufacturers Association Standards.

4. SUBMITTALS

- A. Submit manufacturer's data on motor control centers.
- B. Submit dimensioned drawings of motor control centers indicating accurately scaled layout of enclosures and required individual devices, including but not necessarily limited to, circuit breakers, fusible switches, fuses, ground-fault circuit interrupters and accessories.

5. EQUIPMENT

A. General

1. Motor Control Centers shall be Square "D" Company Model 6, Crouse-Hinds, Allen-Bradley or equal as approved by this Engineer. The enclosures shall be NEMA 1 with door gaskets unless otherwise noted. Units shall be mounted front-of-board, or back-to-back as shown on the drawings. Wiring shall be NEMA Class I, Type B. Each motor control center shall consist of one or more vertical sections bolted together to form a rigid, free-standing assembly and shall be designed to permit future additions, changes or regrouping of units by the purchaser. Motor control centers shall meet the minimum requirements of the latest published standards of NEMA. Provide separate ground bus.

B. Service

1. Motor Control Centers shall be suitable for operation on 480 volts, 4 wire with ground, 60 hertz service. The control voltage shall be 120 volts at 60 hertz. Horizontal and vertical bus bars shall be braced for 65,000 rms symmetrical amperes. Incoming line feeder conductors shall consist of cables. See plans.

C. Vertical Sections

1. Vertical sections shall be formed of 13 gauge hot rolled steel with uniform blemish-free surfaces. Top and bottom structural parts shall be 10 gauge for a strong and rigid assembly. End closing plates shall be 12 gauge and unit parts and doors shall be 14 gauge. Base channels shall be provided, constructed of rugged steel to easily withstand the stress of transit and moving the control

center into position. Bolt holes in the base channels shall be provided in all sections for the purpose of bolting the control centers to the floor. Steel removable lifting angles, shall be provided on the top of the section(s) for convenience in handling the control center.

2. Each section, to comply with standards of NEMA, shall be approximately 90" high excluding lifting angles and base channels. It shall be 20" deep. Sections housing plug-in units shall be 20" wide. Wider sections will not be permitted.

3. Unit sections shall have horizontal wireways at both top and bottom and shall have 4" wide vertical wireway with separate hinged door. Structures housing a full section control unit are not required to have separate vertical wireway.

4. Where wire access ports between unit spaces and vertical wire trough are open, snap-in block-offs shall be provided to prevent items, such as a fish tape, from accidentally entering the unit space. Snap-in wire grommets shall be provided in wire access ports for Size 2 units and smaller for isolation and added protection of small wires. For larger units snap-in guards shall be provided for added protection of larger wires.

D. Bus Bars

1. Main horizontal bus bars rated not less than 600 amperes shall be provided near the top of the control center and extend its entire length when cut and supplied with splice bars to divide the control center for ease in handling. All current carrying parts of the bus shall be tin plated copper. Horizontal bus bars shall be mounted edge- to-edge to provide greater mechanical strength.

2. Vertical bus bars shall be rated not less than 300 amperes for adequate current carrying capacity in a variety of plug-in applications. Vertical bus bars shall be tin plated copper.

3. Horizontal and vertical bus bars shall be electrolytically tin plated to provide maximum protection in adverse atmospheres. Connections between horizontal and vertical busses shall be joined by bolts, conical spring washers for constant pressure joints and self-clinching nuts to allow joint maintenance using one wrench from the front only.

4. A full length tin plated copper ground bus, rated for 600 amps, shall be provided.

E. Bus Barriers

1. Insulated horizontal and vertical bus barriers shall be furnished to reduce the hazard of accidental contact. These barriers shall have a red color to indicate proximity to energized buses. Vertical bus barriers shall have interlocking front and back pieces to give added protection on all sides and shall segregate the phases from each other to reduce the chance of accidental "flash over." Small separate openings in the vertical bus barriers shall permit unit plug-in contacts to pass through and engage the vertical bus bars. Bottom bus covers shall be provided below the vertical bus to protect the ends of this bus from contact with fish tapes or other items entering the bottom of the enclosure. Unused plug-in openings shall have plastic snap-in closing plates for added safety.

F. Unit Stab Connection

1. Units with circuit breaker disconnects through 250 amp frame and fusible switch disconnects through 200 amps shall connect to the vertical bus through a spring reinforced stab-on connector. Units with larger disconnects shall be connected directly to the main horizontal bus with appropriately sized cable or riser bus.

Stabs on all plug-in units shall be solidly bussed to the unit disconnect. Cabled stab assemblies are not permitted.

2. The stab connection shall be a high quality two point connection for each phase designed to tighten during heavy current surge. For a trouble free connection, fingers shall be silver plated to yield a low resistance connection, and shall be backed by spring steel clips to provide high pressure connection points.

G. Units

1. Each unit shall have a door securely mounted with rugged hinges which allow the door to swing open a minimum of 112 degrees for ease of unit maintenance. Unit doors shall be fastened to the stationary structure so they can be closed to cover the unit space when the units have been temporarily removed. To discourage unauthorized tampering, unit doors shall be held closed under fault conditions. Removable door panels held with captive type screws shall be provided on starter unit doors for mounting selector switches and pilot lights. Blank door panels capable of accepting future pushbutton devices shall be furnished when push button devices are not originally specified for starter units. All starter units shall have an external low profile overload reset button. Additional controls, indicating devices and alarms shall be supplied as specified.

2. All plug-on units shall utilize a two stage type operating mechanism which will allow the unit to disengage from the power bus without withdrawing the unit from the motor control center.

3. A single standard padlock shall be able to lock the unit in the RETRACT position, and simultaneously lock the disconnect in the "off" position. When in this position, it shall be possible to close the unit door in order to maintain the enclosure's integrity.

4. A rugged flange mounted operator handle shall be supplied for each switch or breaker. To prevent false circuit indication, this mechanism shall be engaged with the switch or breaker at all times regardless of unit door position. The operator handle shall have a conventional up- down motion with the down position as OFF. For added safety it shall be possible to lock this handle in the OFF position with up to three 3/8" diameter shackle padlocks. For added recognition, the operator handle shall be color coded to display red in the ON position and black in the OFF position. The operator handle shall be interlocked with the unit door so that the disconnect cannot be switched to the ON position unless the unit door is closed. It shall be possible to defeat this interlock by a deliberate act of an electrician should he desire to observe the operation of the operator handle assembly. This interlock shall also prevent opening the unit door unless the disconnect is in the OFF position. A defeater for this action shall also be provided in the event an electrician must gain access to the unit without interrupting the service.

5. Provide acrylic/lamicaid nameplates to identify all units including spaces in accordance with 16000-8. White background with minimum one inch high black lettering.

H. Magnetic Starters

1. Magnetic starters as manufactured by the Control Center Manufacture shall be provided. Thermal melting alloy overloads on starters shall be provided. Three overload relays shall be furnished on each three-phase starter. Four auxiliary contacts (2NO-2NC) shall be provided on each starter. All starters shall be combination type unless otherwise noted.

2. Control circuit transformers shall include two primary fuses and one secondary fuse (in the non-grounded secondary conductor). The transformer shall be sized to accommodate the contactor(s) and all connected control circuits.

3. NEMA Size 1-4 starters shall be mounted directly adjacent to the wireway so that power wiring (motor leads) shall connect directly to the starter terminals without the use of interposting terminals. Larger starters shall be arranged so that power wiring may exit through the bottom of the starter cubical without entering the vertical wireway.

4. All starters shall be furnished with H-O-A switch.

I. Timing Relays and Interlocks

1. Timing relays and interlocks shall be provided to stagger starting times of motors so as not to exceed the AC supply system capability to deliver sufficient voltage and frequency, and to protect the main fuses/cb. Time shall be 0-90SEC min. adjustable.

J. Finish

1. All painted parts shall undergo a phosphatizing pre-painting treatment for rust resistance and good paint bond. All painting shall be with UL listed enamel which shall be baked for a durable hard finish.

6. INSTALLATION

A. Handle starters and enclosures carefully to prevent breakage, denting and scoring finish.

B. Store control centers indoors and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, waterproof wrapping.

C. Install in accordance with manufacturer's written instructions, applicable requirements of NECA and in accordance with recognized industry practices to ensure that products comply with requirements and serves intended purposes.

D. Coordinate installation of motor control centers and enclosures with cable and raceway installation work.

E. Construct 3" high concrete pads which extend min. 2" beyond sides and front of centers installed against walls and 2" beyond all sides of free standing centers.

END SECTION

SECTION 16155 - MOTOR STARTERS

1. RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions and General Requirements apply to this Section.
- B. Requirements of Section 16000 General Provisions govern work specified in this section.
- C. This section shall be governed by alternates insofar as they apply to this section.

2. DESCRIPTION OF WORK

- A. Provide labor, materials, equipment and accessories necessary for a complete and proper motor starter system.
- B. Unless otherwise specified, required for a particular application, or indicated by details or control diagrams on Drawings, provide each motor with a motor starter.

3. QUALITY ASSURANCE

- A. Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of motor starters.
- B. Provide motor starters which have been listed and labeled by Underwriters' Laboratories.
- C. Comply with National Electrical Manufacturers Association Standards.
- D. Acceptable manufacturers offering products complying with requirements:

Allen Bradley

Square D

GE

Cutler-Hammer

4. SUBMITTALS

- A. Submit manufacturer's data on motor starters.

5. EQUIPMENT

A. Each starter and its component and related parts shall be properly designed and coordinated to suit characteristics of motor it controls and driven equipment. Starters provided with automatic control shall be capable of making as frequent starts as control devices may demand.

(1) Equip each starter with contacts to break each ungrounded line to motor. Provide a thermal overload device to open all contacts simultaneously, as an integral part of starter, in each ungrounded line to motor. Provide a suitable reset device for resetting overload trip. Overload devices shall be rated in amperes to correspond to motor nameplate rating but rating shall not exceed that recommended by motor manufacturer for application.

(2) Unless otherwise specified or indicated, starters shall have NEMA type 12 dust tight enclosures with doors arranged for padlocking. Each enclosure shall be so designed that entire starter can be readily removed and shall be of sufficient size to permit easy access for repair, replacement, and making of connections. Separately mounted starters shall be arranged for wall, floor or panel mounting and shall be complete with necessary frames and supports.

B. Unless otherwise indicated on Drawings, locate starters within sight of their associated motors. Where starter is not within sight of motor, provide a disconnect device within sight of motor.

(1) Unless otherwise specified or indicated on Drawings, disconnect device shall be either an unfused switch or a non automatic circuit breaker. Disconnect device for motors rated over 50 horsepower shall be a non automatic circuit breaker. Switches shall be unfused and circuit breakers shall be without overcurrent devices.

C. Provide magnetic starters for 1/2 horsepower and larger motors. Magnetic starters shall be full voltage (across the line) type with under voltage release for automatic control, and undervoltage protection for manual control. Magnetic starters shall be combination type with fused disconnect switch or circuit breaker, except where panelboard containing motor circuit protection is within sight of starter. Circuit breakers shall have interrupting capacity adequate for fault current available at particular location.

(1) All magnetic starters shall have both cover mounted Hand Off Automatic selector switch and start stop pushbutton unless otherwise noted. This applies to both starters in NEMA 12 and NEMA 4 enclosures.

(2) Do not connect selector switches in any manner which interferes with intended operation of safety devices or safety interlocks.

(3) All starters shall have four (4) auxiliary contacts (NO/NC) and (1) set of fail contacts.

D. Magnetic starters for two speed motors shall be designed for use with two speed motors having two separate windings. Starter shall have two separate sets of contacts, mechanically and electrically interlocked to prevent simultaneous closing. Provide overcurrent protection for each winding. Manual control stations shall be three button type, with "Slow", "Fast" and "Stop" positions. Provide pilot lights to indicate speed position.

E. Reduced voltage and increment starters, where specified, shall also comply with the following requirements:

(1) Maximum line current and current increments shall conform to local power company limits.

(2) Line shall not be opened at any time during starting period (closed transition).

(3) Starting torque shall be suitable for driven machine, and shall cause motor to break away from rest on first step.

(4) Starting period shall not be long enough to result in excessive heating of or damage to motor.

(5) Resistors, if used, shall be mounted within starter case in rear of contactor panel, unless otherwise indicated or specified.

(6) Adequately ventilate case.

(7) Disconnect means for starters may be separate from starter in lieu of combination type, but shall be as hereinbefore specified for magnetic starters.

F. Unless otherwise indicated on Drawings, provide manual starters for all motors under 1/2 horsepower. Equip each starter with a manually operated trip free switch. Provide a separately mounted safety disconnect switch except where panelboard containing disconnect and circuit protection for motor is within sight of disconnect switch for starters. Provide hand off automatic selector switches where starters are controlled by automatic devices. Functions, locations, and like, shall be as specified for magnetic starters.

G. Unless otherwise specified or indicated, control circuits and indicating lights shall operate at not over 120 volts, provided, where necessary, by individual dry type control transformers located within starter cases. Each transformer shall have adequate capacity to operate both starter and other connected control equipment, if any. Protect each control transformer by one fuse on secondary side. Control circuit conductors shall be connected, grounded, and protected against overcurrent in accordance with National Electrical Code, and shall be arranged so that an accidental ground will not start any motor.

H. Where interlocking or sequence starting of motors is specified or indicated on Drawings, it shall be done in such a manner that, when main switch or breaker on any starter is open, no part of starter will be left energized. Furnish all equipment, such as relays or auxiliary contacts on breakers or disconnect switches, necessary to accomplish the above.

6. INSTALLATION

A. Install motor starters in accordance with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices to ensure that products serve the intended function.

B. Motor starter installation work with electrical raceway and cable work, as necessary for proper interface.

7. SPECIAL INSTALLATION INSTRUCTIONS

A. All starters noted to have a NEMA 4 enclosure shall be stainless steel.

B. All starters noted to have NEMA 4 non-metallic enclosures shall be fiberglass-reinforced polyester enclosures.

(1) Nonmetallic starters shall be Square D NEMA 4X CLASS 8538 watertight and corrosion resistant or equal.

END SECTION

SECTION 16157 – ADJUSTABLE FREQUENCY DRIVES (VFD)

1. RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions and General Requirements apply to this Section.
- B. Requirements of Section 16000 General Provisions govern work specified in this section.
- C. This section shall be governed by alternates insofar as they apply to this section.

2. DESCRIPTION OF WORK

- A. Provide labor, materials, equipment and accessories necessary for a complete and proper VFD motor control system.
- B. This section provides specification requirements for AC Drive type adjustable frequency, variable speed drives packaged as a complete MCC unit or herein identified as AC Drive or VFD on drawings.
- C. The AC Drive manufacturer shall furnish, field test, adjust and certify all installed AC Drives for satisfactory operation.
- D. Any exceptions/deviations to this specification shall be indicated in writing and submitted with the quotation.

3. QUALITY ASSURANCE

- A. Comply with:
 - (1) ANSI/NFPA 70 - National Electrical Code.
 - (2) NEMA ICS 18 – Motor Control Centers.
 - (3) NEMA ICS 7 – Industrial Control and Systems: Adjustable Speed Drives.
 - (4) NEMA ICS7.1 – Safety Standards for Construction and Guide for Selection, Installation, and Operation of adjustable Speed Drive Systems.
 - (5) UL 845 - UL Standard for Safety for Motor Control Centers.
 - (6) The AC Drive and all selected catalog options shall be UL listed according to Motor Control Center Equipment Specification UL 845. A UL label shall be attached inside each AC Drive as verification.
 - (7) The AC Drive shall be designed, constructed and tested in accordance with NEMA & NEC standards and shall be NOM and CSA certified.
 - (8) The AC Drive and MCC shall be manufactured by one supplier in an ISO 9001 certified facility.
 - (9) Every power converter shall be quality assurance tested with an AC induction motor under load conditions and subjected to a dielectric voltage-withstand test, with all enclosed devices mounted and wired, prior to shipment. Quality assurance documentation shall be furnished to verify successful completion upon written request of the engineer.

(10) The manufacturer of the AC Drive shall have been specialized in the design and production of motor control center drive units for a period of at least 10 years.

(11) All factory supplied options shall be completely tested for successful operation before shipment. Documentation shall be furnished upon the request of the Engineer.

(12) Units shall be manufacturer's standard factory construction. Manufacturer's catalog pages documenting motor control center units to be supplied shall be submitted for approval.

(13) Warranty - The AC Drive shall be warranted to be free from defects in materials and workmanship for a period of eighteen (18) months from date of substantial construction completion.

4. SUBMITTALS

A. Submit manufacturer's data on variable speed drives.

B. Submit dimensioned drawings of motor control centers indicating accurately scaled layout of enclosures and required individual devices, including but not necessarily limited to, circuit breakers, fusible switches, fuses, ground-fault circuit interrupters and accessories.

C. Submit with the delivery of the MCC an Installation and Maintenance Manual and one (1) copy of the manufacturer's drawings per shipping block.

5. EQUIPMENT

A. Acceptable Manufacturers

(1) The AC Drive MCC unit shall be Square D Mflex ATV 61 or prior approved equal. Substitutions must be submitted in writing three (3) weeks prior to original bid date with supporting documentation demonstrating that the alternative manufacturer meets all aspects of the specifications herein.

(2) The drawings shall consist of elementary power and control wiring diagrams and enclosure outline drawings. The enclosure drawings shall include front and side views of the enclosures with overall dimensions and weights, conduit entrance locations, and nameplate legends.

(3) Standard catalog sheets shall be furnished for each different horsepower rated AC Drive, showing voltage, horsepower, maximum current ratings, and recommended replacement parts with part numbers.

(4) A harmonic distortion analysis shall be performed by the manufacturer based on documentation supplied by the contractor. The engineering documentation shall consist of one-line diagrams, utility short circuit information, distribution transformer information (kVA, %Z, and X/R ratio) and emergency standby generator (kW and subtransient reactance) data if applicable. The harmonic distortion analysis report shall be part of the approval drawing process, submitted to the engineer for approval.

(5) Additions to existing MCCs shall be the same as the original manufacturer.

(6) Alternate control techniques other than pulse width modulated technology (PWM) are not acceptable.

B. General Description

(1) The AC Drive shall convert the input AC mains power to an adjustable frequency and voltage as defined below and indicated on the drawings or motor control schedules.

(a) For AC Drives rated up to 500 hp, the AC Drive manufacturer shall use a 6-pulse bridge rectifier design with line reactors, harmonic suppressors for effective harmonic mitigation. The diode rectifiers shall convert fixed voltage and frequency, AC line power to fixed DC voltage. The power section shall be insensitive to phase rotation of the AC line.

(2) The output power section shall change fixed DC voltage to adjustable frequency AC voltage. This section shall use insulated gate bipolar transistors (IGBT) or intelligent power modules (IPM) as required by the current rating of the motor.

C. Construction

(1) The AC Drive shall be mounted in a Type 12/12K MCC Type enclosure with an externally operated disconnect device.

(2) A mechanical interlock shall prevent an operator from opening the AC Drive door when the disconnect is in the On position. Another mechanical interlock shall prevent an operator from placing the disconnect in the On position while the AC Drive door is open. It shall be possible for authorized personnel to defeat these interlocks.

(3) Provisions shall be made for locking all disconnects in the Off position. Provisions for additional padlocking shall be made by the customer using an approved lockout/tagout device.

(4) Provisions shall be made for accepting a padlock to lock the enclosure door.

D. Seismic qualification

(1) A certificate of compliance shall be provided for all wall- and floor-mounted enclosures to the seismic provisions of the IBC (International Building Code) and ASCE/SEI 7 (American Society of Civil Engineers/Structural Engineering Institute Seismic Performance Requirements).

(2) The seismic ratings shall meet the site specific requirements of the installed location as determined by the latest edition of: IBC, NFPA 5000, CBC (California Building Code), and ASCE/SEI 7.

(3) Seismic code compliance testing shall be in accordance with ICC ES AC156 Shake-Table Test Acceptance Criteria protocol with an importance factor of at least 1.5.

(4) All anchorage, lateral bracing, and mounting guidelines shall be specified with drive instruction documentation and/or markings.

(5) The manufacturer shall exhibit a seismic qualification label on the equipment stating compliance to these requirements.

E. Motor data

(1) The AC Drive shall be sized to operate the following AC motors and shall be defined to match the load schedules and the type of connections used between the motor and the load, such as a direct connection or a power transmission connection:

(a) Motor horsepower rating(s) – See motor control schedules.

(b) Motor full load ampere ratings coordinated to NEC2005 Table 430-250.

(c) Motor synchronous speed at 60 Hz. Coordinate with pump supplier.

(d) Motor utilization voltage 480 VAC.

(e) Motor service factor. Coordinate with pump supplier.

F. Application data

(1) The AC Drive shall be sized to operate a constant torque load.

(2) The speed range shall be from a minimum speed of 0.1 Hz to a maximum speed of 200 Hz.

G. Environmental Ratings

(1) The AC Drive shall meet IEC 60664-1 and NEMA ICS-1 Annex A standards.

(2) The AC Drive shall be designed to operate in an ambient temperature of -10 to +40 °C (+14 to 104 °F).

(3) The storage temperature range shall be -25 to +65 °C (-13 to +149 °F).

(4) The maximum relative humidity shall be 95% at 40 °C (104 °F), non-condensing with no dripping water, conforming to IEC 60068-2-3.

(5) The AC Drive shall be rated to operate at altitudes less than or equal to 3,300 feet (1000 meters) without derating. For altitudes above 3,300 feet (1000 meters), the manufacturer's derating factors shall apply.

(6) The AC Drive shall conform to IEC 600721-3-3-3M3 Amplitude for Operational Vibration Specifications.

H. Ratings

(1) The AC Drive shall be designed to operate from an input voltage of 480 VAC plus or minus 10%.

(2) The AC Drive shall operate from an input voltage frequency range of 47–63 Hz.

(3) The displacement power factor shall not be less than 0.95 lagging under any speed or load condition.

(4) The efficiency of the AC Drive at 100% speed and load shall typically not be less than 96%. Efficiency shall vary with the power rating of the AC Drive.

(5) The constant torque rated AC Drive overcurrent capacity shall be 110% for one minute.

(6) The output carrier frequency of the AC Drive shall be randomly modulated depending on the Drive rating for low noise operation. No AC Drive with an operable carrier frequency above 16 kHz shall be allowed.

(7) The output frequency shall be from 0.1–200 Hz.

(8) The AC Drive shall develop rated motor torque at 0.5 Hz (60 Hz base) in a sensorless flux vector (SVC) mode using a standard induction motor without an encoder feedback signal.

I. Protection

(1) Upon power-up, the AC Drive shall automatically test for valid operation of memory, valid operation of option module, loss of analog reference input, loss of communication, dynamic brake failure, DC to DC power supply, control power, and the pre-charge circuit.

(2) The AC Drive shall be UL Listed according to UL 508C for use on distribution systems with 100,000 A available fault current. The AC Drive shall have a coordinated short circuit rating designed to UL 508C and listed on the nameplate. UL 508A industrial panels shall be rated per the specification of the customer.

(3) The AC Drive shall have protection against short circuits, protection between output phases and ground; and protection between the logic and analog outputs.

(4) The AC Drive shall have minimum AC undervoltage power loss ride-through of 200 milliseconds. The AC Drive shall have the user-defined option of frequency fold-back to allow motor torque production to continue to increase the duration of the powerloss ride-through (excludes ATV21 S-Flex).

(5) The AC Drive shall have a selectable ride-through function that shall allow the logic to maintain control for a minimum of one second without faulting.

(6) The AC Drive shall have an auto restart function that shall provide programmable restart attempts for a fault condition other than a ground fault, short circuit, or internal fault condition. The programmable time delay before restart attempts shall be unlimited.

(7) The AC Drive shall have a programmable deceleration mode for normal and fault conditions. The stop modes shall include freewheel stop, fast stop, and DC injection braking.

(8) Upon loss of the analog process follower reference signal, the AC Drive shall enter a tripped condition and/or operate at a user-defined speed set between software programmed low-speed and high-speed settings.

(9) The AC Drive shall have solid state I_{2t} protection that is UL Listed and meets UL 508C as a Class 10 overload protection and meets IEC 60947. The minimum adjustment range shall be from 20–150 % of the nominal output current rating of the AC Drive.

(10) A thermal switch with a user selectable pre-alarm shall provide the AC Drive with a minimum of 60 seconds delay before overtemperature fault.

(11) The heatsink shall have bonded fin, moulded, or block-milled construction for maximum heat transfer.

(12) The AC Drive shall have a fold-back function that shall automatically anticipate a controller overload condition and fold back the frequency to avoid a fault condition.

(13) The output frequency of the AC Drive shall be software enabled to fold back when the motor is overloaded.

(14) There shall be three skip frequency ranges with hysteresis adjustment that can each be programmed independently, back to back, or overlapping.

J. Adjustments And Configurations

(1) The AC Drive shall self-configure to the main operating supply voltage and frequency. Operator adjustments shall not be required.

(2) Upon power up, the AC Drive shall automatically send a signal to the connected motor. The stator resistance data shall be measured at rated current. The AC Drive shall automatically optimize the operating characteristics according to the stored data.

(3) The AC Drive shall be factory preset to operate most common applications.

(4) A choice of at least two types of acceleration and deceleration ramps shall be available in the AC Drive software: linear and S curve. Other product specific curves may be available.

(5) The acceleration and deceleration ramp times shall be adjustable from 0.01 to at least 3,200 seconds.

(6) The volts per hertz ratios shall be user selectable to meet variable torque loads, normal, and high-torque machine applications.

(7) The memory shall retain and record run status and fault type of at least the past four faults.

(8) Slip compensation shall be adjustable from 0–150%.

(9) The software shall have an "Energy Saving" function that shall reduce the voltage to the motor when the variable torque setting is selected. A constant volts/hertz ratio shall be maintained during acceleration. The output voltage shall then automatically adjust to meet the torque requirement of the load.

(10) The AC Drive shall offer programmable DC injection braking that will brake the AC motor by injecting DC current and creating a stationary magnetic pole in the stator. The level of current shall be adjustable between 10% and 100% of rated current and available from 1.0 to at least 20 seconds continuously. For continuous operation after 30 seconds, the current shall be automatically reduced to 50% of the nameplate current of the motor.

(11) Sequencing logic shall coordinate the engage and release thresholds and time delays for the sequencing of the AC Drive output, mechanical actuation, and DC injection braking in order to accomplish smooth starting and stopping of a mechanical process.

K. Graphic Display Terminal Interface

(1) The graphic display terminal shall provide 8 lines of 240 by 160 pixels (in English) to control, adjust, and configure the ATV61 AC Drive or the ATV71 AC Drive (excludes the ATV21 AC Drive). All electrical values, bar charts, configuration parameters, I/O assignments, application and activity functions, faults, local control, adjustment storage, self-test, and diagnostics shall be accessible through the terminal interface. There shall be a standard selection of six additional languages built into the operating software.

(2) The AC Drive model number, torque type, software revision number, horsepower, output current, motor frequency, and motor voltage shall be listed on the drive identification display as viewed on the graphic display terminal.

(3) At a minimum, the selectable outputs shall consist of speed reference, output frequency, output current, motor torque, output power, output voltage, line voltage, DC voltage, motor thermal state, drive thermal state, elapsed time, motor speed, machine speed reference, and machine speed.

(4) The graphic display terminal shall consist of programmable function keys. The functions shall allow both operating commands and programming options to be preset by the operator. A hardware selector switch shall lock out the graphic display terminal from unauthorized personnel.

(5) The graphic display terminal shall offer a simple to advanced user menu consisting of parameter setting, I/O map, fault history, and drive configuration. A software lock shall limit access to the main menu.

(6) The navigation scheme shall provide the ability to scroll through menus and screens, select or activate functions, or change the value of a selected parameter.

(7) An Escape key shall return a parameter to the existing value if an adjustment is not required and the value shall be displayed. The escape function shall also return to a previous menu display.

(8) A Run key and a Stop key shall command a normal start and stop as programmed when the AC Drive is in keypad control mode. The Stop key must be active in all control modes.

(9) A user interface shall be available that is a WINDOWS® based personal computer, serial communication link, or detachable graphic display terminal.

(10) The keypad and all door-mounted controls must be Type 12 rated.

L. Control

(1) External pilot devices may be connected to a terminal strip for starting/stopping the AC Drive, speed control, and displaying operating status. All control inputs and outputs shall be software assignable.

(2) A 2-wire or 3-wire control strategy shall be defined within the software. The 2-wire control shall allow automatic restart of the AC Drive without operator intervention after a fault or loss of power. The 3-wire control shall require operator intervention to restart the AC Drive after a fault or loss of power.

(3) The control power for the digital inputs and outputs shall be 24Vdc.

(4) The internal power supply shall incorporate an automatic current fold-back function that protects the internal power supply if incorrectly connected or shorted. The transistor logic outputs shall be current limited to 220 mA and shall not be damaged if shorted or if excess current is pulled.

(5) All logic connections shall be furnished on pull-apart terminal strips (excludes S-Flex).

(6) There shall be two software assignable analog inputs with interference filtering. The analog inputs shall be software selectable and shall consist of user-defined configurations: x y mA or x y V.

(7) There shall be at least four software assignable logic inputs that shall be selected and assigned in the software. The logic input assignments shall consist of forward, reverse, jog, plus/minus speed (2 inputs required), setpoint memory, preset speeds (up to 8 inputs), auto/manual control, controlled stop, terminal or keypad control, output contactor (2 inputs required), motor switching, and fault reset.

(8) There shall be at least one software assignable analog output with interference filtering. The analog outputs can be selected and assigned in the software. The analog output assignments shall be proportional to the following motor characteristics: frequency, current, power torque, voltage, and thermal state. The output signal shall be user-defined configurations: x y mA or x y V.

(9) Three voltage-free Form C relay output contacts shall be provided. One of the contacts shall indicate AC Drive fault status. The other contacts shall be user assignable.

(10) There shall be a hardware input/output extension module that also provides interlocking and sequencing capabilities. The module shall be fully isolated and housed in a finger-safe enclosure with pull-apart terminal strips. The module shall add four logic inputs, two analog inputs, two relay outputs, and one analog output. All of the inputs and outputs shall be user assignable in the software as previously defined (excludes S-Flex).

(11) The combination enclosure shall have the following optional 22mm door-mounted operators:

- (a) Power On pilot light (red)
- (b) Drive Run pilot light (green)
- (c) Drive Fault pilot light (yellow)
- (d) Hand-Off-Auto selector switch
- (e) Manual speed potentiometer

6. INSTALLATION

- A. Handle starters and enclosures carefully to prevent breakage, denting and scoring finish.
- B. Store control centers indoors and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, waterproof wrapping.
- C. Install in accordance with manufacturer's written instructions, applicable requirements of NECA and in accordance with recognized industry practices to ensure that products comply with requirements and serves intended purposes.
- D. Coordinate installation of motor control centers and enclosures with cable and raceway installation work.
- E. Construct 3" high concrete pads which extend min. 2" beyond sides and front of centers installed against walls and 2" beyond all sides of free standing centers. Pads shall be large enough to accommodate all future sections.
- F. The AC Drive manufacturer shall provide a factory certified technical representative to supervise the contractor's installation, testing and start-up of the AC Drive(s) furnished under this specification for a maximum total of 1 day. The start-up service shall be quoted as a separate line item.
- G. An on-site training course of 1 training day shall be provided by a representative of the AC Drive manufacturer to plant and/or maintenance personnel.

7. SPECIAL INSTALLATION INSTRUCTIONS

- A. **All drives shall be furnished with 3% line side reactors.**

B. A 0-10V speed control shall be accessible on front of VFD enclosure.

C. VFD shall have capability of being controlled (speed) from a 4-20MA signal from telemetry system.

END SECTION

SECTION 16160 - PANELBOARDS

1. RELATED DOCUMENTS

A. General provisions of Contract, General and Supplementary conditions and General Requirements, apply to this section.

B. Requirements of Electrical General Provision sections govern this section, where applicable.

C. This section shall be governed by alternates insofar as they apply to this work.

2. DESCRIPTION OF WORK

A. Provide all labor, materials, equipment and services necessary for proper and complete installation of panelboards.

B. Refer to other Division 16 sections for cable/wire, connectors and electrical raceway work required in conjunction with panelboards and enclosures, not work of this section.

3. QUALITY ASSURANCE

A. Special Use Markings: Provide panelboards, constructed for special use, with UL marks indicating that special usage, i.e., "suitable for use as service entrance equipment".

B. UL Compliance: Comply with applicable UL publications pertaining to panelboards, enclosures and panelboard accessories. Provide units which have been listed and labeled by Underwriters Laboratories.

C. NEC Compliance: Comply with National Electrical Code (NFPA 70/ANSI C1) as applicable to installation of cabinets, cutout boxes and panelboards. Comply with applicable NEC Articles pertaining to installation of wiring and equipment in hazardous locations.

D. NEMA Compliance: Comply with National Electrical Manufacturers Association Stds. Pub. No. 250, "Enclosures for Electrical Equipment (1000 volt maximum)"; Pub. No. 250, "Enclosures for Electrical Equipment (1000 volt maximum)"; Pub. No. PB 1, "Panelboards,"; installation portion of Pub. No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards" and Pub. No. PB 1.2, "Application Guide for Ground Protective Devices and Equipment."

4. SUBMITTALS

A. Submit manufacturer's data on panelboards and enclosures.

B. Submit dimensioned drawings of panelboards and enclosures indicating accurately scaled layout of enclosures and required individual panelboard devices, including but not necessarily limited to, circuit breakers, fusible switches, fuses, ground fault circuit interrupters and accessories.

5. EQUIPMENT

A. Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials, design and construction in accordance with published product information. Equip with number of unit panelboard devices as required for a complete installation. Where types, sizes, or ratings are not otherwise indicated, comply with NEC, UL and established industry standards for applications indicated.

- (1) All terminals for wiring connections shall be suitable for copper or aluminum.
- (2) **Buses shall be tin plated copper.** Bus capacity shall be as indicated on drawings, otherwise, bus capacity shall be equal to or greater than panelboard feeder overcurrent protective device.
- (3) Provide a bare uninsulated equipment grounding bar suitably brazed or bolted to interior of each enclosure. This bar shall be equivalent in current carrying capacity to incoming feeder ground conductor and shall be suitable for brazed or approved pressure connector terminations of ground conductors for associated feeders and branch circuits.
- (4) A neutral bar, where required, shall be mounted at opposite end of each panelboard from main lugs and shall have numbered terminals for connection of neutral wires.
- (5) Bus bar connections to branch circuit overcurrent protection devices shall be of sequence phased type.
- (6) Where "provision for," "future," or "space" is indicated on drawings, space shall be equipped with bus connections to future over current device with suitable insulation and bracing to maintain proper short circuit rating and voltage clearances. All provisions shall be made for ready insertion of a future device.
- (7) All panelboards shall be dead front type.

B. Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code gauge, minimum 16 gauge thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with adjustable indicating trim clamps, and doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed door hinges. Provide enamel finish over a rust inhibitor. Design enclosure for recessed or surface mounting as indicated. Provide enclosures fabricated by same manufacturer as panelboards, and which fit properly with panelboards to be enclosed.

- (1) Provide typewritten directories placed under a clear plastic cover on interior of doors. Directories shall identify panelboards and indicate each circuit number and description of associated branch circuit. Directories for fuse and switch panels shall also indicate switch, fuse, and branch feeder size. For panelboards without doors, provide a separate laminated phenolic identification plate on or near each device cover and provide same information that directories described above require.
- (2) Where feeders go through panelboard cabinets to serve panelboards above or beyond same, wiring gutters in panelboard cabinets shall be a minimum of 8 inches on sides and 8 inches top and bottom. Cables shall be neatly bundled, routed and supported within gutters. Do not reduce minimum bending radii as recommended by cable manufacturer.
- (3) Top and bottom feeding through panelboard buses will not be permitted. Panels served by a common feeder shall have through feeder gutter tapped or provide auxiliary gutter with a feeder tap to each panel.
- (4) Lighting and power panelboards less than 49 inches wide for surface mounting shall be equipped with a one piece sheet steel frame and shall have a hinged door. Frame shall be same size as cabinet and shall completely cover wiring gutters. Equip doors over 48 inches in height with a vault handle and a three point catch. Cabinets greater than 48 inches wide shall have sectionalized frames and multiple doors.

C. Provide panelboard accessories and devices including, but not necessarily limited to, cartridge time delay type fuses, circuit breakers and ground fault protection units, as recommended by panelboard manufacturer for ratings and applications indicated.

(1) Circuit breaker protective devices shall be rated for circuit voltage on which they are used; have trip rating and number of poles indicated on drawings; be molded case breakers of quick make, quick break, bolt on, thermal magnetic type and be trip free. Automatic tripping shall be indicated by a handle position between manual OFF and ON position.

a. All similar units of all panelboards shall be same manufacture, except where a manufacturer does not produce a frame size or type called for, and like units shall be interchangeable.

b. Adjustable magnetic trip devices shall be adjusted at factory to "low " trip setting ampere values.

c. Circuit breakers shall have a minimum interrupting rating of 10,000 amperes symmetrical, unless a greater rating is indicated on drawings. In all cases circuit breakers shall have an interrupting current rating equal or greater than available fault current at their locations in electrical system.

(2) Fusible switch branch circuit protective devices shall be as indicated on drawings, shall be interrupter switches of quick make, quick break type, and shall have sufficient load break capacity to properly coordinate with time current characteristics of current limiting fuses, where required, to provide an integrated switch and fuse device. Provide each switch pole with cartridge fuses as indicated on drawings. Interrupter switches shall have a load break capacity in excess of normal horsepower rating. Each unit shall be capable of withstanding let through current available before its fuse operates without damage or change in rating. Short circuit interrupting rating of circuit switch fuse combination shall be 100,000 RMS symmetrical amperes. Each unit shall be operable from front by means of an external operating handle and provided with an interlocking mechanism which allows access to de energized fuses and wiring only when in OFF position. Unit cover shall be so interlocked that it may not be removed or opened when switch is in ON position, except that interlock shall be tool releasable by a qualified person for inspection of contacts and mechanism. All similar switch units of all panelboards shall be of same manufacturer.

D. Manufacturers of panelboards shall be Square "D", Cutler-Hammer or equal as approved by this Engineer.

6. INSTALLATION

A. Handle panelboards and enclosures carefully to prevent breakage, denting and scoring finish.

B. Store panelboards and enclosures indoors and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, waterproof wrapping.

C. Install panelboards and enclosures, in accordance with manufacturer's written instructions, applicable requirements of NECA and in accordance with recognized industry practices to ensure that products comply with requirements and serves intended purposes.

(1) Install lighting and power panelboards with tops 6 feet 6 inches above floor and bottoms not less than 12 inches above floor (multi section panels shall be provided to meet these spacings) arranged for conduit or bus duct connections. Mount on metal channels. Where panelboards are equipped with remotely controlled switches or contactors, top of cabinet may be mounted above 6 feet provided height above floor of highest circuit breaker handle is not over 6 feet 6 inches.

D. Coordinate installation of panelboards and enclosures with cable and raceway installation work.

E. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secure.

F. Provide electrical connections within enclosures.

G. Fill out panelboard's circuit directory card upon completion of the work.

7. SPECIAL INSTALLATION REQUIREMENTS

A. Main service distribution panel shall have distribution class lightning arrestors.

B. Mini-powerzone type combination transformer panels shall have stainless steel enclosures and have bolt-on type circuit breakers.

END SECTION

SECTION 16170 - SAFETY AND DISCONNECT SWITCHES

1. RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions and General Requirements, apply to this section.
- B. Requirements of electrical general provision sections govern work specified in this section.
- C. This section shall be governed by alternates insofar as they affect this work.

2. DESCRIPTION OF WORK

- A. Provide labor, materials, equipment and services necessary for proper and complete installation of safety and disconnect switches.
- B. Types of safety and disconnect switches required for project include the following:
 - Equipment disconnects.
 - Appliance disconnects.
 - Motor circuit disconnects.
- C. Acceptable manufacturers offering products complying with requirements:
 - Square D
 - GE
 - Cutler-Hammer

3. QUALITY ASSURANCE

- A. Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of electrical safety and disconnect switches.
- B. Provide safety and disconnect switches which have been listed and labeled by Underwriters Laboratories.
- C. Comply with National Electrical Manufacturers Association Stds. Pub. No. KS1.
- D. Manufacturers of safety and disconnect switches shall be Square "D", Allen-Bradley or Cutler-Hammer.

4. SUBMITTALS

- A. Submit manufacturer's data on electrical safety and disconnect switches.

5. EQUIPMENT

- A. Provide **heavy duty** type, sheet steel enclosed safety switches, of type, size and rating indicated; incorporating quick make, quick break type switches, constructed so switch blades are visible

in "OFF" position with door open; equipped with operating handle which is an integral part of enclosure base and whose position is easily recognizable and is padlockable in "OFF" position.

B. Mount switches in NEMA 12 enclosures unless otherwise indicated. Boxes exposed to wet or rain conditions shall be NEMA 4 type unless otherwise noted. Switches shall be rated at 240 or 600 minimum volts as required by voltage of circuit on which they are utilized and shall be rated in horsepower. Each shall be capable of interrupting locked rotor current of motor for which it is to be used. Current shall be assumed as ten (10) times full rated load current.

C. Mount switch parts on insulating bases to permit replacement of parts from front of switch. All current carrying parts shall be designed to carry rated load without excessive heating. Switch contacts shall be silver tungsten type or plated to prevent corrosion, pitting and oxidation and to assure suitable conductivity. Fuse clips shall be of positive pressure type and switch operating mechanism shall be designed to retain its effectiveness with continuous use at rated capacity without use of auxiliary springs in current path. Switches shall be capable of withstanding available fault current or let through current before fuse operates without damage or change in rating. Fuse clips shall be designed and coordinated to accommodate class and type of fuse specified or indicated to be used with switch.

6. INSTALLATION

A. Deliver switches individually wrapped in factory fabricated fiber board type containers.

B. Handle switches carefully to avoid damage to material components, enclosures and finish. Do not install damaged switches; remove from project site.

C. Store switches in a clean dry space. Protect switches from dirt, fumes, water and physical damage.

D. Install safety and disconnect switches where indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices.

E. Coordinate safety and disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.

F. Install disconnect switches used with motor driven appliances larger than 1/8 h.p. and motors and controllers within sight of controller position unless otherwise indicated.

7. SPECIAL INSTALLATION INSTRUCTIONS

A. All disconnect switches noted to have a NEMA 4 enclosure shall be stainless steel.

B. All disconnects noted to have NEMA 4 non-metallic enclosures shall be fiberglass-reinforced polyester enclosures.

(1) Nonmetallic disconnect switches shall be Square D NEMA 4X CLASS 3110 watertight and corrosion resistant or equal.

C. Main service disconnect switches shall have distribution class lightning arrestors.

END SECTION

SECTION 16181 - FUSES

1. RELATED DOCUMENTS

- A. General Provisions of Contract, General and Supplementary Conditions and General Requirements, apply to this section.
- B. Requirements of electrical general provision sections govern work specified in this section.
- C. This section shall be governed by alternates insofar as they affect this work.

2. DESCRIPTION OF WORK

- A. Provide all labor, materials, equipment and services necessary for proper and complete installation of fuses.

3. QUALITY ASSURANCE

- A. Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of fuses.
- B. Fuses shall be listed by Underwriters Laboratories.

4. SUBMITTALS

- A. Submit manufacturer's data on fuses and spare fuse cabinet.

5. EQUIPMENT

- A. Except as otherwise specified herein, provide complete sets of fuses for all switches requiring fuses. Fuses shall be of size indicated on drawings. Provide spare fuses in original boxes of the following quantities: one complete set (3 fuses) for each different size, type and class. A spare fuse cabinet, Bussmann type SFC or equal, shall be provided and installed as directed by owner..
- B. Install current limiting fuses in lieu of regular fuses where fault current exceeds 10,000 RMS amperes. Fuses rated over 600 amperes shall be NEMA Class L. Unless otherwise specified, fuses for use with switches rated 600 amperes and less shall be UL Class RK 1, and have interrupting rating of 200,000 RMS amperes. Class RK 1 fuses shall be dual element type with minimum time delay of ten seconds at 500 percent of rating.
- C. Current limiting high interrupting capacity fuses manufacturer with each unit as required for complete coordination.
- D. Provide all project fuses supplied by same manufacturer. Proper selectivity with associated protective equipment shall be substantiated by published catalog data.
- E. Switch size and fuse ratings indicated on Drawings and/or specified are based on general approximate values for each motor horsepower delineated. Since characteristics of fuses for motor short circuit protection vary with different manufacturers, coordinate fuse values with switch sizes for each motor.

6. INSTALLATION

A. Install fuses where indicated and required in accordance with manufacturer's written instructions, applicable requirements of N.E.C., and in accordance with recognized industry practice.

END SECTION

SECTION 16190 – SYSTEM SHORT CIRCUIT COORDINATION STUDY & ARC FLASH ANALYSIS

1.1 RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions, and General Requirements, apply to this Section.
- B. Requirements of Electrical General Provisions sections govern work specified in this Section.
- C. This section shall be governed by alternates insofar as they affect this work.

1.2 DESCRIPTION OF WORK

- A. The work covered under this Section shall include this Contractor providing an engineering analysis and coordination study for the electrical distribution system, The analysis shall include a short circuit analysis with protective device evaluation, a protective device coordination study arc-flash hazard analysis.
- B. The project shall begin at the point of utility service for the facility, through the Main switch/switchboard/motor control center (MCC) and continue down through the system, to all downstream 480 volt and 208 volt distribution and branch circuit panelboards and other motor control centers and distribution panels.
- C. The project shall include generators and any associated emergency power distribution equipment, including automatic transfer switches and generator ground fault protection, if equipped.

1.3 QUALITY ASSURANCE

- A. The short-circuit /coordination studies and arc-flash hazard analysis shall be conducted by personnel with a minimum of five (5) years experience who is skilled in performing and interpreting power system studies and who is a full-time employee of a firm experienced in the analysis, evaluation, and coordination of electrical distribution systems, similar to the system for this project. The firm/company must have at a minimum four (4) year record of successful in-service performance.
- B. The studies shall be prepared in accordance with the latest edition of NETA Std. ATS, NFPA 70B, the "National Electrical Code", ANSI C2 "National Electrical Safety Code", and ANSI/IEEE Guidelines, as well as manufacturer's recommendations.

1.4 SUBMITTALS

- A. Submittals are required in accordance with SECTION 16000 of these specifications.
- B. The short-circuit and protective device coordination studies shall be submitted to this project's Design Engineer of record prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment

drawings for manufacturing. If completion of the studies may cause delay in equipment manufacturing, approval from the Design Engineer of record may be obtained for preliminary submittal of sufficient study data to ensure that the selection of device and characteristics will be satisfactory. Generally, shop drawing submittals for equipment effected by the coordination study will not be reviewed until the short-circuit/coordination study has been submitted and successfully reviewed.

- C. The results of the short-circuit, protective device coordination, and arc-flash hazard analysis studies shall be summarized in a final report. Submit bound copies of the final report with tabbed sections, in the quantities required. Additional copies, where required, shall be provided in PDF format.
- D. The report shall include, but not be limited to, the following sections:
 - 1. One-line diagram showing protective device ampere ratings and associated designations, cable size & lengths, transformer kVA and voltage ratings, motor and generator kVA ratings, switchboard and panelboard designations.
 - 2. Descriptions, purpose, basis and scope of the study.
 - 3. Tabulations of the worst-case calculated short circuit duties as a percentage of the applied device rating (automatic transfer switches, circuit breakers, fuses, etc.); the short circuit duties shall be upward adjusted for X/R ratios that are above the device design ratings.
 - 4. Protective device time versus current coordination curves with associated one line diagram identifying the plotted devices, tabulations of ANSI protective relay functions and adjustable circuit breaker trip unit settings.
 - 5. Fault study input data, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout.
 - 6. Details of the incident energy and flash protection boundary calculations.
 - 7. Sample of an arc-flash hazard warning label.
 - 8. Comments and recommendations for system improvements, where needed, including extending of feeder or other conductors necessary to lower the fault-current to an acceptable level.

2.1 STUDY AND ANALYSIS

- A. Contractor shall furnish short-circuit and protective device coordination studies as prepared by the electrical distribution equipment manufacturer or an approved engineering firm.
- B. Contractor shall furnish an Arc-Flash Hazard Analysis Study performed in compliance with the latest edition of IEEE Standard 1584 – “IEEE Guide for Performing Arc-Flash Hazard Calculations” and per NFPA 70E – “Standard for Electrical Safety in the Workplace”, reference Article 130.3 and Annex D, prepared by the electrical distribution equipment manufacturer or an approved engineering firm.

2.2 DATA COLLECTION

- A. Contractor shall furnish all field data as required by the power system studies and arc-flash hazard analysis. The Study Preparer shall furnish the Contractor with a listing of required data. The Contractor shall expedite collection of the data to eliminate unnecessary delays and assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.
- B. Source contribution may include present and future utility supply, motors, and generators.
- C. Load data utilized may include existing and proposed loads.
- D. Include fault contribution of new/existing motors in the study.

2.3 SHORT-CIRCUIT ANALYSIS WITH PROTECTIVE DEVICE EVALUATION

- A. Systematically calculate fault currents based on the available fault current at the facility service entrance. Study preparer shall obtain the available fault current from the local utility.
- B. Short-circuit calculations shall be prepared by means of a digital computer utilizing a commercially available software package. Motor contribution shall be incorporated in determining fault levels. Results of short-circuit calculations shall be presented in tabular form and shall include momentary and interrupting fault values for three-phase and phase-to-ground faults.
- C. Analyze the short-circuit currents by preparing a tabulation comparing the fault levels to the device interrupting ratings. Indicate areas in which integrated/series ratings are utilized. The following information shall be included in the tabulation:
 - 1. Bus identification number.
 - 2. Location identification.
 - 3. Voltage
 - 4. Manufacturer and type of equipment.
 - 5. Device rating.
 - 6. Calculated short-circuit current.

2.4 PROTECTIVE DEVICE COORDINATION STUDY

- A. Prepare coordination time-current characteristic curves to determine the required settings/sizes of the protective devices to maximize selectivity. The utility upstream protective device feeding the facility shall be maintained as the upper limit for coordination. These settings shall be obtained by the preparer, along with any other protective device setting requirements. The coordination curves shall be prepared on log-log paper and illustrate adequate clearing times between series devices. The curves shall be created through the use of the study software package, but must reflect actual protective devices to be installed. Adequate time-current curves shall be generated to depict coordination. In addition, protective device characteristics shall be suitably determined to reflect calculated short-circuit levels at the location.
- B. A narrative analysis shall accompany each coordination curve sheet and describe the coordination and protection in explicit detail. All curve sheets shall

be multi-color for improved clarity. Areas lacking complete coordination shall be highlighted and reasons provided for allowing condition to remain or provide solution to resolve situation. The following information shall be provided on all curve sheets:

1. Device identification and associated settings/size.
2. Voltage at which curves are plotted.
3. Current multiplier.
4. ANSI frequent fault damage curve.
5. Cable insulation damage curves.
6. Transformer inrush point.
7. Single-line for the portion of the system.
8. Motor starting profiles (where applicable).

2.5 ARC-FLASH HAZARD ANALYSIS

- A. The Arc-Flash Hazard Analysis shall be performed by a computer aided circuit simulation of the distribution system specific to this project. These calculations shall determine the Arc-Flash Incident Energy (AFIE) levels and flash protection boundary distances. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, panelboards, busway, generators, automatic transfer switches, and motor-control centers) where work could be performed on energized parts.
- B. The Arc-Flash Hazard Analysis shall be performed in conjunction with the Short-Circuit/Coordination Study.
- C. Results of the analysis shall be submitted in tabular form and shall include as a minimum the bus name, bolted fault current and arcing fault current level, flash protection boundary distances, personal protective equipment (PPE) hazard risk category and the AFIE levels.
- D. The analysis shall be performed under worst-case Arc-Flash conditions, and the final report shall describe the worst-case conditions when different from worstcase bolted fault conditions.
- D. Arc-Flash Warning Labels:
 1. The Contractor of the Arc-Flash Hazard analysis shall provide Arc-Flash Warning labels for all electrical equipment that may be opened or accessed while energized. Labels shall be minimum 3.5 inch x 5 inch thermal transfer type of high adhesion polyester. Labels shall be machine printed, with no field markings.
 2. All labels shall be based on recommended overcurrent device settings and shall be provided after the results of the analysis have been presented to the Owner and after any system changes, upgrades or modifications have been incorporated in the system. The labels shall identify the flash protection boundary, the arc-flash incident energy (AFIE) level, working distances, required personal protective equipment (PPE) hazard risk category, nominal voltage, and engineering report number, revision number and issue date.

2.6 SINGLE-LINE DIAGRAM

- A. The final report shall include a multi-color single-line diagram of the electrical distribution system within the scope of the project. The single-line shall include:
 - 1. Transformer rating, voltage ratio, impedance, and winding connection.
 - 2. Feeder cable phase, neutral and ground sizes, length of cable, conductor material, and conduit size and type.
 - 3. Switchgear, switchboards, panelboards, MCC's, fuses, circuit breakers, ATS's and switches continuous current ratings.
 - 4. Protective relays with appropriate device numbers and CT's and PT's with associated ratios.
 - 5. Detailed legend indicating device type identification and other significant details.

3.1 SUMMARY

- A. The results of the system studies shall be summarized in a final report. One "as-built" copy shall be posted in each main electric room.

3.2 FIELD SETTINGS AND ADJUSTMENTS

- A. This Contractor shall engage the equipment manufacturer's service group or alternately a qualified independent testing firm to perform field adjustments of the protective devices as required for placing the equipment in final operating condition. The settings shall be in accordance with the approved short-circuit study and protective device evaluation/coordination study.
- B. Necessary field settings of devices and adjustments and minor modifications to equipment to accomplish conformance with the approved short-circuit and protective device coordination study, shall be carried out by the equipment manufacturer's service group or qualified independent testing firm
- C. Notify Owner in writing of any required major equipment modifications.
- D. Major additions, deletions, upgrades or modifications to any part of the electrical distribution system will require re-calculation of the studies and analysis' for the portions of the system that has been changed from the original studies. These re-calculations shall be completed by the same engineer or firm that did the original studies, at no additional cost to the Owner.

3.3 ARC-FLASH WARNING LABELS

- A. Apply arc-flash warning labels to equipment. The labels shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

3.4 ARC-FLASH TRAINING

- A. The supplier of the Arc-Flash Hazard Analysis shall train the Owner's qualified electrical personnel of the potential arc-flash hazards associated with working on energized equipment (minimum of 3 hours).

END SECTION

SECTION 16200 - MISCELLANEOUS ELECTRICAL EQUIPMENT

1. RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary conditions and General Requirements, apply to this section.
- B. Requirements of Electrical General Provision sections govern this section, where applicable.
- C. This section shall be governed by alternates insofar as they apply to this work.

2. DESCRIPTION OF WORK

- A. Provide all labor, materials, equipment and services necessary for proper and complete installation of equipment specified.
- B. Refer to other Division 16 sections for additional work required in conjunction with electrical equipment, not work of this section.

3. QUALITY ASSURANCE

- A. Special Use Markings: Provide equipment, constructed for special use, with UL marks indicating that special usage, i.e., "suitable for use in Class 1, Division 1 Environments".
- B. UL Compliance: Comply with applicable UL publications pertaining to miscellaneous equipment. Provide units which have been listed and labeled by Underwriters Laboratories.
- C. NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to installation of miscellaneous electrical equipment. Comply with applicable NEC Articles pertaining to installation of wiring and equipment in hazardous locations.

4. SUBMITTALS

- A. Submit manufacturer's data on all miscellaneous electrical equipment items.
- B. Submit dimensioned drawings of equipment and enclosures indicating accurately scaled layout of enclosures and required individual devices.

5. EQUIPMENT

- A. Bitumastic Coatings
 - 1. Coatings for use on conduits and between metal and concrete contact points shall be of self priming type.
 - 2. Coatings shall be black, high build type single component coal tar mastic capable of maximum 30 mil dry film thickness.
 - 3. Coatings shall be applied in two (2) coats to achieve average of 18 mil dry film thickness over surface to be protected.
 - 4. Coatings shall be Carboline Bitumastic 50 or equal.

B. Corrosion Control Tape

1. **Corrosion control tape shall be applied to all rigid aluminum conduit where in contact with concrete (passing thru slabs, etc.) and where installed below concrete or in contact with earth.**

2. Corrosion control tape shall be Polyken No. 826 yellow in color, 12 mil thickness, 2" or 4" wide as required. Use Polyken No. 1027 primer prior to tape installation per manufacturer requirements.

C. Exothermic Ground Connections

1. Exothermic welding systems shall be approved by Underwriters Laboratories to ANSI UL 467 "Grounding and Bonding Equipment."

2. Exothermic welding shall be used for making electrical connections of copper to copper, copper to steel or copper to cast iron for grounding and cathodic applications.

3. Exterior connections shall be suitable for exposure to the elements of direct burial in earth or concrete without degradation over the lifetime of the grounding system.

4. Interior connections in occupied building shall be made using a low smoke producing process.

5. Products for exothermic connections shall be Cadweld, Thermoweld, Permaweld or

D. Cable Reels

1. Cable reels shall be suitable for corrosive installations and conform to NEMA 4 Standards for installation in wet locations. Reels shall come pre-assembled with cord of size, type and number of conductors as required for supplying power to motorized hoist. Contractor shall install reels as near as possible to center of hoist travel distance and shall furnish with the following:

a. Ball stop for cable at reel.

b. Cable grip/strain relief for cable connection at hoist.

c. Guide rails.

d. Junction box.

e. Field Fabricated Steel angle bracket, for support below crane bridge, with Pivot base.

f. Roller guide.

g. Min. 60' of 3#10. 'SOW" cable (600V)

2. Cable reels and all components shall be U.L. listed. Reels shall be Insul-8 (Wampfler) 1900 Series, Woodhead or equal.

E. Generator (Cam-Lok) Connection Cabinet "GCC"

1. Contractor shall furnish and install wall mount NEMA 3R stainless steel generator connection cabinets. Doors shall have continuous hinge and be lockage. Interior bussing where required shall be silver plated copper. Connectors shall be Crouse-

Hinds color coded E10 Series. Cabinet connector colors shall match cable connectors colors of existing generator.

2. Cabinets shall be as manufactured by Berthold Electric, Eaton Corporation or equal. Cabinets shall be complete with all required connectors and bussing. Contractor field fabricated units will not be accepted. Submit manufacturer shop drawings for unit to be supplied.
3. Cabinet connectors shall be female type and cordset connects shall be male type. (Verify with Owner standards for connector configuration and connector colors prior to purchase.)
4. Coordinate all connector color, types and quantities between connection cabinet supplier and generator with Owner.
5. Contractor shall furnish Owner with (1) lock for each cabinet. All locks shall be keyed alike. Furnish Owner with 4 sets of keys. Locks shall be Master Pro Series with 2 1/2" shackle.
6. Connectors shall be of same rating as transfer switch.
7. Verify with owner for no. and size of Cam-Lok connectors needed.

F. Chemical Spill Combination Alarm Horn/Light & Pull Stations

1. Alarm horn light unit shall be NEMA 4X type as Manufactured by E2S.
2. Alarm unit shall be SON4L-AC 120volt with Tone 5 sounder and L.E.D beacon with grey housing and red lens. Unit shall have standard 5 year warranty.
3. Pull station shall be green with contacts rated min. 2A, 240VAC and labeled 'Evacuate'. Unit shall be as manufactured by Sigcomm SG-42, RGS, Potter Signal or equal.

6. INSTALLATION

- A. Handle miscellaneous equipment carefully to prevent breakage, denting and scoring finish.
- B. Store miscellaneous electrical equipment indoors and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, waterproof wrapping.
- C. Install miscellaneous electrical equipment, in accordance with manufacturer's written instructions, applicable requirements of NECA and in accordance with recognized industry practices to ensure that products comply with requirements and serves intended purposes.
- D. Coordinate installation of miscellaneous electrical equipment with cable and raceway installation work and work of other trades.
- E. Anchor equipment firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secure.

END SECTION

SECTION 16450 - ELECTRICAL GROUNDING

1. RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions and General Requirements, apply to this section.
- B. Electrical general provision sections govern this section, where applicable.
- C. This section shall be governed by Alternates insofar as they apply to this work.

2. DESCRIPTION OF WORK

A. Provide labor, material, equipment and services for proper and complete electrical grounding system.

B. Grounding of electrical installations comprises both system and equipment grounding, and includes, but is not necessarily limited to, metal raceways, transformer frames, switchgear enclosures, metal enclosures of electrical devices, and circuit conductors.

C. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.

D. Electrical cable, wire, connectors, clamps, and raceway work are specified in applicable Division 16 basic material sections.

E. Method

(1) Supplement grounded neutral of secondary distribution system by and equipment grounding systems to properly safeguard equipment and personnel. Design equipment grounding system so all metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment, and other conductive items in close proximity with electrical circuits operate continuously at ground potential and provide a low impedance path for possible ground fault currents.

(2) The AC secondary system ground shall be connected using exothermic welds to at least three ground rods minimum 3/4 inch by 10 feet. Where required to meet requirements of herein specified tests, install extra rods at no additional cost to Owner. Locate rods a minimum of 10 feet from each other or any other electrode and loop interconnect with each other by a minimum No. 6 AWG bare copper conductor brazed to each rod below grade. Do not splice grounding electrode conductor.

(3) In addition, provide in conduit a minimum 3/0 or as required green insulated copper ground conductor to main metallic water service entrance and connect to same by means of adequate ground clamps. Where a dielectric main water fitting is installed, connect this ground conductor to street side of dielectric water fitting. Do not install a jumper around this fitting. Bond to ground conductor at each end. Provide with ground clamps a 3/0 jumper around water meter.

(4) Connect system neutral ground and equipment ground system to common ground bus as indicated on Drawings, or if not indicated, as required by NEC.

(5) Ground secondary services at supply side of secondary disconnecting means and at related transformers in accordance with NEC. Provide each service disconnect enclosure with a neutral disconnecting means and an insulated neutral stud which interconnects with insulated neutral and uninsulated equipment ground buses to establish system common ground point. Locate neutral

disconnecting link or links so that low voltage neutral bar with all interior secondary neutrals can be isolated from common ground bus and service entrance conductors.

(6) Size required equipment grounding conductors and straps in compliance with NEC. Provide equipment grounding conductors with green insulation equivalent to insulation on associated phase conductors. Braze related feeder and branch circuit grounding conductors to grounding bar or connect with approved pressure connectors. A feeder serving several panelboards shall have a continuous grounding conductor which shall be connected to each related cabinet bar. Aluminum, straps or bars may be substituted for proposed copper items if this is consistent with materials proposed for low voltage distribution system. Aluminum materials shall be comparable in current carrying capacity, temperature, rise, and mechanical strength, and installation shall include all necessary precautions regarding electrical connections with dissimilar metals.

(7) Provide low voltage distribution systems with a separate green insulated equipment grounding conductor for each single or three phase feeder and each branch circuit. Install required grounding conductor in common conduit with related phase and/or neutral conductors. Where there are parallel feeders installed in more than one raceway, each raceway shall have a green insulated equipment ground conductor. Single phase branch circuits required for 120 and 277 volt lighting, receptacles, and motors shall consist of phase, neutral and grounding conductors installed in common metallic conduit. Provide flexible metallic conduit equipment connections utilized in conjunction with the above single phase branch circuits with suitable green insulated grounding conductors connected to approved grounding terminals at each end of flexible conduit. Provide single phase branch circuits required for special equipment and all branch circuits installed in nonmetallic or flexible conduits with a separate grounding conductor.

(8) Determine number and size of pressure connectors to be provided on all equipment grounding bars required in panelboards and other electrical equipment for termination of equipment grounding conductors. In addition to active circuits, provide pressure connectors for all three phase spares and spaces.

(9) Provide a green colored equipment ground conductor and connected as described below. Provide each ground conductor with spade tongue terminals or solderless pressure connectors to suit conditions.

a. From green ground terminal of all receptacles to green 10 32 "washer in head" outlet box machine screw. Note: Receptacles with special cast boxes and factory designed and approved ground path will not require a separate ground jumper.

b. From green 10 32 "washer in head" machine screw in ceiling outlet box or junction box through flexible metallic conduit to ground terminal in fixture.

c. From green 10 32 "washer in head" machine screw in ceiling outlet box or junction box through flexible metallic conduit to green 10 32 "washer in head" machine screw in switch outlet box in movable partitions.

d. From green 10 32 "washer in head" machine screw in junction box or disconnect switch through flexible metallic conduit to ground terminal in connection box mounted on single phase fractional horsepower motor.

e. From equipment ground bus in motor control center through conduit and flexible metallic conduit to ground terminal in connection box mounted on three phase motor. Note: where motor has separate starter and disconnect device, ground conductor shall originate at ground bar in panelboard supplying these motors and be bonded to each starter and disconnect device enclosure also.

f. From equipment ground bar to equipment grounding bar on a busway, install and connect by an approved method a ground conductor.

g. From a computer area power panel ground bar, provide each branch circuit with a green insulated equipment ground conductor. Minimum size of this conductor shall be per NEC but no ground conductor circuit shall exceed 3 ohms resistance to building ground system.

(10) Nonmetallic conduits or ducts shall contain a green insulated grounding conductor unless otherwise specified.

a. Equipment grounding conductors are not required for telephone ducts.

(11) Where electric devices such as electric air cleaners or heaters are installed in air ducts, provide a green insulated equipment ground conductor. Bond conductor to each unit, air duct, and to ground in panelboard.

(12) Where electric immersion type water heater or surface anti frost heating cables are installed, provide a green insulated equipment ground conductor. Bond this conductor to water piping at unit and to ground bar in panelboard.

(13) Subject completed equipment grounding system to a megger test at each service disconnect enclosure ground bar to insure that ground resistance, without chemical treatment or other artificial means, does not exceed twenty five (25) ohms. Certified test reports of ground resistance shall be submitted to Engineer for approval. Necessary modifications for compliance with the twenty five (25) ohm value shall be performed without additional expense to Owner.

(14) Where steel conduit(s) terminate without mechanical connection to a metallic housing of electrical equipment by means of locknut and bushings or adapters such as switchboards, switchgear, motor control centers, the following procedure shall be followed: Provide each conduit with a ground bushing and each bushing connecting with a bare copper conductor to ground bus in electrical equipment. Ground conductor shall be in accordance with article on Grounding of NEC. Bond electrically non continuous metallic conduits containing ground wiring only to ground wire at both conduit entrance and exit in a manner similar to that described above.

3. QUALITY ASSURANCE

A. Comply with NFPA No. 70, National Electrical Code, as applicable to materials and installation of electrical grounding systems and associated equipment and wiring.

B. Comply with UL standards and IEEE Greenbook pertaining to electrical grounding and bonding.

C. Manufacturers offering products complying with requirements include: Cadweld, ITT Blackburn, ITT Weaver, Copperweld Bimetallics Group, Cathodic Engineering Equipment Co., or equal.

4. SUBMITTALS

A. Submit manufacturer's information on exothermic type connection system. Submit written results of grounding system megger test.

5. EQUIPMENT

A. Except as otherwise indicated, provide for each electrical grounding indicated, a complete assembly of materials including but not necessarily limited to cable, wire, connectors, terminals (solderless lugs), grounding rods/electrodes and plate electrodes, bonding jumper braid, and other items

and accessories needed for a complete installation. Where more than one type meets indicated requirements, selection is Installer's option. Where material or component is not otherwise indicated, provide products complying with NEC, and established industry standards.

B. Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC.

C. Provide electrical connectors, terminals and clamps as recommended by connector, terminal and clamp manufacturer for intended applications.

D. Steel ground rods with copper clad exterior, 3/4" dia. x 10'.

E. Acceptable Manufacturers:

(1) Grounding equipment shall be Cadweld, ITT Blackburn, ITT Weaver, Copperweld Bimetallics Group, Cathodic Engineering Equipment Co., or equal.

6. INSTALLATION

A. Testing

(1) The CONTRACTOR shall be required to provide all labor, tools, instruments, and materials as necessary to perform testing of the grounding electrode system. Results shall be submitted in writing to the ENGINEER. The testing shall be done to determine the effectiveness of the selected grounding scheme and to see that it conforms with resistance specified (2.5 ohms maximum).

(2) The testing should be done using a fall-of-potential method test at the point of grounding electrode conductor connection to main power distribution equipment and at each separately derived system or MCC. The test shall be performed no sooner than 48 hours after a rainfall event.

(3) The written report should contain the following information:

a. Type of ground scheme used, i.e., building steel, driven rod, mat, etc.

b. Type of instrument used.

1) Mfr.

2) Model number

3) Confirm fall-of-potential test

4) *Serial number

5) *Where instrument was obtained

* These 2 items are required so that the same instrument may be utilized should reproduction of the test be necessary due to unsatisfactory readings/instrument miscalibration.

c. Ground resistance readings obtained at various test distances.

d. Ground resistance/distance curve.

e. Value of Grounding Electrode Resistance at knee of curve.

f. Sketch showing setup of instrumentation and location electrode and test probes.

g. Proposed method to achieve the specified resistance, should an unacceptable reading be obtained.

h. Ground resistance readings obtained (if applicable) after modification incorporated.

B. Ground Enhancement Material

(1) Where indicated on the Drawings or as deemed necessary by the CONTRACTOR to achieve design grounding electrode system resistance, a ground enhancement material shall be utilized, in accordance with manufacturer's recommendations.

(2) The ground enhancement material must be permanent and maintenance free (no recharging with salts or chemicals which may be corrosive) and maintain its earth resistance for the life of the system. It must set up firmly and not dissolve or decompose, or otherwise pollute the soil or local water table. The material shall be capable of being applied dry or in a slurry form, and shall reduce resistance by at least 40 percent.

(3) Basic components of this material shall be carbon, hydraulic cements, and hydrous aluminum silicates. Minimum 4-inch diameter holes shall be used with ground rod installations, with depth 6" shorter than length of rod, completely filled with the material. Trenches for grounding electrode conductor shall also utilize this material the full length from electrode to building, in accordance with manufacturer installation recommendations, except trench depth shall allow buried conductor to be at least 2'-6" deep.

(4) Ground enhancement material shall be GEM by Erico Products, Powerfill by Cathodic Engineering Equipment Company, or equal.

(5) Should ground rods be impractical for use due to rocky conditions, then grounding electrode plates may be used after acceptance by the ENGINEER or a case by case basis.

(6) Install electrical grounding systems where indicated, in accordance with manufacturer's instructions and NEC as necessary to interface installation of electrical grounding system with other work.

C. Special Installation Instructions

(1) Contractor shall coordinate with General Contractor and connect main AC system ground to exposed rebar stub at main service disconnect per 2011 N.E.C. requirements.

(2) All connections to ground rods shall be made using exothermic (Cadweld) type connections.

END SECTION

SECTION 16460 - TRANSFORMERS

1. RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions, and General Requirements, apply to this Section.
- B. Requirements of Electrical General Provisions sections govern work specified in this Section.
- C. This section shall be governed by alternates insofar as they affect this work.

2. DESCRIPTION OF WORK

- A. Provide labor, materials, equipment and services necessary for proper and complete installation of transformers.
- B. Types of transformers required for this project include the following:
 - Dry type distribution transformers.

3. QUALITY ASSURANCE

- A. Manufacturers offering products complying with requirements include:
 - Square D Co.
 - Cutler-Hammer
 - Or equal
- B. Provide transformers which have been listed and labeled by Underwriters Laboratories.
- C. Comply with National Electrical Code (NFPA No. 70) as applicable to installation and construction of electrical power/distribution transformers.
- D. Comply with applicable portions of National Electrical Manufacturers Association standards pertaining to power/distribution transformers.
- E. Comply with applicable American National Standards Institute (ANSI) standards pertaining to power/distribution transformers.
- F. Comply with applicable portions of Institute of Electrical and Electronic Engineers (IEEE) standards pertaining to power/distribution transformers.

4. SUBMITTALS

- A. Submit manufacturer's data on power/distribution transformers, including certification of transformer performance efficiency at indicated loads, percentage regulation at 100% and 80% power factor, no load and full load losses in watts, % impedance at 75 degrees C, hot spot and average temperature rise above 40 degrees C ambient, sound level in decibels, and standard published data.

5. EQUIPMENT

A. Except as otherwise indicated, provide manufacturer's standard materials and components as indicated by published product information designed and constructed as recommended by manufacturer, and as required for a complete installation.

B. Dry Type Distribution Transformers

(1) Provide factory assembled general purpose air cooled dry type distribution transformers where shown, of size, characteristics, and rated capacity as indicated; single phase, or three phase, 60 hertz, standard impedance. Provide NEMA ST 20 TAP arrangements (2) 2 1/2% ANFC and (4) 2 1/2% BNFC). Insulate with Class 220 insulation and rate for continuous operation at rated KVA. Limit transformer surface temperature rise to maximum of 65 degrees C. Provide terminal enclosure, with cover, to accommodate primary and secondary coil wiring connections and electrical supply raceway terminal connector. Equip terminal leads with connectors installed. Limit terminal compartment temperature to 75 degrees C when transformer is operating continuously at rated load with ambient temperature of 40 degrees C. Provide wiring connectors suitable for copper or aluminum wiring. Electrically ground core and coils to transformer enclosure by means of flexible metal grounding strap. Provide transformers with fully enclosed sheet steel enclosures. Apply manufacturer's standard light gray indoor enamel over cleaned and phosphatized steel enclosure. Cushion mount transformer with external vibration isolation supports recommended by manufacturer to limit sound level rating to 50 d.b. as determined in accordance with NEMA standards.

6. INSTALLATION

A. Deliver transformers with factory installed shipping skids; package transformers in watertight containers or wrappings.

B. Handle transformers carefully to avoid damage to components, enclosures and finishes. Do not install damaged equipment; replace and return damaged units to equipment manufacturer.

C. Store transformers in a clean dry place and protect from weather and construction traffic.

D. Install transformers in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that transformers comply with requirements of National Electrical Code, and applicable portions of ANSI/NEMA standards pertaining to installation of electrical transformers and ancillary equipment.

E. Provide positive equipment ground and bond for transformer equipment where indicated.

F. Upon completion of installation of transformers, energize primary circuit at rated voltage and frequency from normal power source and test transformer, including, but not limited to, audible sound levels, to demonstrate compliance; otherwise, remove and replace with new units and with retesting.

END SECTION

SECTION 16510 - BUILDING LIGHTING FIXTURES

1. RELATED DOCUMENTS

A. General provisions of Contract, General and Supplementary Conditions and General Requirements, apply to this section.

B. Requirements of electrical general provision sections govern the work specified in this section, where applicable.

C. This Section shall be governed by alternates insofar as they affect this work.

2. DESCRIPTION OF WORK

A. Provide material, equipment, labor and services necessary for proper and complete installation of interior lighting fixtures.

3. QUALITY ASSURANCE

A. Comply with National Electrical Code (NFPA No. 70) as applicable to installation and construction of interior lighting fixtures.

B. Comply with applicable portions of National Electrical Manufacturers Association standards pertaining to lighting equipment.

C. Comply with applicable American National Standards Institute standards pertaining to lamp materials, and lamp ballasts and transformers, and interior lighting fixtures.

D. Provide interior lighting fixtures which have been listed and labeled by Underwriters Laboratories.

E. Provide fluorescent-lamp ballasts which comply with Certified Ballast Manufacturers Association standards and carry CBM label.

F. Comply with additional fixture requirements contained in Interior Lighting Fixture Schedule at end of this section or indicated on Drawings.

4. SUBSTITUTIONS

A. Lighting fixtures detailed on drawings and specified in schedules are intended to indicate general fixture type. Fixture products of other manufacturers may be proposed, provided these are of similar design, equally efficient, have aesthetically acceptable appearance, and are approved by Architect or Engineer.

B. In addition to requirements of Section 16000 Products, proposal shall consist of three (3) bound copies of cuts on lighting fixtures and shall include the following information:

- (1) Name of Manufacturer
- (2) Catalog Number
- (3) Fixture drawings, showing metal gauges and finish.
- (4) Photometric distribution curves.
- (5) Coefficient of utilization as determined by an independent testing laboratory.

5. SUBMITTALS

A. Submit fixture shop drawings and manufacturer's data in booklet form with a separate sheet for each fixture, assembled in luminaire "type" numerical/alphabetical order, with proposed fixture and accessories clearly indicated on each sheet.

6. LIGHT FIXTURES

A. Light fixtures shall consist of, but not be limited to lamps, lampholders, reflectors, ballasts, starters, and wiring.

B. Provide all recessed fixtures installed in plaster or drywall ceilings with plaster frames supplied by fixture manufacturer.

C. All ferrous metal surfaces of fixtures and plaster frames shall be treated and given rust inhibiting and finish coat adherence properties before finish coats are applied. Finish coats shall be enamel baked on at approximately 320 degrees F or dry powder electrostatically applied.

D. Unless otherwise specified, metal baffles and plastic or glass diffuser panels and low-brightness lens panels shall be contained in rigid, hinged or safety chained metal frames. Diffusers and lens panel shall be replaceable without the use of tools other than screwdriver or pliers. Frames and lens shall provide proper tolerance for normal expansion and contraction without damage to panels.

E. Plastic members shall be uncolored 100 percent virgin acrylic.

F. Fixtures shall allow replacement of ballasts without removal of fixture.

G. It shall be possible to remove and install lamps in fixtures without tools.

7. LAMPS

A. Provide new and unused lamps for all fixtures.

B. Provide mercury vapor and metal Halide lamps with extinguishing mechanisms to prevent operation of lamps when outer globe is broken.

C. Incandescent lamps shall be rated 130 volts.

8. BALLASTS

A. Each ballast shall meet requirements of "Certified Ballast Manufacturer's Association". Securely fasten ballasts in place with mounting surface of ballast making as complete contact with surface of ballast mounting area of fixture as practical. Attach ballasts to mounting surface of fixture by one bolt and nut or sheet metal screw for each ballast mounting hole or as recommended by ballast manufacturer for optimum heat transfer. Ballasts shall have an "A" sound rating.

B. Equip all fixtures with ballasts with external GLR line fuses in HLR holders. Fuse size shall be determined by fixture manufacturer.

C. Provide low temperature fluorescent ballasts in fixtures mounted in cold rooms, outdoors, and as indicated.

D. H.I.D. ballasts shall be constant wattage autotransformer, high power factor type, unless otherwise indicated.

E. Fluorescent ballast to be high performance electronic to operate at a frequency of 25KHz or

higher with less than 2% lamp flicker, at an input voltage of 108 to 132 VAC (120 volt line) or 249 to 305 VAC (277 volt line) at an input frequency of 60 Hz minimum of .99 power factor. Light output to remain constant for line voltage of $\pm 5\%$. Ballast to comply with EMI and RFI limits set by FCC (CFR 47 part 18) for normal electrical equipment and have less than 1.5 lamp current crest factor (LCCF). Units shall be full rapid start except slimline and maintain full cathode heat during operation. Ballast to meet ANSI standard (82.41) and UL listed Class P Type 1 outdoor. Ballast shall be non-PCB. Ballast to have less than 10% total harmonic distortion less than 6% third harmonic distortion. Ballast to have A sound rating with a power factor greater than .99 and have a twenty year rated lamp life. Ballast to operate 1, 2, 3 or 4 T8 or T12 or T5 lamps as specified in fixture specification. Number of ballasts in multi-lamped fixture to be determined by switching or multiple fed luminaries. Responsibility for correct number of ballasts in luminaries and correct voltage to be responsibility of fixture suppliers. Motorola, Advance or Universal are acceptable manufacturers.

9. INSTALLATION

- A. Deliver lighting fixtures individually wrapped in factory-fabricated fiberboard type containers.
- B. Handle fixtures carefully to prevent breakage, denting and scoring of fixture finishes. Do not install damaged lighting fixtures; replace and return damaged units to equipment manufacturer.
- C. Store lighting fixtures in a clean, dry space. Store in original cartons and protect from dirt and debris, physical damage, weather and construction traffic.
- D. Install lighting fixtures of types indicated, where indicated, and at indicated heights; in accordance with lighting fixture manufacturer's written instructions and with recognized industry practices; to ensure that fixtures comply with requirements and serve intended purposes. Comply with NEMA standards, and requirements of National Electrical Code pertaining to installation of lighting fixtures.
- E. Set lighting fixtures and equipment plumb, square, and level and secure to structural support members of building. Provide all steel supports necessary for lighting fixtures in addition to those specified under general building construction. Recessed and semi-recessed fixtures may be supported from suspended ceilings and ceiling tees if ceiling system support rods or wires are provided not more than 6 inches from each edge of each fixture. Secure fixtures in suspended ceilings to framing members in accordance with NEC 410-16 by using standard clips made for the purpose. Sheet metal screws are not acceptable.
- F. Mounting heights specified or indicated shall be to bottom of fixture. Coordinate exact mounting of lighting fixtures with type, style and pattern of ceiling being installed.
- G. Clean interior lighting fixtures of dirt and debris upon completion of installation. Protect installed fixtures from damage during remainder of construction period.
- H. Upon completion of installation of lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
- I. At date of substantial completion, replace lamps in lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by Engineer.

BUILDING LIGHTING FIXTURE SCHEDULE

- LF-1 1' X 4' recessed LED type fixture, UL listing for wet location, .135 acrylic A19 fully gasketed diffuser, aluminum door, 20GA.aluminum housing.
KURTZON WL-F-5-1x4-2/LEDH35-120-FF-A19
- LF-2 Surface mounted self-contained emergency light with thermoplastic housing, dual voltage input capability, solid state charger, short-circuit protection, thermal protection, AC/LVD reset, 36 watt capacity sealed maintenance free lead calcium battery, brownout protection, low voltage disconnect, UL label, and three (3) year total customer satisfaction warranty. Unit to be supplied with (2) H2012 lamp heads.
Lithonia IND 1254-H2012
Chloride equal
Holophane equal
- LF-3 LED Exterior Wallpack fixture. Cast alum. Housing, prismatic glass lens and photocell.
HOLOPHANE W4GLED-30C-50K-T3M-120-PE-SF-BZ
- LF-4 120V NEMA 4 alarm strobe type fixture. Wall mount. Red lens. Wet location listed with guard.
Thomas & Betts HAZFLASH "M4" VXS61RGPB2
- LF-5 Exterior wall pack type light fixtures, 120V. Fused. Die cast aluminum housing, Dark bronze finish. Glass diffuser. One (1) 250WMH lamp.
Wet location listed.
Lithonia WFL3-250M-HPW-120-SF-DBL
- LF-6 4'-0" surface mounted LED industrial with polycarb. housing, UL listing for wet location, polycarb. diffuser secured to fully gasketed housing by stainless steel.6000 lumens nominal.
Holophane EVT4-79LED-ASY-MVOLT-SF-WL-STSL-MOUNT BRACKET AS REQUIRED
- LF-7 Surface mounted L.E.D. down light. Class 2 Division 2 rated. 5000K array. Low copper aluminum alloy cast housing with glass optics. 120V.
HOLOPHANE PETROLUX LED HPLED42-350-4K-AS-L5-12-UN-F1 or equal
- LF-8 Universal mounted stencil face LED exit sign with polycarbonate housing, single faceplate, white finished housing, low energy consumption long-life LED lamps. UL label, wet location and three year total fixture warranty.
Lithonia WLTE W1R

END SECTION

SECTION 16610 –AUTOMATIC TRANSFER SWITCH

1. RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions and General Requirements apply to this section..
- B. Electrical General Provision sections govern work specified in this Section, where applicable.
- C. This section shall be governed by Alternates insofar as they affect this work.

2. DESCRIPTION OF WORK

- A. Provide all labor, material, equipment and services necessary for proper and complete installation of new manual transfer switch.
- B. Intent of Specifications – The Contractor shall secure manual transfer switches of the latest commercial type and design as specified herein.

3. QUALITY ASSURANCE

- A. Comply with applicable portions of National Electrical Code (NFPA No. 70).
- B. Comply with applicable portions of National Electrical Manufacturers Association standards for manual transfer switches.
- C. Provide manual transfer switches and other electrical components which have been listed and labeled by Underwriters' Laboratories.
- D. The manufacturer of the transfer switch shall be a firm regularly engaged in the manufacture of switches of the type, size, ratings, and electrical characteristics specified, and whose products have been in satisfactory service for not less than five years.
- E. The manufacturer shall comply with all applicable sections of appropriate codes, including but not limited to NEC, UL 1008, UL 486A, NFPA 99, NFPA 101, NFPA 110, ANSI/NEMA ICS 2, and applicable NEMA Standards. The complete transfer switch assembly, including cable lugs, etc. shall be UL listed under UL Standard 1008.

4. SUBMITTALS

- A. Submittals shall be provided in accordance with the contract documents. Submittals shall include manufacturer's original data sheets and detailed shop drawings. Shop drawings shall include a detailed specification sheet listing project name, supplier, and a description of each item supplied. Description shall include model number, voltage, number of poles, and enclosure type. Submittals shall include schematic wiring diagram, complete dimensional information, and a listing of accessories supplied for each item. In order to avoid confusion, drawings shall be accurate and specific for the equipment being supplied. Marked up "generic" drawings are not acceptable.
- B. Operation and maintenance data shall be supplied after shipment in accordance with the contract documents.

5. MATERIALS

- A. Materials and Workmanship - All materials, equipment, and parts comprising the units specified herein, shall be new and unused, of current manufacture and of highest grade.

1. AUTOMATIC TRANSFER SWITCHES

A. General

1. Scope And Related Work

- a. Furnish and install Automatic Transfer Switch with number of poles, amperage and voltage as shown on drawings. UL Withstand and Close-on ratings as listed in this specification are provided as a minimum requirement.
- b. Related Work: this section shall be used in conjunction with related specification sections and related contract documents, including drawings, to establish the total requirements for the automatic transfer switches. Use of this section exclusively may result in the omission of basic requirements.

2. Codes And Standards

- a. The Automatic Transfer Switches and controls shall conform to the requirements of the following:
 - i. UL 1008: Underwriters Laboratories Standard for Transfer Switch Equipment
 - ii. NFPA 70 National Electrical Code
 - iii. NFPA 99 Essential Electrical Systems for Health Care Facilities
 - iv. NFPA 110 Standard for emergency and standby power systems
 - v. ANSI/IEEE 446 Recommended Practice for Emergency and Standby Power Systems for Commercial Applications
 - vi. NEMA ICS 10 P1 Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment
 - vii. IBC-2006 International Building Code-Seismic Certified
 - viii. UL 508 Standard for Industrial Control

3. Submittals

- a. Submittals shall be provided in accordance with the contract documents. Submittals shall include the manufacturer's original data sheets and detailed shop drawings. Shop drawings shall include a detailed specification sheet listing the project name, supplier, and a description of each item supplied. The description shall include model number, voltage, number of poles, and enclosure type. Submittals shall include schematic wiring diagram, complete dimensions information, and a listing of accessories proposed for each item. In order to avoid confusion, all drawings shall be accurate and specific for the equipment being supplied. Marked up generic drawings are not acceptable.

- b. Operation and maintenance data shall be supplied after shipment in accordance with the contract documents.
- 4. Installation, Operation And Maintenance Data
 - a. The manufacturer shall supply three (3) copies of installation, operation and maintenance manuals to the owner after delivery of the equipment.
- 5. Warranty
 - a. The automatic transfer switch shall be provided with a five year warranty, covering all parts, labor, travel and expenses during the first two years, followed by three years of replacement parts coverage. Warranty shall commence on startup or six months from date of shipment, whichever occurs first. Warranty shall not be dependent upon customer purchase of additional equipment or preventive maintenance contracts.

B. Products

- 1. Acceptable Manufacturers
 - a. Automatic Transfer Switch shall be manufactured in the United States of America and of type RTS03B, 1600A, 480V, 4POLE as manufactured by Russelectric. Requests for substitutions shall be made a minimum of ten (10) days prior to bid date. Manufacturers catalog data and complete list of exceptions and deviations to the specification shall accompany each request and authorized acceptance shall be addenda only.
- 2. General
 - a. Transfer switches shall be electrically operated and mechanically held with double throw construction. Ratings shall be as shown on the drawings.
 - b. Switches shall be four pole type. Where four pole switches are required, a true four pole switch shall be supplied, with all four poles mounted on a common shaft. The entire fourth pole assembly, including contacts, arc chutes, etc. shall be identical to the other power poles. The fourth pole shall be switched simultaneously with, and by the same mechanism as, the main power poles. The short circuit rating of the fourth pole shall be identical to the ratings of the main power poles. The complete assembly shall be factory tested to ensure proper operation and compliance with the specifications requirements. Overlapping neutral designs are not acceptable.
- 3. The transfer switch shall be mounted in a special 59" deep freestanding NEMA 3R, enclosure, unless otherwise indicated on the drawings. Enclosures shall be fabricated from 12 gauge steel. The enclosure shall be sized to exceed minimum wire bending space required by UL 1008, even when compression lugs are provided.
- 4. The transfer switch shall be seismic certified, capable of operating successfully after being subjected to a minimum IBC 200% g Earthquake Test. Testing shall be performed and verified by an independent, A2LA accredited, testing

- laboratory, in accordance with IBC 2006. Any additional bracing, structural changes, and/or accessories required to pass seismic testing shall be included. Certification must be obtained via actual shake table testing. Certification by calculation only is not acceptable.
5. The automatic transfer switch shall be capable of transferring successfully in either direction with 70% of rated voltage applied to the switch terminals.
 6. Where open transition transfer switches are indicated, the Source 1 and Source 2 contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Designs relying on electrical interlocks only are not acceptable. Main contacts shall be mechanically locked in both the positions without the use hooks, latches, magnets or springs. Main contacts on all size switches shall be segmented with tungsten arcing tips. Contacts shall be machined from solid copper. Separate arcing contacts with magnetic blowouts shall be provided on all transfer switches. Interlocked molded case circuit breakers or contactors are not acceptable.
 7. All open transition transfer switches shall be equipped with a safe manual operator designed to prevent injury to operating personnel. The manual operator shall provide the same contact to contact transfer speed as the electrical operator to prevent a flash-over from switching the main contacts slowly. Manual operation shall not require prior disconnection of electrical operators or control wiring, and shall be safe even if the electrical operator becomes energized during manual operation. The manual operator shall be external type, operable through the door of the enclosure. Safe manual transfer shall be possible under all load conditions, either energized or non-energized.
 8. The automatic transfer switch shall be double throw, actuated by two electrical operators, momentarily energized, and connected to the transfer mechanism by a simple over-center type linkage providing inherent quick break, quick make operation when operated electrically or manually.
 9. For large motor and transformer switching applications, and for transfer switches used for load shedding, where indicated by the "dual" operator designation on the drawings, the transfer switch shall be double throw, actuated by two electrical operators. The adjustable time delay between the opening of the closed contacts and the closing of the open contacts shall allow the loads to be demagnetized before transfer. The dual operator transfer switch shall allow the motor and transformer loads to be re-energized after transfer with normal inrush current. The manufacturer shall have a minimum of 5 years experience in building dual operators style switches. In phase monitor or sync check designs shall not be acceptable.
 10. All bolted bus connections shall have Belleville compression type washers.
 11. All control components and wiring shall be front accessible. All control wires shall be multiconductor 18 gauge 600-volt SIS switchboard type point to point harness. All control wire terminations shall be identified with tubular sleeve-type markers.
 12. The switch shall be equipped with 90 degrees C rated copper/aluminum solderless mechanical type lugs, unless otherwise indicated on the drawings. If compression lugs are indicated on the drawings, these lugs shall be supplied by the ATS supplier, and the UL listing of the switch shall not be compromised. The load side of the ATS shall have double the quantity of the standard lugs

13. Controller

- a. The transfer switch shall be equipped with a Microprocessor Controller with a Power Supply Module, CPU and I/O Modules. The Microprocessor shall be identical for all voltage and ampere ratings. The controller shall be capable of serial communications.
- b. The controller shall contain voltage sensing modules capable of direct single phase or three phase sensing of each source from 120 VAC to 600 VAC. The Power Supply Module shall accept a 24 VDC external power source allowing controller communications in the event of a power outage.
- c. Voltage sensing shall be true RMS type and accurate to +/- 1% of nominal voltage. Frequency sensing shall be accurate to +/- 0.05Hz. The operating temperature range shall be -20 to +50 degrees C and storage from -40 to +90 C.
- d. The controller shall connect to the transfer switch through an interconnecting wiring harness. Interfacing relays shall be provided to isolate the controller from abnormal voltages applied to any and all customer input and output wiring terminals.
- e. All customer interface connections shall be wired to a common DIN rail Cage Clamp terminal block. Sufficient space shall be provided to allow for future modifications and upgrades.
- f. The controller shall meet or exceed the requirements for Electromagnetic Compatibility as follows:
 - i. EN55022 (CISPR11) Conducted and Radiated emissions, Class B
 - ii. EN61000-4-2 (Level 4) ESD immunity test
 - iii. EN61000-4-3 (ENV50140) Radiated RF
 - iv. EN61000-4-4 Electrical fast transient/burst immunity test
 - v. EN61000-4-5 IEEE C62.41 Surge immunity test
 - vi. EN61000-4-6 (ENV50141) Conducted immunity test
 - vii. EN61000-4-11 Voltage dips and interruption immunity
 - viii. IEEE 472 (ANSI C37.90A) Ring wave immunity
- g. Controller Display and Keypad
 - i. A color, ¼ VGA minimum, graphical display shall be provided for viewing data and setting operational parameters. Parameters shall also be available for viewing remotely and limited control through a front accessible USB communications port. All programming functions shall be pass code protected.

- ii. The Controller shall provide high intensity LED's for the following:
 - a) Source Availability - Indicates the source voltage and frequency are within pre-set parameters.
 - b) Source Connected - Indicates the source main contacts closed and the load being served from the source.
 - c) XFER Inhibit - Indicates that the ATS is being inhibited from automatic operation to the unconnected source.
 - d) Alarm: Indicates an alarm condition is active.
 - e) TD Active: Indicates that a transfer switch time delay is actively timing.

- iii. For ease of navigation, the display shall include the following:
 - a) Soft Keys – Change function based on user location in the menu structure.
 - b) Dedicated Navigational Keys – Home, Scroll Up, End, Escape and Enter.
 - c) Dedicated Pushbuttons for Alarm Reset, Test, Control and Information.

h. Voltage, Frequency and Phase Rotation Sensing

- i. The transfer switch controller has programmable voltage and frequency sensing of both Source 1 and Source 2, and shall be capable of detecting a single or three phase losses. The Controller shall have adjustable pickup and dropout settings for each source. Set point ranges for both Source 1 and Source 2 shall be as follows:

Parameter	Dropout/Trip	Pickup/Reset
Under-voltage	72 to 100%	70 to 98%
Over-voltage	100 to 108%	102 to 110%
Under-frequency	45.1 to 60.0 Hz	45.0 to 59.9%
Over-frequency	50.0 to 69.7 Hz	50.1 to 69.8 Hz

- ii. The controller shall monitor phase rotation of both sources and inhibit transfer if both sources are not the same phase rotation. Source rotation shall be field selectable as either ABC or CBA.
- iii. Settings shall be adjustable in 1% increments either through the keypad, USB port or remotely via communications.

- iv. A single source status screen shall be provided to allow for viewing of the status of both sources including three phase voltage, power and frequency.
- i. Time Delays: The transfer switch controller shall provide the following time delays:
 - i. The controller shall include an adjustable time delay of 0 to 10 seconds to momentarily override Source 1 power outages and to delay engine starting. The time delay shall be expandable up to 60 minutes if an external 24 VDC power supply is provided for ATS control.
 - ii. The controller shall include an adjustable 0 to 60 minute time delay on transfer to Source 2, factory set at 3 seconds.
 - iii. The controller shall include a time delay on retransfer to the preferred source adjustable 0 to 259 minutes, factory set at 5 minutes.
 - iv. The controller shall include a time delay on engine cool down adjustable 0 to 60 minutes, factory set at 5 minutes.
 - v. All time delays shall be adjustable in 1second increments. All time delays shall be adjustable via the graphical display, the front USB port or configuration software using the USB, serial or Ethernet communications port.

14. Sequence Of Operation

- a. The transfer switch shall be designed to transfer load between two sources, as follows:
 - i. Source 1 Utility
 - ii. Source 2 Standby Generator
- b. When the voltage on any phase of Source 1 is outside of the acceptable parameters, as defined later in this specification, and after a programmable time delay period to allow for momentary voltage dips, the engine starting contacts shall close to initiate starting of the standby generator.
- c. The transfer switch shall transfer to Source 2 when that source has reached specified voltage and frequency on all phases.
- d. After restoration of Source 1 voltage and frequency on all phases, as specified later in this specification, an adjustable time delay shall delay the retransfer to Source 1 to assure stabilization of that source. After expiration of that time delay period, the transfer switch shall retransfer to Source 1. Should Source 2 fail anytime during the time delay period, the transfer switch shall bypass the time delay and immediately retransfer to an available Source 1.

- e. After retransfer to Source 1, the standby generator shall be allowed to operate at no load for a programmable period of time. The transfer switch cool-down timer shall be coordinated with any engine control cool-down timers to avoid excessive unloaded operation.

15. Additional Features And Accessories

- a. Test Switch – The controller shall be provided with a two position, password protected, test switch to simulate a Source 1 failure. An external Key operated maintained contact test switch shall also be provided.
- b. Engine Start Signal – A SPDT contact, rated 10 amps at 30 VDC, shall be provided to start the engine generator in the event of a Source 1 outage or customer initiated test.
- c. Source connected contacts rated 10 amps at 120 VAC shall be provided to signal when the ATS is connected to each source. Quantity of 3 for each position.
- d. Source Connected LED's - The controller shall include LED's to indicate when the ATS is connected to each source.
- e. Source Availability LED's and Contacts - The controller shall include LED's to indicate the availability of each source. In addition, two voltage free form "C" contacts shall be provided to indicate availability of Source 1, and two voltage free form "C" contacts shall be provided to indicate availability of Source 2. The lights and relays shall provide true source availability indication, as determined by the voltage sensing settings for each source.
- f. Commit/No-Commit Transfer Selector – The controller shall include a programmable selector to configure the controller to commit, or not to commit, to transferring the load to Source 2 in the event the Source 1 power returns prior to Source 2 being ready to accept load.
- g. Inhibit Transfer Signals – The controller shall be capable of accepting transfer control inputs that inhibit transfer of the ATS to either source for load control purposes for use with generator control switchgear.
- h. Auto/Manual Selector – The controller shall include a programmable function to select either Automatic or Manual operation.
- i. ATS/Engine Exerciser: The controller shall include a user configurable exerciser. Exerciser shall be configurable for daily, 7 day, 14 day or 28 day exercise periods, each with (7) programmable events. The exerciser shall also be configurable as a full, 365 day exerciser with up to 24 independent exercise events. Each event shall be configurable for Test with Load and Test Without Load. Each event shall include user adjustable start time, date and test duration. All time and date settings shall be stored in non-volatile EEPROM memory. The controller shall include full programmability for daylight savings time.
- j. Diagnostics: The controller shall contain self and system diagnostic screens for the purpose of detecting and troubleshooting abnormal system events.

- k. Communications Interface: The controller shall be capable of interfacing via serial/RS485 or optional Ethernet TCP/IP communications ports integral to the controller. All communications parameters (baud rate, parity, IP Address, etc.) shall be accessible and programmable via the front keypad. Both serial and Ethernet communication shall be Modbus open protocol.
- l. Event Logger: The controller shall have the ability to log data and to maintain the last 256 events, even in the event of a power failure. Time and date stamping of events will be accurate to 1 ms. Controller shall be capable of synchronizing its date/time setting with a main PC via Network Time Protocol over an Ethernet TCP/IP network connection.
- m. The following events shall be time and date stamped:
 - i. Last Primary Source Failure
 - ii. Last reason for transfer.
 - iii. Last transfer to alternate source
 - iv. Last retransfer to primary source
 - v. Time load is without power
 - vi. Time ATS powered up
 - vii. Total time on source 1
 - viii. Total time on source 2
 - ix. Total number of primary source failures
 - x. Total number of transfers
- n. Communications Modules
 - i. Ethernet Communications: Where indicated on the drawings, the controller shall be capable of supporting an optional Ethernet TCP/IP communications, in lieu of the standard serial communications, via an internally mounted and self powered communications card. Ethernet shall be 10/100 MBit, auto sensing and include an RJ45 network connector.
 - ii. Open Protocol: Both serial and Ethernet communications shall be Modbus protocol. Proprietary communications protocols shall not be acceptable.
 - iii. External Power Supply: The controller shall be capable of being connected to an external 24 VDC power supply to permit full operation and communications of the controller when both sources are de-energized.

- iv. Auto Load Shed: The controller shall be capable of being programmed to automatically shed the connected load in the event of a user configurable under frequency condition.
- v. Customer Configurable Alarms – The controller shall be capable of being configured to display customer configured alarm points. Alarms shall be capable of being reset via a remote contact or the front panel RESET pushbutton.

16. POWER QUALITY METERING

- A. If indicated on the drawings, the ATS shall be provided with optional metering for the parameters listed below. Metering shall be true RMS type, with 1% accuracy for voltage and 0.5% accuracy for currents. The transfer switch shall be provided with solid core current transformers with 5 amp secondary current. CT's shall be wired to a shorting block for safety purposes.

The following meter parameters shall be provided:

- 1. Phase current: Ia, Ib, Ic, In and average current (Iavg)
- 2. Phase voltage: Va, Vb, Vc, Vab, Vac, Vbc
- 3. Voltage and Current unbalance
- 4. Hz, PF, W, Var, VA
- 5. Wh, VAh, VARh
- 6. Voltage and Current Harmonics (% THD up to 8th order)
- 7. Phase Rotation Sensing
- 8. Synchroscope (lead/lag)

- B. The ATS shall be capable of monitoring and capturing waveform data in the event of a utility power outage or other user specified event.

- 1. A total of 10 active channels of waveform capture may be user configured.
- 2. Each channel shall be capable of capturing up to 256 cycles of waveform information.
- 3. Analog channels may be configured for 4, 8, 16 or 32 samples/cycle.
- 4. Digital channels shall be configured for 1 sample/cycle.
- 5. Waveform data shall be stored in industry standard COMTRADE format for broadest compatibility and ease of downloading to a PC.

- C. The controller shall be capable of logging digital and analog measured parameters and storing the data in non-volatile memory.

- D. The controller shall contain a 10 channel Data Logger. Each channel shall be capable of being configured to monitor a digital on/off or analog measured parameter.

- E. The sampling rate of each channel shall be configurable from 1 cycle to 60 minutes per sample. The data shall be stored in non-volatile memory in a first in, first out method.

17. Withstand Ratings

- a. The transfer switch shall be UL listed in accordance with UL 1008 for 3 cycle close and withstand ratings. Switches that are not tested and labeled by UL for 3 cycles are not acceptable. The minimum UL listed close and withstand ratings at 480 VAC shall be as follows:

Size Amps	3 Cycle	Current Limiting Fuses
100 – 400	42 Ka	200,000 Ka
600 – 800	65 Ka	200,000 Ka
1000 – 1200	85 Ka	200,000 Ka
1600 – 4000	100 Ka	200,000 Ka

- b. During 3 cycle closing and withstand tests, there shall be no contact welding or damage. The 3 cycle test shall be performed without the use of current limiting fuses. The tests shall verify that contact separation has not occurred, and there is contact continuity across all phases. Test procedures shall be done in accordance with UL-1008, and testing shall be certified by Underwriters Laboratories, Inc.
- c. In accordance with UL-1008, after completion of the short time closing and withstand testing, the same sample shall successfully pass the Temperature Test and the Dielectric Voltage-Withstand Test to verify the ability of the ATS to carry full rated current after completing the short time tests.

2. INSTALLATION - TRANSFER SWITCHES

- A. Transfer switch shall be installed as indicated in accordance with the equipment manufacturer's written instructions, and recognized industry practices to ensure that system equipment complies with requirements of NEC and applicable portions of NECA's "Standard of Installation" pertaining to general electrical installation practices.
- B. The electrical contractor shall examine areas and conditions under which the transfer switch shall be installed, and notify engineer in writing of conditions detrimental to proper completion of work.
- C. Coordinate with other electrical work, including cables, wires, raceways, electrical boxes and fittings as appropriate.
- D. Provide appropriate safety and arc flash labels, as required.
- E. Ground equipment according to Division 16 section on Grounding and Bonding.
- F. Connect wiring according to Division 16 section on "Conductors and Cables."
- G. Wire to remote components: Match type and number of cables and conductors to control and wiring communication requirements of transfer switch(es) as recommended by the manufacturer.

- H. Tighten electrical connectors and terminals according manufacturer's published torque tightening values. If manufacturer's torque values are not available, use those as specified in UL486A and UL 486B.
- I. Prior to shipment, the transfer switch shall be factory tested and inspected to ensure proper operation. Tests shall include voltage, frequency, and time delay settings for compliance with specifications.
- J. Manufacturer shall perform a dielectric test complying with NEMA ICS 1.
- K. After installing the equipment, and after electrical circuitry has been energized, the installing contractor shall test for compliance with requirements, as follows:
 - 1. Perform each electrical test and visual and mechanical inspection.
 - 2. Check for electrical continuity of circuits and for short circuits.
 - 3. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - 4. Verify manual transfer operation (if applicable).
 - 5. Simulate at least three power failures, verifying operation of transfer equipment from Source 1 to Source 2, and return to Source 1.
 - 6. Verify time delay settings as desired by the owner.
- L. Coordinate ATS testing concurrently with testing of engine generator, and run concurrently.
- M. The transfer switch manufacturer shall employ a nationwide, factory direct field service organizations. All field service personnel shall be direct employees of the manufacturer. Third party service organizations are not acceptable.
- N. The transfer switch manufacturer shall include an "800" telephone number for field service support. Support shall be available 24 hours a day, 365 days a year. The field service number shall be displayed on the outside of each enclosure.
- O. The manufacturer shall maintain complete records and schematic drawings, along with replacement parts, for all switches by serial number, for a minimum of 20 years.
- P. Warranty
 - 1. The automatic transfer switch shall be provided with a five year warranty, covering all parts, labor, travel and expenses during the first two years, followed by three years of replacement parts coverage. Warranty shall commence on startup or six months from date of shipment, whichever occurs first. Warranty shall not be dependent upon customer purchase of additional equipment or preventive maintenance contracts.

END OF SECTION

SECTION 16800 - SURGE PROTECTIVE DEVICES

1. RELATED DOCUMENTS

- A. General Provisions of Contract, General and Supplementary Conditions and General Requirements, apply to this section.
- B. Requirements of electrical general provision sections govern this section, where applicable.
- C. This section shall be governed by alternates insofar as they apply to this section.

2. DESCRIPTION OF WORK

- A. This Section includes Surge Protection Devices for low-voltage power, control and communication equipment.
- B. Provide labor, material, equipment and services necessary for proper and complete installation of secondary surge (lightning) arresters and surge protective devices.
- C. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included.

3. QUALITY ASSURANCE

- A. Comply with National Electrical Code Article 285 as applicable to construction and installation of surge arresters.
- B. Provide surge arresters which have been listed and labeled by Underwriters Laboratories.
 - (1) UL1449 3rd Edition: Surge Protective Devices (SPD)
 - (2) UL1283 5th Edition: Electromagnetic Interference Filters
- C. Comply with applicable portions of ANSI/IEEE:
 - (1) C62.41.1: 2002 IEEE Guide on the Surge Environment in Low-Voltage (1000V and less) AC Power Circuits
 - (2) C62.41.2: 2002 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits
 - (3) C62.45: 2002 IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000V and Less) AC Power Circuits
 - (4) C62.62: 2000 IEEE Standard Test Specifications for Surge Protective Devices for Low Voltage (1000V and Less) AC Power Circuits
 - (5) C62.72: 2007 IEEE Guide for the Application of Surge Protective Devices for Low Voltage (1000V and Less) AC Power Circuits
- D. Surge protective devices selected for project shall comply with short circuit current ratings per N.E.C. 285.6.

E. Surge protective devices selected for project shall comply with NFPA 780 – Standard for the Installation of Lightning Protection Systems.

F. Source Limitations: All secondary service suppression devices and accessories shall be from a single manufacturer.

4. SUBMITTALS

- A. Submit manufacturer's data on secondary lightning arresters.
- B. Submit manufacturer's data on surge protective devices.

5. PRODUCTS

A. The types of surge protective devices required for project shall include the following as noted within plans and specifications:

- (1) Surge protective devices (modular-replaceable module solid state type).
- (2) Surge protective devices (non-modular encapsulated non-replaceable component- solid state type).
- (3) Telephone, data, signal and instrumentation surge protective devices.

B. Surge Protective Devices (SPDs)

(1) Description

(a) This section describes the materials and installation requirements for transient voltage surge suppressors (TVSS) for the protection of all AC electrical circuits from the effects of lightning induced currents, substation switching surges and internally generated surges resulting from inductive and/or capacitive load switching.

(2) Modular Surge Protection (Type 1)

- (a) Configured as shown on the riser diagram and/or panel schedules.
- (b) The SPD surge current ratings shall be based on the electrical system ampacity listed in the table below.

Electrical System Ampacity @ SPD Install Point	Surge Protection (kA)	
	Per Mode	Per Phase
2500 – 6000A	300	600
1200 – 2000A	250	500
600 – 1000A	200	400
225 – 400A	150	300
125 – 225A	100	200

(c) The SPD shall be rated for voltage, phase and wye or Delta configuration as indicated on Drawings or noted in specifications.

(d) Modes of Protection: The SPD system shall provide surge protection in all possible modes (L-N, L-G, L-L, and N-G) for the circuit or service to be protected. Each replaceable module must provide the uncompromising ability to deliver full surge current rating per mode.

(e) SPD modules shall be configured to isolate individual suppression component failures without causing total loss of surge protection in that mode.

(f) Opening of supplementary protective devices, internal or external, is not permissible during UL1449 3rd Edition Nominal Discharge testing.

(g) Optional Connection Methods: [Fused Disconnect, 60A, #6AWG] [Surge Rated Disconnect, 100A, #2AWG] [Distribution Block, 100A, #2AWG] [Terminal Block, 60A #6AWG].

(h) Each individual module shall feature an LED indicating the individual module has all surge protection devices active. If any module is taken off-line, the LED will turn off and/or a "fail" LED will illuminate, providing individual module status.

(i) Monitoring: Units shall have Status Indication Lights, Surge Counter with Audible Alarm and Form "C" Contacts.

(j) The modular SPD shall be provided in a NEMA 4 enclosure for exterior use and NEMA 12 enclosure for interior use unless otherwise noted.

(k) The SPD shall provide EMI/RFI electrical noise attenuation of 36 to 44dB in the range of 50kHz to 100MHz as defined by MIL-STD-220A test procedures.

(l) Voltage Protection Ratings: The UL1449 3rd Edition Voltage Protection Ratings "VPR" (6kV, 3000 Amps, 8/20µs waveform) must not exceed the UL assigned values listed below.

	208/120V	480/277V
Line to Neutral	900V	1200V
Line to Ground	800V	1200V
Neutral to Ground	700V	1200V
Line to Line	1200V	2000V

(m) The SPD shall have a minimum UL 1449 3rd Edition Nominal Discharge Current Rating (In) of 10,000 Amps. When used in conjunction with a UL 96A certified Lightning Protection System the (In) rating shall be 20,000 Amps.

(n) Approved Manufacturers: The following SPD manufacturers and respective models are acceptable, subject to conformance with indicated requirements:

Current Technologies TSr Product Series

THOR SYSTEMS SL2 Product Series

Liebert Interceptor II Series

(3) NON-MODULAR SURGE PROTECTION (Type 2)

(a) Configured as shown on the riser diagram and/or panel schedules.

(b) The SPD surge current ratings shall be based on the electrical system ampacity listed in the table below.

Electrical System Ampacity @ SPD Install Point	Surge Protection (kA)	
	Per Mode	Per Phase
400 – 800A	150	300
125 – 225A	100	200
15-100A	50	100

(c) The SPD shall be rated for voltage, phase and wye or Delta configuration as indicated on Drawings or noted in specifications.

(d) Modes of Protection: The SPD system shall provide surge protection in all possible modes (L-N, L-G, L-L, and N-G) for the circuit or service to be protected. Each replaceable module must provide the uncompromising ability to deliver full surge current rating per mode.

(e) All non-modular units shall be factory wired for each phase conductor and for Neutral and Ground conductors.

(f) Continuous LED indication of the system integrity (including N-G mode for a Wye system) utilizing LEDs. Monitoring: Units shall have Solid State Status Indication Lights, Surge Counter with Audible Alarm and Form "C" Contacts.

(g) The non-modular SPD shall be provided in a NEMA 4 enclosure for exterior locations or NEMA 12 enclosure for interior locations unless otherwise noted.

(h) The SPD shall provide EMI/RFI electrical noise attenuation of 32 to 37dB in the range of 50kHz to 100MHz as defined by MIL-STD-220A test procedures.

(i) Voltage Protection Ratings: The let-through voltage test results used to obtain the UL1449 3rd Edition Voltage Performance Ratings "VPR" (6kV, 3000 Amps, 8/20µs waveform) must not exceed the UL assigned values listed below.

	208/120V	480/277V
Line to Neutral	700V	1200V
Line to Ground	700V	1200V
Neutral to Ground	800V	1200V
Line to Line	1000V	2000V

(j) The SPD shall have a minimum UL 1449 3rd Edition Nominal Discharge Current Rating (In) of 10,000 Amps. When used in conjunction with a UL 96A certified Lightning Protection System the (In) rating shall be 20,000 Amps.

(k) Approved Manufacturers: The following NON-MODULAR SPD manufacturers and respective models are acceptable, subject to conformance with indicated requirements:

Current Technologies	TSn Product Series
THOR SYSTEMS	TG Product Series
Liebert	Accuvar All Product Series

(4) Transient Voltage Surge Suppressors - Telephone, Data, Signal and Instrumentation.

- (a) TVSS shall be listed in accordance with UL 497A where applicable.
- (b) TVSS shall be of compact in-line design and have low shunt capacitance for minimum signal loss.
- (c) TVSS shall utilize high speed avalanche diodes for protection.
- (d) TVSS units shall meet or exceed the following criteria:

- 1) Response time < 10ns
- 2) Maximum shunt capacitance < 40pf except coaxial. Devices which shall be < 30AR.
- 3) Coaxial cable devices shall have -0.5db insertion loss and no series resistance.
- 4) Telephone/Data units shall exceed Category 5.
- 5) Standard clamp voltages/peak pulse currents shall meet or exceed the following as applicable to respective system requirements:

Ethernet 10-base T	7.5V/750A
Telephone Dial-up	240V/250A
CSU/DSU	60V/200A
T-1	60V/200A
DDS	60V/200A
Cable TV	7.5V/750A
Satellite TV	18V/340A
4-20MA Instrumentation (Analog)	30V/370A

- (e) TVSS shall have a warranty for a period of five years.
- (f) Manufacturers
 - 1) Surge protectors shall be as manufactured by Current Technologies, TSC, DDC, MTC and CCC Series or equal. EDCO Series SS65 (4-20ma instrumentation) or equal.

(5) Transient Voltage Surge Suppressors - 120VAC Hardwired Equipment

- (a) TVSS shall be listed in accordance with UL 1449 Third Edition and UL 1283.
- (b) TVSS shall provide surge current diversion paths for all modes of protection; L-N, L-G, N-G.

(c) TVSS shall have operational status indicators and each MOV shall be fused.

(d) Unit shall be housed in NEMA 4 enclosure, have terminal screw connections and each MOV shall be fused.

(e) TVSS shall meet or exceed the following criteria:

1) Maximum surge current capability (single pulse rated) PER PHASE (2 x per mode) shall be:

a) Hardwired equipment (40) kA per phase or as noted on drawings.

(f) Manufacturers

Surge protectors shall be as manufactured by EDCO, HSP Series or equivalent.

6. INSTALLATION

A. Deliver each piece of equipment in durable shipping cartons. Maintain cartons through shipping, storage and handling as required to prevent damage and eliminate dirt and moisture. Store cartons inside and protect from weather.

B. Install system and materials in accordance with manufacturer's instructions and roughing in drawings, and details on drawings. Install electrical work and use electrical products complying with requirements of applicable Division 16 sections of these specifications.

C. Term "wiring" is defined to include providing of wire, conduit and miscellaneous materials as required for mounting and connecting devices.

D. Install a complete wiring system as required for system(s) surge protection.

E. Number Code or Color Code conductors, appropriately and permanently for identification and servicing of systems.

F. Contractor shall install surge protective devices and lightning arresters.

G. Surge Protective Devices shall be provided in quantities such that all modes of protection of the secondary service is protected. This protection shall be provided at the main service panel.

H. Surge Protective Devices shall be installed such that both line and ground lead lengths are as short as possible. Splicing of additional conductor to increase lead length as provided by manufacturer will not be accepted.

I. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others except when permitted and then only after arranging to provide temporary utility services according to requirements indicated. Notify and coordinate with the engineer when an interrupt is required and prior to interrupting.

J. Coordinate location of field-mounted surge protective devices to allow adequate clearances for maintenance.

K. All devices must be installed on the load side of the facility after the first overcurrent protection or disconnect unless otherwise noted.

L. Products shall be installed external to service, distribution, and branch panel equipment. All SPDs must have the same or greater AIC, Interrupting or Fault rating of the equipment the SPD is protecting.

M. Continuity measurements shall be made between the Neutral and Ground connections to verify the Neutral-to-Ground bond.

7. WARRANTY

A. All Surge Protective Devices (SPDs), associated hardware, and supporting components shall be warranted to be free from defects in materials and workmanship, under normal use and in accordance with the instructions provided, for a period of five (5) years.

B. Any component or subassembly contained within the surge protection system that shows evidence of failure or incorrect operation during the five (5) year warranty period, shall be replaced by the manufacturer.

8. SPECIAL INSTALLATION INSTRUCTIONS

A. Contractor shall furnish and install (1) Type "2" SPD on all new and existing services fed from utility company transformers.

END SECTION



SECTION 16915 - TELEMETRY CONTROL

1. RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions and General Requirements apply to this Section.
- B. Requirements of Section 16000 General Provisions govern work specified in this section.
- C. This section shall be governed by alternates insofar as they apply to this section.

2. DESCRIPTION OF WORK

- A. Provide labor, materials, equipment and accessories necessary for complete and proper control systems/equipment circuits as indicated on drawings..
- B. Description of Work - The telemetry system control equipment cabinets, transmitter, antenna etc. shall be installed by the owner's system supplier. Electrical contractor shall furnish and install control circuits, door contacts etc. as shown on drawings for connection to the telemetry system and coordination of conduit/cable/wire termination points with owners telemetry supplier.
- C. Installation
 - (1) Coordination
 - a. The Owner's Telemetry Systems Integrator shall coordinate with other electrical and mechanical work including wires/cables, raceways, electrical boxes and fittings, controls supplied by others, and existing controls, to properly interface installation and commissioning of the telemetry control system.
 - (2) Coordinate telemetry control panels/equipment installation with owner's telemetry system supplier.
 - (3) Ground cable shields and equipment according to system manufacturer's written instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common-mode returns, noise pick-up, cross talk and other impairments.
 - (4) Wiring within Enclosures where required: Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
 - (5) Upon completion of installation, start-up and testing shall be performed for circuits installed under this contract.

END SECTION



SECTION 16920 - CONTROLS

1. RELATED DOCUMENTS

- A. General provisions of Contract, General and Supplementary Conditions and General Requirements apply to this Section.
- B. Requirements of Section 16000 General Provisions govern work specified in this section.
- C. This section shall be governed by alternates insofar as they apply to this section.

2. DESCRIPTION OF WORK

- A. Provide labor, materials, equipment and accessories necessary for complete and proper control systems.
- B. Unless otherwise specified, required for a particular application, or indicated by details or control diagrams on Drawings, provide each motor with a motor starter of type specified.

3. QUALITY ASSURANCE

- A. Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of control panels.
- B. Provide control panels which have been listed and labeled by Underwriters' Laboratories.
- C. Comply with National Electrical Manufacturers Association Standards.

4. SUBMITTALS

- A. Submit manufacturer's data complete with wiring diagrams and individual manufacturer cutsheets for all items contained within control panels.

5. EQUIPMENT

- A. General
 - (1) Equipment controls shall be as specified herein and shown on the Contract Drawings.
 - (2) Certain equipment starters contain nonresettable elapsed time meters as shown in the Contract Drawings.
 - (3) All starters contain red "on" lights, control transformers, and (2) sets spare auxiliary contacts. Reset pushbuttons shall also be provided for overloads built into the starters.
- B. Custom Control Panels
 - (1) All control panels furnished under this Contract shall be manufactured in accordance with industry standards and as herein specified. Control panels are specified to be furnished with the equipment controlled.
 - (2) Control panel construction shall comply with OSHA and other code requirements as applicable, and may be attested to by UL listing the panels as an assembly. Otherwise,

panel modifications as required by the Electrical Inspector shall be performed by the supplier at no extra cost to the Owner.

(3) Control panels to be furnished on this project shall be wired to function according to schematics shown on the Contract Drawings. In addition to the requirements shown on the Contract Drawings, the panels shall adhere to additional requirements as written herein, and in the utilization equipment specifications.

(4) Enclosures shall be dead front with all operators devices accessible in a lockable switch compartment on the enclosure door. All relays, timers, terminal strips, etc., shall be mounted to a subpanel inside the enclosure. All control wiring must be stranded and sized to be protected by a 15 A/IP circuit breaker. Supplemental overcurrent protection may be used in lieu of oversized wiring.

(5) All terminal strips and lugs shall be of a type UL listed to terminate the size and quantity of wires encountered. Where conduits enter the boxes, if they are NEMA 4X, sealing locknuts or hubs must be used to maintain the box rating.

(6) Wet location or outdoor mounted enclosures shall comply with Article C. below.

(7) Elementary control schematics and connection diagrams showing the spatial relationship of components and wiring shall be submitted for review. Also, a bill of materials, drawing of device arrangement on front, and enclosure fabrication drawings shall be submitted. Further, descriptive literature is required on all components. A copy of the shop drawings shall be furnished and stored in a pocket inside the enclosure.

(8) Sleeve type wire markers or other "permanent" type marker shall be installed on all wires, keynoted back to the elementary schematic or the connection diagram, and all terminals identified.

C. Control Panel Enclosures For Outdoor/Wet Locations

(1) The purpose of this Specification is to provide details of an enclosure that protects internal equipment from rain, dust, vandalism, and other conditions found in an outdoor environment or otherwise harsh environment.

(2) The manufacturer shall provide part numbers on all components for repair purposes. Enclosure shall be single or double door as required.

(3) Control panel enclosure sizing shall be by supplier in accordance with appropriate standards and codes.

a. Minimum size of pad mount enclosures not including floor stands shall be 48"W x 60" high.

(4) The enclosure(s) will meet or exceed the requirements of a NEMA 4X rating and shall be UL listed.

D. Cabinet Construction

(1) The cabinet and door or doors shall be constructed from 5052-H32 sheet aluminum alloy which has thickness of 0.125 inch. External welds shall be made by using the Heliarc welding method, whereas internal welds will be made by the wire welding method. All welds shall be neatly formed and free of cracks, blow holes and other irregularities.

- (2) All inside and outside edges of the cabinet shall be free of burrs.

E. Door Hardware

- (1) The cabinet door or doors shall be a minimum of 80 percent of the front surface area and shall be hinged on the right side when facing the cabinet (right and left outside edges for double door enclosures).

- (2) Each door shall be furnished with a gasket that satisfies the physical properties as found in UL508 table 21.1 and shall form a weathertight seal between the cabinet and door.

- (3) The hinges shall be continuous and bolted to the cabinet and door utilizing ¼-20 stainless steel carriage bolts and ny-lock nuts.

- (4) The hinges shall be made of 0.093 inch thick aluminum and shall have a 3" open width with a 0.250 inch diameter stainless steel hinge pin.

- (5) The hinge pin shall be capped top and bottom by weld to render it tamperproof.

- (6) All bolt holes shall be gasketed.

- (7) The latching mechanism shall be a 3-point draw roller type.

- (8) The center catch and pushrods shall be cadmium plated, Type II, Class 1 or equal.

- (9) An operating handle shall be furnished.

- (10) The handle shall be stainless steel with ¾ inch diameter shank.

- (11) The latching handle shall have a provision for padlocking in the closed position.

F. Switch Compartment

- (1) A switch compartment, with removable back panel, is to be supplied on the enclosure main door. It shall be large enough to include all operating devices.

- (2) The switch compartment door opening shall be double flanged on all four sides for strength and to prevent liquids or dirt from dropping into the compartment when the door is open.

- (3) The door shall be furnished with a gasket that satisfies the physical properties as found in UL508 Table 21.1 and will form a weathertight seal between cabinet and door.

- (4) The switch compartment door shall have a tight key lock. Two keys shall be furnished with each lock.

- (5) The switch compartment door hinge shall be 0.063 inch stainless steel with a 0.120 diameter stainless steel hinge pin.

G. Equipment Mounting

- (1) The enclosure shall be equipped with two adjustable "C" mounting channels on both side walls and back wall of the enclosure, allowing versatile positioning of shelves or panels.

(2) The mounting channels shall provide infinite vertical and horizontal adjustment and not limit the positioning of shelves or panels. All mounting hardware will be furnished.

(3) If equipment is to be shelf mounted, the enclosure shall be provided with shelves fabricated from 5052-H32 aluminum having a thickness of 0.125 inch.

(4) The shelf depth shall be a minimum of 10.5 inches. The enclosure will have provision for positioning shelves or panels to within 4 inches of the bottom and to within 8 inches of the top of the enclosure.

(5) If the equipment is to be panel mounted, the enclosure shall be provided with a 5052-H32 aluminum back panel having a thickness of 0.125.

(6) The panel shall be natural finish. All mounting hardware will be furnished.

(7) A control panel shop drawing storage pocket shall be provided inside the enclosure at a convenient location.

H. Cabinet Finish & Mounting

(1) Unless otherwise specified, the outside surface of the cabinet shall have a smooth, uniform, natural aluminum finish.

(2) Pad Mounted Enclosure (Where Applicable)

a. Enclosure shall have 12" high floor stands to support entire enclosure bottom from contact with concrete pad.

I. Acceptable Manufactures

(1) Cabinet is to be as manufactured by Hoffman or a UL listed equivalent.

6. GENERAL SYSTEM DESCRIPTIONS

A. The systems description section of these Specifications is supplementary to the descriptions in other Divisions of the Specifications and to the Contract Drawings. Refer also to the equipment specifications and controls shown on the Contract Drawings.

7. PUMP STATION CONTROL

A. Refer to Division 11000 Specifications for additional control requirements.

8. INSTALLATION

A. Deliver custom control panels with factory-installed shipping skids and shims; package accessories in factory-fabricated fiber-board type containers. Do not deliver damaged, dented or cracked equipment; replace and return damaged units to equipment manufacturers.

B. Install control panels where indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices to ensure that sets comply with requirements and serve intended purposes. Comply with NEMA standards, requirements of National Electric Code pertaining to construction of fabricated control panels.

C. Ground cable shields and equipment according to system manufacturer's written instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common-mode returns, noise pick-up, cross talk and other impairments.

D. Wiring within Enclosures: Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced or interrupted in any enclosure associated with the control system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Upon completion of installation, start-up and testing shall be performed by a manufacturer trained service representative. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Operating and maintenance instruction books shall be supplied upon delivery of unit and procedures explained to operating personnel.

END SECTION

SECTION 16941 - CONTROL AND INSTRUMENTATION CABLE AND WIRE

1. RELATED DOCUMENTS

- A. General Provisions of Contract, General and Supplementary Conditions and General Requirements apply to work specified in this section.
- B. Requirements of Electrical General Provision Sections govern this Section, where applicable.
- C. This section shall be governed by Alternates insofar as they affect this work.

2. DESCRIPTION OF WORK

- A. Provide labor, materials, equipment and services necessary for proper and complete installation of control and instrumentation cable and wire.
- B. Requirements of this section apply to cable and wire work specified elsewhere in these specifications.
- C. Unless specified otherwise in this Section or indicated on Drawings, control and instrumentation device/equipment power wiring is specified under Section 16120.

3. QUALITY ASSURANCE

- A. Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of control cable and wire.
- B. Provide cable and wire which has been listed and labeled by Underwriters Laboratories.
- C. Comply with National Electrical Manufacturers Association/Insulated Power Cable Engineers Association Standards publications pertaining to materials, construction and testing wire cable, where applicable.
- D. Manufacturers offering products complying with requirements include:
 - (1) Wire:
Southwire Company
Triangle PWC, Inc.
Or equal
 - (2) Cable:
Belden
Or equal

4. SUBMITTALS

- A. Submit manufacturers' product data on all 4-20MA signal cables and power cables.

5. MATERIALS

- A. Provide factory-fabricated cable and wire of sizes, ratings, materials and types indicated. Where not indicated, provide proper selection as determined by main control and instrumentation panel supplier to comply with project's installation requirements and NEC standards.

B. Use (1) 16 ga. twisted/shielded pair cable for 4-20ma signal circuits from transmitters etc. Cable shall be Belden No. 8719, or General Cable type VNTC with 100% shield coverage and stranded/tinned 18 ga. drain wire.

C. Use No. 12 stranded conductor for control circuit wiring connected to lighting switches and snap switches.

D. Valves, valve controllers, start-stop selector switches etc. Use minimum 75 degrees C rated insulation unless specified otherwise, indicated on Drawings, or required by NEC. Use 600 volt insulation rating unless specified or indicated otherwise.

6. INSTALLATION

A. Install cable and wire as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure products serve intended functions.

B. Store cable, wire and connectors in factory-installed coverings in a clean, dry indoor space which provides protection against weather.

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

D. Use pulling compound or lubricant, when necessary; compound must not deteriorate conductor and insulation.

E. Do not use a pulling means, including fish tape, cable or rope which can damage raceway.

F. Install exposed cable, parallel and perpendicular to surface or exposed structural members and follow surface contours, where possible.

G. Wire or cable splices for control and instrumentation circuits shall not be accepted.

H. Install poly pull line in all spare control and instrumentation circuit conduits.

I. Prior to energization, check cable and wire for continuity of circuitry and for short circuits. Correct malfunction when detected.

J. Do not install any control or instrumentation cable or wiring in same conduit or J-box with electrical power wiring.

K. **NOTE:** Electrical Contractor shall be responsible for providing and installing all control and instrumentation wiring and cable from all remote devices to the main control panel (MCP). This shall include the termination of wires/cables on both ends and installation of wire No. markers.

7. SPECIAL INSTALLATION INSTRUCTIONS

A. Wire or cable splices for control and instrumentation circuits shall not be accepted.

B. Do not install any control or instrumentation cable or wiring in same conduit or J-box with electrical power wiring, unless otherwise noted.

C. All 4-20MA signal cables shall be run complete without splice in minimum 1" conduit. These cables shall not be run in same conduit or through exterior pull boxes which contain power wiring.

END SECTION

APPENDIX NO. 1

REPORT OF GEOTECHNICAL INVESTIGATION

BATTLE TRAINING ROAD PUMP STATION SITE



Report of
***GEOTECHNICAL
EXPLORATION***

AMERICAN ENGINEERS, INC.

BATTLE TRAINING ROAD
PUMP STATION

HARDIN COUNTY WATER
DISTRICT NO. 2

HARDIN COUNTY, KY
OCTOBER 2013

DESIGNING YOUR FUTURE, TODAY.

AEI



AMERICAN ENGINEERS, INC.

PROFESSIONAL ENGINEERING

65 Aberdeen Drive
Glasgow, KY 42141
Office (270) 651-7220
Fax (270) 651-3246

October 4, 2013

Mr. Carlos F. Miller, PE
Kenvirons, Inc.
452 Versailles Road
Frankfort, Kentucky 40601

Re: Report of Geotechnical Exploration
Hardin County Water District No. 2
Battle Training Road Pump Station
Hardin County, Kentucky
AEI Project No. 213-193

Dear Mr. Miller:

American Engineers, Inc. Field Services Center is pleased to submit this geotechnical report that details the results of our geotechnical exploration performed at the above referenced site.

The attached report describes the site and subsurface conditions and also details our recommendations for the proposed project. The Appendices to the report contains a drawing with a boring layout, typed boring logs and the results of all laboratory testing.

We appreciate the opportunity to be of service to you on this project and hope to provide further support on this and other projects in the future. Please contact us if you have any questions regarding this report.

Respectfully,
AMERICAN ENGINEERS, INC.

A handwritten signature in black ink, appearing to read "Brad High".

Brad High, PG
Staff Geologist

A handwritten signature in black ink, appearing to read "Dusty Barrett".

Dusty Barrett, PE
Geotechnical Project Manager

**REPORT OF GEOTECHNICAL EXPLORATION
HARDIN COUNTY WATER DISTRICT NO. 2
BATTLE TRAINING ROAD PUMP STATION
HARDIN COUNTY, KENTUCKY**

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**REPORT OF GEOTECHNICAL EXPLORATION
HARDIN COUNTY WATER DISTRICT NO. 2
BATTLE TRAINING ROAD PUMP STATION
HARDIN COUNTY, KENTUCKY**

1 GENERAL SITE DESCRIPTION

The site of the proposed pump station site is located in Hardin County, Kentucky off KY Highway 434. Currently, construction of a 10 million gallon per day (MGD) pump station is scheduled at the site. At the time of the exploration, each site was covered in a growth of mixed grass. Topographic relief can generally be described as rolling to steep. Topographic relief in the vicinity of the approximate 65 foot by 50 foot building footprint is on the order of about ten feet based on available topographic mapping. It is our understanding that the finished floor elevation (FFE) of the building will lie at approximate Elevation 468 requiring up to about 8 feet of cut to achieve the proposed FFE.

Foundation loads were unknown at the time of this report but are not anticipated to result in significant concentrated loads. It is our understanding that the upper wall of the pump station will likely be designed as a retaining wall to resist earth pressures from the hillside above.

2 GENERAL SITE GEOLOGY

Available geologic mapping (*Geologic Map of the Colesburg Quadrangle, Hardin and Bullitt Counties, Kentucky, USGS, 1967 and the Kentucky Geologic Map Information Service*) shows the sites to be underlain by Lower Mississippian-aged deposits of the Borden Formation as well as Quaternary-aged alluvium and lacustrine deposits. Mapping indicates the lower part of the Borden Formation to consist of silty shale and clay shale. The silty shale is described as light olive gray to dark greenish gray in color, calcareous and clayey. The clay shale is described as greenish gray to olive gray in color and silty in part. The alluvium was described as a heterogeneous mixture of sand, silt, clay and gravel.

No geologic hazards were apparent at the site upon review of available mapping or during the investigation, however minor faulting was indicated about 2 miles to the south of the site on the 7.5-minute quadrangle map. It is impossible to investigate a site to such an extent to fully identify the possibility of future geologically related problems. It should be understood by the owner that there is some risk of future ground subsidence when building in areas where karst activity has been known to historically exist.

3 SCOPE OF WORK PERFORMED

The geotechnical exploration consisted of drilling four soil test borings, three with rock core and one rockline sounding. Borings were staked and elevated by AEI. A boring layout is included in Appendix A of this report.

The borings were drilled by an AEI drill crew using a truck-mounted drill rig equipped with continuous flight hollow-stem augers and an NQ2-size diamond coring bit. A Senior Soils Engineering Technician was on site throughout the fieldwork to log the soils and rock encountered during the drilling operation. The recovered soil samples and rock core were further classified in the lab by a Geologist and a Geotechnical Engineer.

4 RESULTS OF THE EXPLORATION

4.1 GENERAL

Information provided in the Appendices for this report includes boring locations, logs of the borings, and other relevant geotechnical information. A description of the subsurface soil, bedrock and groundwater conditions follows.

4.2 SUBSURFACE SOIL CONDITIONS

The generalized subsurface conditions encountered at the boring locations, including descriptions of the various strata and their depths and thicknesses are presented on the Boring Logs in Appendix B.

Eight to 16 inches of topsoil was encountered in each of the borings beneath the existing ground surface, however will likely vary between the borings. The borings typically encountered low to moderate plasticity clay soils beneath the topsoil. These soils can typically be classified as lean clay, CL, (Clay of Low plasticity), in accordance with the Unified Soil Classification System. The near-surface soils encountered typically contained trace to some fine to medium gravel and trace to some fine sand, brown to gray in color, moist to wet of presumed optimum moisture content for compaction, and medium stiff to stiff in soil strength consistency. Plasticity of the clays soils encountered during the investigation generally increases with depth.

SPT-N values in the residual clays ranged from seven to 37 blows per foot (bpf), with most between ten and 15 bpf. Corresponding estimated unconfined compressive strength (Q_p) values ranged from less than 0.25 to more than 4.5 tons per square foot (tsf) with most values between about 2.25 and 4.5 tsf. Together, the SPT-N and Q_p values are indicative of stiff soil strength consistencies with medium stiff and very stiff zones.

Atterberg limits testing, grain-size analyses and visual classification of recovered soil samples indicate that the near-surface clay soils classify as CL (Clay of Low plasticity), lean clay, in accordance with the USCS. Liquid limit test results ranged from 33 to 39

percent with corresponding plasticity indices ranging from 15 to 20 percent. Moisture contents of the residual clays range from about 16 to 28 percent with most between 18 and 23 percent. Results of Atterberg limits and moisture content testing indicate that the residual clays are typically near to about five percent wet of the plastic limit. Unconfined compressive strength testing was performed on selected relatively undisturbed soil samples and ranged from 2,277 to 13,279 pounds per square foot (psf). Selected laboratory testing results are noted on the Boring Logs in Appendix A and Laboratory Testing Results in Appendix C.

4.3 BEDROCK CONDITIONS

Refusal, as indicated by the driller on the field boring logs, indicates a depth where either essentially no downward progress can be made by the auger or where the N-value indicates essentially no penetration of the split-spoon sampler. It is normally indicative of a very hard or very dense material such as large boulders or the upper bedrock surface. Auger refusal was encountered in each of the soil test borings and the rockline sounding. Auger refusal depths ranged from about 25 to 32 feet beneath the existing ground surface. The recovered rock core was typically described as shale, silty to arenaceous, medium gray to bluish gray in color, soft to moderately hard, and laminated to thin bedded. Core recovery percentages were all 100 percent, with Rock Quality Designation (RQD) values of zero.

4.4 GROUNDWATER CONDITIONS

Groundwater was not encountered in any of the borings at the site during drilling operations. In cohesive soils such as those encountered at the site, a long time is required for the hydrostatic groundwater level to come to equilibrium in the borehole. The short-term groundwater levels reported by the drill crew are not generally indicative of the long-term groundwater level. To accurately determine the long-term groundwater level, as well as the seasonal and precipitation induced fluctuations of the groundwater level, it is necessary to install piezometers in the borings, and monitor them for an extended length of time. Frequently, groundwater conditions affecting construction in this region are caused by trapped or perched groundwater, which occurs within the soil materials or at the soil/rock interface in irregular, discontinuous locations. If these water bodies are encountered during excavation, they can produce seepage durations and rates that will vary depending on the recent rainfall activity and the hydraulic conductivity of the material.

4.5 SEISMIC CONDITIONS

According to the Kentucky Building Code, 2012 Edition, and the subsurface conditions encountered in the borings, Site Class D should be utilized for foundation design.

Soil liquefaction analysis was outside the scope of this investigation. Prior studies in this region on similar soil types indicate that the potential for liquefaction is low and is primarily dependent on the variability of site soils and earthquake severity.

Once the subgrade is judged to be relatively uniform and suitable for support of engineered fill, fill areas should be brought to design elevations with on site soil and/or suitable off-site borrow material placed and compacted as specified in Section 5.1.7 Fill Placement.

5.1.4 On-Site Soils

The near-surface soils on the sites are low to moderate plasticity clays that classify as CL in accordance with the USCS. Efforts should be made to schedule earthwork activities during the late spring to early fall months since these soils will pump, rut, and lose strength with moisture contents more than several points wet or dry of the optimum moisture content for compaction. These soils are judged suitable for use as fill material at the site provided provisions are made for wetting or drying the soils for compaction and are placed and compacted in accordance with Section 5.1.7.

5.1.5 General Fill Requirements

Any material, whether borrowed on-site or imported to the site, placed as engineered fill on the project site beneath the proposed building or other proposed on-grade structures such as pavement, parking lots, sidewalks, etc., should be an approved material, free of environmental contamination, vegetation, topsoil, organic material, wet soil, construction debris, and rock fragments greater than six inches in diameter. We recommend that any borrow material, if needed, consist of granular or lean clay materials or mixtures thereof with Unified Classifications of CL, SC, or GC. We further recommend high plasticity clays, known as fat clays (CH soils) not be *imported* to the sites due to their potential for volume changes with fluctuations in moisture content.

The preferred borrow material should have a Plasticity Index (PI) less than 20 and a standard Proctor maximum dry density of at least 95 pcf. Engineering classification and standard Proctor tests should be performed on all potential borrow soils, and the test results evaluated by an AEI Geotechnical Engineer to evaluate the suitability of the soil for use as engineered fill.

5.1.6 Off-Site Soils

If off-site material is needed it should meet the requirements specified in 5.1.5 above.

5.1.7 Fill Placement

Lean clay, CL, soil placed under building areas should be placed in maximum eight inch (loose thickness) horizontal lifts, with each lift being compacted to a minimum of 98 percent of the standard Proctor maximum dry density, at a moisture content from optimum to 2 percent wet of optimum. The compaction requirement may be reduced to 95 percent in proposed paved areas and to 92 percent in proposed landscape areas. Representative and adequate field density testing should be performed by AEI to verify that compaction requirements have been met.

5.1.8 Soil Movement

Site grading should be maintained during construction so that positive drainage is promoted at all times. Final site grading should be accomplished in such a manner as to divert surface runoff and roof drains away from the foundation elements and paved areas. Precipitation runoff should be collected in storm sewers as quickly as possible. Maintenance should be performed regularly on paved areas to seal pavement cracks and reduce surface water infiltration into the pavement subgrade.

5.2 STRUCTURE FOUNDATIONS

5.2.1 Recommended Bearing Pressure

For foundation elements bearing on residual clays or engineered fill, an allowable bearing capacity of 2,000 pounds per square foot may be utilized for design. However, based on SPT-N values obtained near the surface in the borings, the Contractor should anticipate that some undercutting of footings will likely be required. Footings which do not achieve the design bearing capacity should be undercut to suitable material and backfilled with lean clay fill as outlined in Section 5.1.7 or with KDOH No. 57 stone.

5.2.2 Acceptance of Foundation Bearing Surfaces

Prior to placement of reinforcing steel in spread footings, an AEI Engineer or Engineering Technician should review the bearing surface to verify that the design bearing capacity provided can be achieved. The spread footings should also be reviewed to verify that the bottom is level and free of mud, loose soil or other questionable material that might affect foundation support.

5.2.3 Groundwater

Any groundwater encountered in spread footing excavations should be removed prior to concrete placement. Some zones of seepage may be present at the soil/rock interface depending on the time of year construction takes place.

5.2.4 Potential Foundation Movement

A detailed settlement analysis was beyond the scope of this investigation. It is anticipated that less than 1 inch of total settlement will occur with soil bearing foundation systems with differential settlement anticipated to be in the range of $\frac{1}{2}$ to $\frac{3}{4}$ inch.

These estimates assume that the foundations are designed and constructed according to the recommendations in this report and in conjunction with sound foundation construction practice.

5.2.5 Below Grade Walls

Below grade walls should include sand or gravel backfill. The design should also include weepholes or other provisions to prevent hydrostatic pressures behind the wall. For retaining walls free to rotate without top fixity, an equivalent fluid pressure of 70 pcf should be used for design. For below grade walls with top fixity restrained from rotation

such as basement walls, an equivalent fluid pressure of 95 pcf should be used for design. If positive drainage cannot be achieved, then values of 105 pcf and 115 pcf, respectively should be utilized for design. These values account for a slope of 2H:1V above the wall.

Earth pressure on below grade walls will result in a lateral load on the foundations. A passive earth pressure coefficient of 2.45 should be used along with a safety factor of 2.0 for determining the allowable passive pressure in front of the wall. For a unit weight of 125 pcf, this results in an equivalent fluid pressure of 150 pcf. A coefficient of friction of 0.35 can also be used between the concrete foundation and soil bearing materials when calculating resisting forces.

5.2.6 Grade Supported Floor Slab Recommendations

We recommend on-grade supported floor slabs be isolated from the building foundations and allowed to float free and settle differentially with the building. We have estimated an Effective Modulus of Subgrade Reaction (K) of 100 pci for floor slab design.

The final floor slab design, including the amount of and type of steel reinforcement (welded wire mesh or bar reinforcing) will be dependent on the structural engineer's evaluation of the final grade slab thickness, concrete compressive strength, and actual slab loadings. Additional design and construction recommendations are provided as follows:

- Proofrolling of the cut subgrade and existing subgrade should be performed to identify soft or unstable soil prior to engineered fill placement. Soft soils should be removed to the extent determined in the field by the AEI Geotechnical Engineer or Technician. Proofrolling of the final floor slab subgrade should also be performed prior to floor slab construction and any defects appropriately repaired as recommended in the field by AEI.
- The floor slab should be supported on a minimum 4-inch compacted layer of free draining granular base material to distribute concentrated loads, improve drainage, and reduce the risk of deterioration of the prepared subgrade during construction. The stone should be kept moist not wet, immediately before placement of concrete to limit differential curing conditions at the top and bottom of the slab.
- A vapor barrier can be placed on the granular subbase to reduce migration of moisture through the slab. However, proper concrete mix designs, placement and curing methods must be used to reduce the potential for concrete shrinkage problems that are sometimes associated with the use of a vapor barrier. Reference to ACI 302.1 R 96, "Guide for Concrete Floor and Slab Construction",

should be utilized. Joints between slab sections should contain keys or dowels to permit slab rotation but to reduce extreme vertical differential displacements.

5.3 GENERAL CONSIDERATIONS

5.3.1 Construction Monitoring/Testing

All construction operations involving foundation construction should be performed in the presence of an experienced representative of AEI. The representative would operate under the direct supervision of an AEI Geotechnical Engineer.

Field observations should be performed prior to and during concrete placement operations.

5.3.2 Limitations

The conclusions and recommendations presented herein are based on information gathered from the borings advanced during this exploration using that degree of care and skill ordinarily exercised under similar circumstances by competent members of the engineering profession. No warranties can be made regarding the continuity of conditions between the borings.

We will retain samples acquired for this project for a period of 30 days subsequent to the submittal date printed on the cover of this report. After this period, the samples will be discarded unless otherwise requested.

APPENDIX A

Boring Layout

APPENDIX B

Boring Logs

FIELD TESTING PROCEDURES

The general field procedures employed by the Field Services Center are summarized in the following outline. The procedures utilized by the AEI Field Service Center are recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Soil Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the surface conditions. Borings are advanced into the ground using continuous flight augers. At prescribed intervals throughout the boring depths, soil samples are obtained with a split-spoon or thin-walled sampler and sealed in airtight glass jars and labeled. The sampler is first seated 6 inches to penetrate loose cuttings and then driven an additional foot, where possible, with blows from a 140 pound hammer falling 30 inches. The number of blows required to drive the sampler each six-inch increment is recorded. The penetration resistance, or "N-value" is designated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. The split spoon sampling procedures used during the exploration are in general accordance with ASTM D 1586. Split spoon samples are considered to provide *disturbed* samples, yet are appropriate for most engineering applications. Thin-walled (Shelby tube) samples are considered to provide *undisturbed* samples and obtained when warranted in general accordance with ASTM D 1587.

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Core Drilling Procedures for use on refusal materials. Prior to coring, casing is set in the boring through the overburden soils. Refusal materials are then cored according to ASTM D-2113 using a diamond bit attached to the end of a hollow double tube core barrel. This device is rotated at high speeds and the cuttings are brought to the surface by circulating water. Samples of the material penetrated are protected and retained in the inner tube, which is retrieved at the end of each drill run. Upon retrieval of the inner tube the core is recovered, measured and placed in boxes for storage.

The subsurface conditions encountered during drilling are reported on a field test boring record by the driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soil in general accordance with the procedures outlined in ASTM D 2487 and D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

Representative portions of soil samples are placed in sealed containers and transported to the laboratory. In the laboratory, the samples are examined to verify the driller's field classifications. Test Boring Records are attached which show the soil descriptions and penetration resistances.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designate the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

Water table readings are normally taken in conjunction with borings and are recorded on the "Boring Logs". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Sampling Terminology

Undisturbed Sampling: Thin-walled or Shelby tube samples used for visual examination, classification tests and quantitative laboratory testing. This procedure is described by ASTM D 1587. Each tube, together with the encased soil, is carefully removed from the ground, made airtight and transported to the laboratory. Locations and depths of undisturbed samples are shown on the "Boring Logs."

Bag Sampling: Bulk samples of soil are obtained at selected locations. These samples consist of soil brought to the surface by the drilling augers, or obtained from test pits or the ground surface using hand tools. Samples are placed in bags, with sealed jar samples of the material, and taken to our laboratory for testing where more mass material is required (i.e. Proctors and CBR's). The locations of these samples are indicated on the appropriate logs, or on the Boring Location Plan.

CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

COHESIVE SOILS (Clay, Silt, and Mixtures)

<u>CONSISTENCY</u>	<u>SPT N-VALUE</u>	<u>Qu/Op (tsf)</u>	<u>PLASTICITY</u>	
Very Soft	2 blows/ft or less	0 – 0.25	Degree of	Plasticity
Soft	2 to 4 blows/ft	0.25 – 0.49	Plasticity	Index (PI)
Medium Stiff	4 to 8 blows/ft	0.50 – 0.99	Low	0 – 7
Stiff	8 to 15 blows/ft	1.00 – 2.00	Medium	8 – 22
Very Stiff	15 to 30 blows/ft	2.00 – 4.00	High	over 22
Hard	30 blows/ft or more	> 4.00		

NON-COHESIVE SOILS (Silt, Sand, Gravel, and Mixtures)

<u>DENSITY</u>	<u>SPT N-VALUE</u>	<u>PARTICLE SIZE IDENTIFICATION</u>	
Very Loose	4 blows/ft or less	Boulders	12 inch diameter or more
Loose	4 to 10 blows/ft	Cobbles	3 to 12 inch diameter
Medium Dense	10 to 30 blows/ft	Gravel	Coarse – 1 to 3 inch
Dense	30 to 50 blows/ft		Medium – ½ to 1 inch
Very Dense	50 blows/ft or more		Fine – ¼ to ½ inch
		Sand	Coarse – 0.6mm to ¼ inch
			Medium – 0.2mm to 0.6mm
			Fine – 0.05mm to 0.2mm
		Silt	0.05mm to 0.005mm
		Clay	0.005mm

RELATIVE PROPORTIONS

<u>Descriptive Term</u>	<u>Percent</u>
Trace	1 – 10
Trace to Some	11 – 20
Some	21 – 35
And	36 – 50

NOTES

Classification – The Unified Soil Classification System is used to identify soil unless otherwise noted.

Standard “N” Penetration Test (SPT) (ASTM D1586) – Driving a 2-inch O.D., 1 3/8-inch I.D. sampler a distance of 1 foot into undisturbed soil with a 140-pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6-inches to seat the sampler into undisturbed soil, and then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6 inches of penetration on the field drill log (e.g., 10/8/7). On the report log, the Standard Penetration Test result (i.e., the N value) is normally presented and consists of the sum of the 2nd and 3rd penetration counts (i.e., $N = 8 + 7 = 15$ blows/ft.)

Soil Property Symbols

Qu:	Unconfined Compressive Strength	N:	Standard Penetration Value (see above)
Qp:	Unconfined Comp. Strength (pocket pent.)	omc:	Optimum Moisture content
LL:	Liquid Limit, % (Atterberg Limit)	PL:	Plastic Limit, % (Atterberg Limit)
PI:	Plasticity Index	mdd:	Maximum Dry Density



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CLIENT Kenvirons, Inc. PROJECT NAME Battle Training Road Pump Station
 PROJECT NUMBER 213-193 PROJECT LOCATION Hardin County, Kentucky
 DATE STARTED 8/27/13 COMPLETED 8/28/13 GROUND ELEVATION 471.9 ft
 DRILLER James Felts GROUND WATER LEVELS:
 DRILLING METHOD HSA/ Diamond impregnated coring bit AT TIME OF DRILLING --
 LOGGED BY Jason Childress CHECKED BY Dusty Barrett AT END OF DRILLING --
 NOTES _____ AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (10 inches)									
0-10		(CL) lean CLAY, trace to some fine sand, trace to some fine to medium gravel, brown, moist to wet	ST 1	82		4.5+	24	37	20	17	
5			ST 2	67		4.5+	18	39	19	20	
10			ST 3	85		4.0	22				
10-15			ST 4	85		2.5	21				
15			ST 5	100		2.75	26				
20			ST 6	85		2.25	23				
25		weathered SHALE, gray	SPT 7	100	8-17-20 (37)	4.5+	16				vertical fracture noted from 26.0 to 26.6 feet
25-30		SHALE, silty to arenaceous, medium gray to bluish gray, soft to moderately hard, laminated to thin bedded	RC 8	100 (0)							
30-35			RC 9	100 (0)							
35			RC 10	100 (0)							

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CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 10/8/13 08:07 - T:113 PROJECTS\213-193 BATTLE TRAINING ROAD PUMP STATION\213-193 BATTLE TRAINING ROAD PUMP STATION.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		SHALE, silty to arenaceous, medium gray to bluish gray, soft to moderately hard, laminated to thin bedded (<i>continued</i>)									
40			RC 11	100 (0)							
45			RC 12	100 (0)							
Refusal at 25.5 feet. Bottom of borehole at 46.2 feet.											



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CLIENT Kenvirons, Inc. PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193 PROJECT LOCATION Hardin County, Kentucky

DATE STARTED 8/27/13 COMPLETED 8/27/13 GROUND ELEVATION 467.3 ft

DRILLER James Felts GROUND WATER LEVELS:

DRILLING METHOD HSA/ Diamond impregnated coring bit AT TIME OF DRILLING --

LOGGED BY Jason Childress CHECKED BY Dusty Barrett AT END OF DRILLING --

NOTES _____ AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (8 inches) (CL) lean CLAY, trace to some fine to medium sand, trace to some fine to medium gravel, brown, moist to wet, stiff to medium stiff									
1			SPT 1	100	4-5-6 (11)	4.5+	18				
2			SPT 2	100	4-5-6 (11)	4.5+	18				
3			SPT 3	67	3-3-5 (8)	2.25	24				
4			SPT 4	100	2-5-4 (9)	2.5	23				
5											
6			SPT 5	100	2-3-4 (7)	1.25	25				
7											
8			SPT 6	67	3-7-6 (13)	1.25	26				
9											
10			SPT 7	67	8-6-8 (14)	<0.25	28				
11											
12		weathered SHALE, gray									
13		SHALE, silty to arenaceous, medium gray to bluish gray, soft to moderately hard, laminated to thin bedded	RC 8	100 (0)							
14			RC 9	100 (0)							
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
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32											
33											
34											
35											

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CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		SHALE, silty to arenaceous, medium gray to bluish gray, soft to moderately hard, laminated to thin bedded (continued)									
			RC 10	100 (0)							

Refusal at 29.3 feet.
Bottom of borehole at 39.8 feet.



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CLIENT Kenvirons, Inc.
 PROJECT NUMBER 213-193
 DATE STARTED 8/27/13 COMPLETED 8/27/13
 DRILLER James Felts
 DRILLING METHOD Hollow-stem augers
 LOGGED BY Jason Childress CHECKED BY Dusty Barrett
 NOTES _____

PROJECT NAME Battle Training Road Pump Station
 PROJECT LOCATION Hardin County, Kentucky
 GROUND ELEVATION 463.3 ft
 GROUND WATER LEVELS:
 AT TIME OF DRILLING ---
 AT END OF DRILLING ---
 AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (ROD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (10 inches)									
0-10		(CL) lean CLAY, trace to some fine to medium sand, trace to some fine gravel, brown with gray mottle, moist to wet, stiff	SPT 1	87	6-7-6 (13)	4.5	16				
10-15		(CL) silty lean CLAY, trace to some fine sand, some fine gravel, gray, wet	ST 2	100		3.75	17	33	18	15	
15-20			SPT 3	87	3-5-5 (10)	3.0	18				
20-25			ST 4	80		4.5	22				
25-30			ST 5	100		0.75	24				
30-35			ST 6	75		1.0	21				
35-40			ST 7	50		4.0	21				
40-45											
Refusal at 29.3 feet. Bottom of borehole at 29.3 feet.											

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CLIENT Kenvirons, Inc. PROJECT NAME Battle Training Road Pump Station
 PROJECT NUMBER 213-193 PROJECT LOCATION Hardin County, Kentucky
 DATE STARTED 8/26/13 COMPLETED 8/26/13 GROUND ELEVATION 461.3 ft
 DRILLER James Felts GROUND WATER LEVELS:
 DRILLING METHOD HSA/ Diamond impregnated coring bit AT TIME OF DRILLING —
 LOGGED BY Jason Childress CHECKED BY Dusty Barrett AT END OF DRILLING —
 NOTES AFTER DRILLING —

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (ROD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (16 inches)	SPT 1	100	3-5-7 (12)	3.5	16				
		(CL) lean CLAY, trace to some fine to medium sand, trace to some fine to coarse gravel, brown to gray, moist to wet, stiff to very stiff	SPT 2	100	5-6-9 (15)	4.5	16				
5			ST 3	50		4.5	16	35	20	15	
			SPT 4	100	3-7-12 (19)	4.5	19				
10			ST 5	100		3.5	19				
15			ST 6	75		2.5	22				
20			SPT 7	100	4-5-6 (11)	3.5	19				
25			SPT 8	100	4-6-7 (13)	4.5	18				
30			SPT 9	100	4-6-14 (20)	3.0	21				
35		SHALE, silty to arenaceous, medium gray to bluish gray, moderately hard, laminated to thin bedded	RC 10	100 (0)							
			RC 11	100 (0)							

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 PROJECT NUMBER 213-193 PROJECT LOCATION Hardin County, Kentucky

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		SHALE, silty to arenaceous, medium gray to bluish gray, moderately hard, laminated to thin bedded (<i>continued</i>)									
40			RC 12	100 (0)							
Refusal at 31.7 feet. Bottom of borehole at 42.9 feet.											

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PAGE 1 OF 1

CLIENT Kenvirons, Inc. PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193 PROJECT LOCATION Hardin County, Kentucky

DATE STARTED 8/28/13 COMPLETED 8/28/13 GROUND ELEVATION _____

DRILLER James Felts GROUND WATER LEVELS:

DRILLING METHOD Hollow-stem augers AT TIME OF DRILLING —

LOGGED BY Jason Childress CHECKED BY Dusty Barrett AT END OF DRILLING —

NOTES _____ AFTER DRILLING —

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		OVERBURDEN									Offset 15 feet and redrilled; original sounding refused at 2.2 feet
5											
10											
15											
20											
25											
Refusal at 28.8 feet. Bottom of borehole at 28.8 feet.											

GEO TECH BH COLUMNS - GINT STD US LAB.GDT - 10/8/13 08:07 - T:113 PROJECTS213-193 BATTLE TRAINING ROAD PUMP STATION213-193 BATTLE TRAINING ROAD PUMP STATION.GPJ



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KEY TO SYMBOLS

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PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)



CL: USCS Low Plasticity Clay



SHALE: Shale



TOPSOIL: Topsoil

SAMPLER SYMBOLS



Rock Core



Standard Penetration Test



Shelby Tube

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
 PI - PLASTIC INDEX (%)
 W - MOISTURE CONTENT (%)
 DD - DRY DENSITY (PCF)
 NP - NON PLASTIC
 -200 - PERCENT PASSING NO. 200 SIEVE
 PP - POCKET PENETROMETER (TSF)

TV - TORVANE
 PID - PHOTOIONIZATION DETECTOR
 UC - UNCONFINED COMPRESSION
 ppm - PARTS PER MILLION

▽ Water Level at Time
 Drilling, or as Shown
 ▽ Water Level at End of
 Drilling, or as Shown
 ▾ Water Level After 24
 Hours, or as Shown

KEY TO SYMBOLS - GINT STD US LAB.GDT - 10/6/13 08:08 - T:113 PROJECTS\213-193 BATTLE TRAINING ROAD PUMP STATION\213-193 BATTLE TRAINING ROAD PUMP STATION.GPJ

APPENDIX C

Laboratory Testing Results



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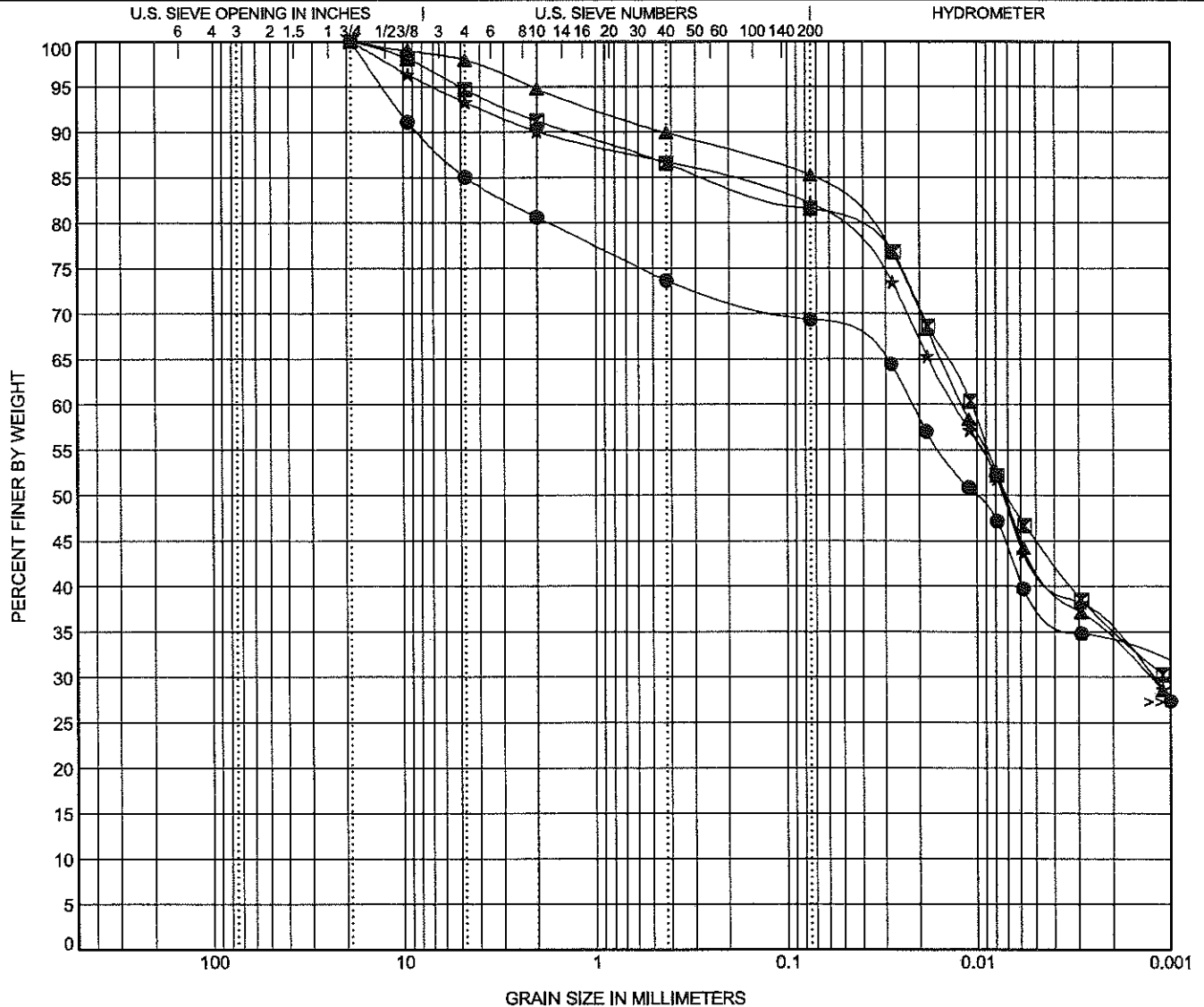
GRAIN SIZE DISTRIBUTION

CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-1	2.5	lean brown clay	37	20	17		
☒ B-1	4.5	lean brown clay	39	19	20		
▲ B-3	5.0	lean brown clay	33	18	15		
★ B-4	5.0	lean brown clay	35	20	15		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-1	2.5	19	0.022	0.001		14.9	15.7	30.7	38.7
☒ B-1	4.5	19	0.011			5.3	13.1	36.5	45.1
▲ B-3	5.0	19	0.012	0.001		2.0	12.7	42.6	42.7
★ B-4	5.0	19	0.013	0.001		6.7	11.1	39.7	42.4

GRAIN SIZE - GINT STD US LAB.GDT - 10/08/13 06:09 - T:113 PROJECTS\213-193 BATTLE TRAINING ROAD PUMP STATION.GPJ



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UNCONFINED COMPRESSION TEST

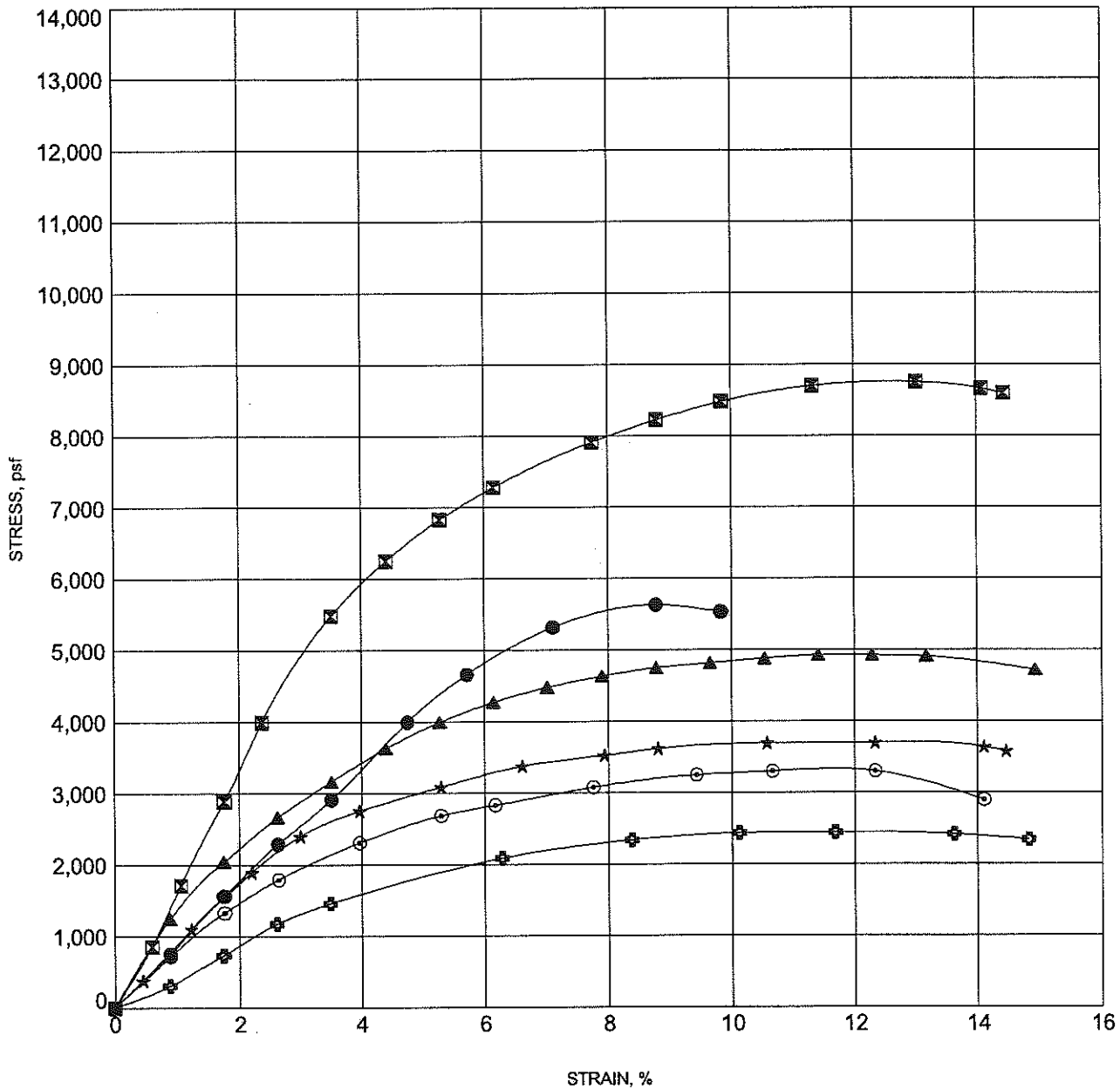
CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky

UNCONFINED - GINT STD US LAB.GDT - 10/8/13 08:09 - T:13 PROJECTS\213-193 BATTLE TRAINING ROAD PUMP STATION\213-193 BATTLE TRAINING ROAD PUMP STATION.GPJ



BOREHOLE	DEPTH	Classification	γ_d	Qu
●	B-1 2.5	lean brown clay	100	5630
☒	B-1 4.5	lean brown clay	110	8750
▲	B-1 7.5	lean brown clay	105	4926
★	B-1 9.5	lean brown clay	98	3695
⊙	B-1 14.5	lean brown clay	100	3299
⊕	B-1 19.5	lean brown clay	106	2443



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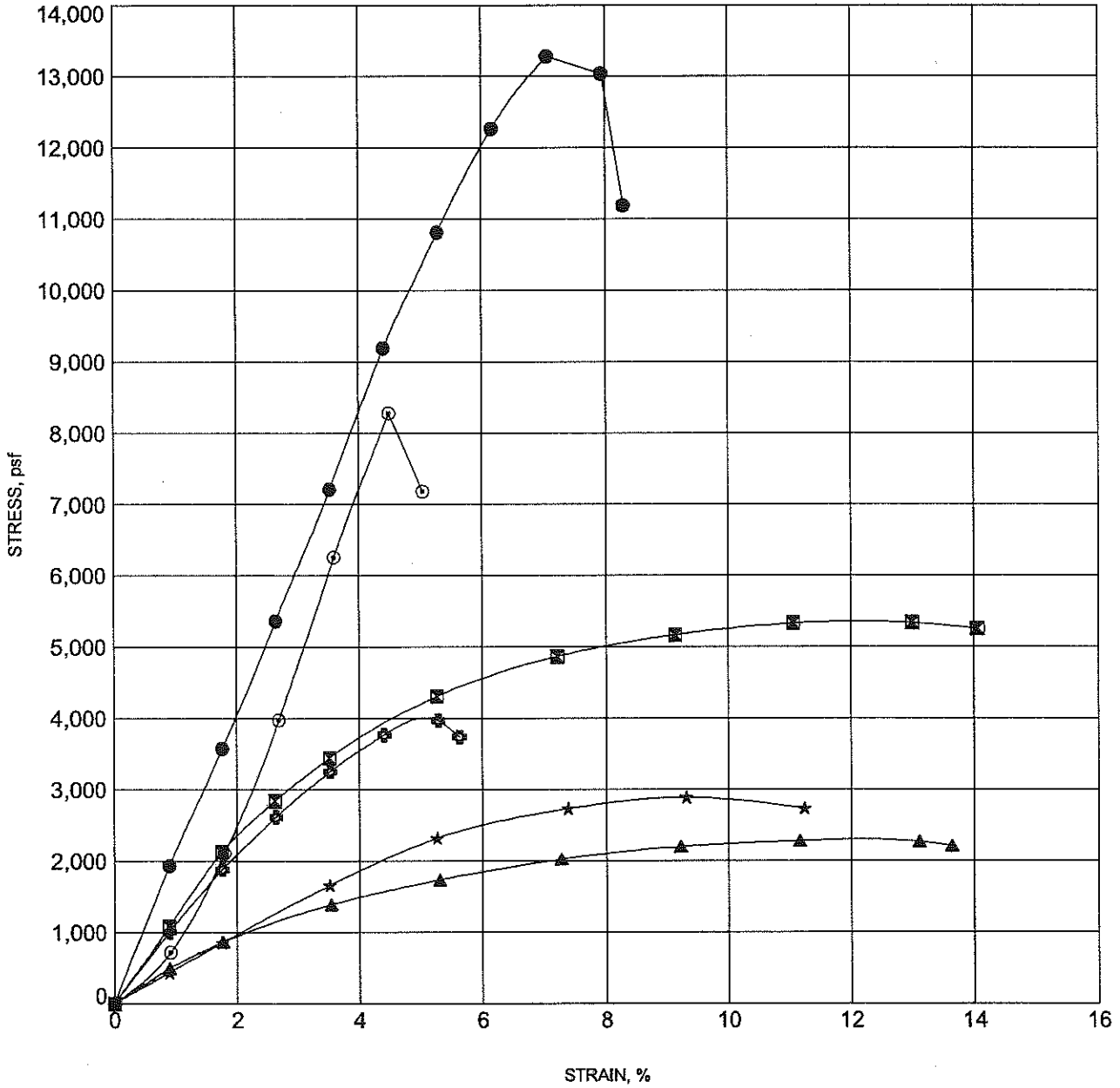
UNCONFINED COMPRESSION TEST

CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky



UNCONFINED - GINT STD US LAB.GDT - 10/8/13 08:09 - T\13 PROJECTS\213-193 BATTLE TRAINING ROAD PUMP STATION\213-193 BATTLE TRAINING ROAD PUMP STATION.GPJ

BOREHOLE	DEPTH	Classification	γ_d	Qu
●	B-3	5.0	lean brown clay	113 13279
■	B-3	10.0	lean brown clay	103 5338
▲	B-3	15.0	lean gray tobrown clay	100 2277
★	B-3	20.0	lean brown clay	111 2889
○	B-4	5.0	lean brown clay	108 8278
◻	B-4	10.0	lean brown clay	100 3970

Your Geotechnical Engineering Report

To help manage your risks, this information is being provided because subsurface issues are a major cause of construction delays, cost overruns, disputes, and claims.

Geotechnical Services are Performed for Specific Projects, Purposes, and People

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering exploration conducted for an engineer may not fulfill the needs of a contractor or even another engineer. Each geotechnical engineering exploration and report is unique and is prepared solely for the client. No one except the client should rely on the geotechnical engineering report without first consulting with the geotechnical engineer who prepared it. The report should not be applied for any project or purpose except the one originally intended.

Read the Entire Report

To avoid serious problems, the full geotechnical engineering report should be read in its entirety. Do not only read selected sections or the executive summary.

A Unique Set of Project-Specific Factors is the Basis for a Geotechnical Engineering Report

Geotechnical engineers consider a numerous unique, project-specific factors when determining the scope of a study. Typical factors include: the client's goals, objectives, project costs, risk management preferences, proposed structures, structures on site, topography, and other proposed or existing site improvements, such as access roads, parking lots, and utilities. Unless indicated otherwise by the geotechnical engineer who conducted the original exploration, a geotechnical engineering report should not be relied upon if it was:

- not prepared for you or your project,
- not prepared for the specific site explored, or
- completed before important changes to the project were implemented.

Typical changes that can lessen the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a multi-story hotel to a parking lot
- finished floor elevation, location, orientation, or weight of the proposed structure, anticipated loads or
- project ownership

Geotechnical engineers cannot be held liable or

responsible for issues that occur because their report did not take into account development items of which they were not informed. The geotechnical engineer should always be notified of any project changes. Upon notification, it should be requested of the geotechnical engineer to give an assessment of the impact of the project changes.

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that exist at the time of the exploration. A geotechnical engineering report should not be relied upon if its reliability could be in question due to factors such as man-made events as construction on or adjacent to the site, natural events such as floods, earthquakes, or groundwater fluctuation, or time. To determine if a geotechnical report is still reliable, contact the geotechnical engineer. Major problems could be avoided by performing a minimal amount of additional analysis and/or testing.

Most Geotechnical Findings are Professional Opinions

Geotechnical site explorations identify subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field logs and laboratory data and apply their professional judgment to make conclusions about the subsurface conditions throughout the site. Actual subsurface conditions may differ from those indicated in the report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risk associated with unanticipated conditions.

The Recommendations within a Report Are Not Final

Do not put too much faith on the construction recommendations included in the report. The recommendations are not final due to geotechnical engineers developing them principally from judgment and opinion. Only by observing actual subsurface conditions revealed during construction can geotechnical engineers finalize their recommendations. Responsibility and liability cannot be assumed for the recommendations

within the report by the geotechnical engineer who developed the report if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject To Misinterpretation

Misinterpretation of geotechnical engineering reports has resulted in costly problems. The risk of misinterpretation can be lowered after the submittal of the final report by having the geotechnical engineer consult with appropriate members of the design team. The geotechnical engineer could also be retained to review crucial parts of the plans and specifications put together by the design team. The geotechnical engineering report can also be misinterpreted by contractors which can result in many problems. By participating in pre-bid and preconstruction meetings and providing construction observations by the geotechnical engineer, many risks can be reduced.

Final Boring Logs Should not be Re-drawn

Geotechnical engineers prepare final boring logs and testing results based on field logs and laboratory data. The logs included in a final geotechnical engineering report should never be redrawn to be included in architectural or design drawings due to errors that could be made. Electronic reproduction is acceptable, along with photographic reproduction, but it should be understood that separating logs from the report can elevate risk.

Contractors Need a Complete Report and Guidance

By limiting what is provided for bid preparation, contractors are not liable for unforeseen subsurface conditions although some owners and design professionals believe the opposite to be true. The complete geotechnical engineering report, accompanied with a cover letter or transmittal, should be provided to contractors to help prevent costly problems. The letter states that the report was not prepared for purposes of bid

development and the report's accuracy is limited. Although a fee may be required, encourage the contractors to consult with the geotechnical engineer who prepared the report and/or to conduct additional studies to obtain the specific types of information they need or prefer. A prebid conference involving the owner, geotechnical engineer, and contractors can prove to be very valuable. If needed, allow contractors sufficient time to perform additional studies. Upon doing this you might be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Closely Read Responsibility Provisions

Geotechnical engineering is not as exact as other engineering disciplines. This lack of understanding by clients, design professionals, and contractors has created unrealistic expectations that have led to disappointments, claims, and disputes. To minimize such risks, a variety of explanatory provisions may be included in the report by the geotechnical engineer. To help others recognize their own responsibilities and risks, many of these provisions indicate where the geotechnical engineer's responsibilities begin and end. These provisions should be read carefully, questions asked if needed, and the geotechnical engineer should provide satisfactory responses.

Environmental Issues/Concerns are not Covered

Unforeseen environmental issues can lead to project delays or even failures. Geotechnical engineering reports do not usually include environmental findings, conclusions, or recommendations. As with a geotechnical engineering report, do not rely on an environmental report that was prepared for someone else.



AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING

65 Aberdeen Drive
Glasgow, KY 42141
270-651-7220

SPECIFICATIONS AND CONTRACT DOCUMENTS
FOR
HARDIN COUNTY WATER DISTRICT NO. 2
LOUISVILLE WATER COMPANY
SUPPLEMENTARY SUPPLY
CONTRACT 27 – 24-INCH TRANSMISSION PIPELINE

Prepared By:

KENVIRONS, INC.
452 VERSAILLES ROAD
FRANKFORT, KENTUCKY 40601

PROJECT No. 2007107

JANUARY, 2014





ADDENDUM NO. 1

March 4, 2016

**HARDIN COUNTY WATER DISTRICT NO. 2
HARDIN COUNTY, KENTUCKY**

CONTRACT 27: 24-INCH TRANSMISSION PIPELINE

BID OPENING: MARCH 9, 2016 AT 1:00 P.M. LOCAL TIME

The following clarifications, additions and/or revisions are hereby made a part of the contract documents for this project:

1. Specification Section 15100, Sub-Section 2.3.7 Pipe Joints for Ductile Iron Pipe shall be revised as follows:
"Pipe joints shall be mechanical joint, rubber ring slip joint, flanged or locked joint as shown on the plans."
2. The construction days are calendar days. Weekend work will not be restricted. However, a minimum of three (3) days notice will be required for scheduling construction inspectors for work on weekends.
3. The KDOT Encroachment Permit does not include a requirement for the preparation of a traffic control plan by the Contractor. KDOT has since indicated that a traffic control plan will be required from the Contractor for the work on the KY 434 (Battle Training Road) right-of-way. A copy of the encroachment permit is included with the Addendum.
4. The Bid Advertisement and Specification Section 0101 Special Conditions, Sub-Section 3.0, Time of Completion and Sub-Section 4.0, Liquidated Damages indicate respectively that the Time of Completion is 270 days and Liquidated Damages are \$800 per day. The Time of Completion and Liquidated Damages as contained in the Form of Agreement between Owner and Contractor shall be corrected to conform with Specification Section 0101.
5. Push-on joint ductile iron pipe is specified in certain areas as shown in the Drawings. In those areas the fittings, valves and carrier pipe lengths in steel encasement pipe shall be restrained. The restrained lengths are clearly shown in the Drawings and/or in the tables contained in the Miscellaneous Drawings. The restrained pipe lengths are shown on the Drawings to be accomplished with field lock type gaskets rated for 350 psi minimum and mechanical joint fittings and



valves restrained with tandem Megalugs. It is acceptable to substitute CL350 lock joint pipe, fittings and valves or locked joint pipe with mechanical joint fittings and valves restrained with tandem Megalugs. Additionally, in the area specified in the Drawings for CL250, push-on, ductile iron pipe, the tandem Megalugs shall be used to secure the mechanical joint valves and fittings as shown on the Drawings.

6. Regarding Item 5 above of this Addendum, if lock joint pipe is substituted for field lock gaskets, payment will be based on the quantity of field lock gaskets that would have been required to accomplish the required restrained length and paid in accordance with Bid Item No. 18-24 inch Restrained Type Locking Gasket.
7. The references, in the Drawings and Specifications, to Restrained Joint Pipe or Lock Joint Pipe is synonymous.
8. There are references in the Specifications regarding pipeline swabbing. Swabbing the pipeline is not required in this project.
9. The Water District will be responsible for providing the water needed to initially fill and flush the pipeline. Additional filling and flushing of the lines shall be at the Contractor's expense at a rate of \$2.50 per 1,000 gallons.
10. There are drawings on Sheet No. D-3 showing stream crossing details in earth (Type A) and rock (Type B). The details show the carrier pipe installed through a steel encasement pipe. The trenched stream crossings with ductile iron pipe do not require an encasement pipe. All other aspects of the details are applicable.
11. Relative to Specification Section 0101 Special Conditions, pages 0101-2 and 0101-3 are corrected as follows:
 - 11.1 Sub-Section 5, Insurance shall read **"See Section 0800, Supplementary Conditions SC-5.04 for the minimum amounts of insurance coverage to be furnished under the contract."**
 - 11.2 Sub-Sections 6.0, Bonding and 7.0, Site Dimensions are contained on both pages 0101-2 and 0101-3 and are the same in content. Disregard the indented paragraph designated e) at the top of page 0101-3.
12. Special attention is directed to the specific conditions stipulated in the Memorandums of Agreement relative to the separate Hack properties. The specific requirements and the party responsible for the cost is clearly defined in the Memorandums. The Memorandums of Agreement for the Alan Hack and Ronald Hack properties are contained in the back of the Specifications.
13. The question regarding whether it will be necessary to red light the road during construction will be as required by KYDOT relative to the approved traffic plan.

14. A note on Sheet 6 indicates the possible need for a directional bore for a stream crossing. All stream crossings on the project are accomplished by trenching in accordance with the Nationwide 12 permit contained in the Specifications.
15. General Note No. 27 clearly states that the Contractor shall obtain the KPDES Storm Water General Permit. The forms for that permit are contained in the Specifications.
16. The question was raised regarding the need for thrust blocks at vertical bends. At stream crossings where vertical bends might be required to accomplish the vertical offset, it is the intent to restrain the pipe completely through the offset and for the required length beyond the offset and eliminate vertical thrust blocks.
17. Regarding Sheet 6 of the Drawings, the Nitrile gaskets may be stopped on KY 434 where the separation between the oil pipeline and water pipeline is at least 200 feet.
18. In the instance where the concrete cut-off wall and concrete paving in the short length of stream bed in which the pipe is installed, the cost for concrete paving shall be included in Bid Item No. 22 – Concrete Cut-Off Wall.
19. Regarding bedding of ductile iron pipe in a rock trench, clean dirt may be used in lieu of crushed stone.
20. The contract does not have a mandatory “Buy American” clause, however the Contractor is encouraged to use American made products.
21. Equipment cannot be operated directly above the oil pipeline. Sheet 3 of the Drawings contains SPLP requirements.
22. Regarding the installation of the stub-outs for the Colesburg Pump Station, the pipeline and pump station contractors shall convene and coordinate the timing and separation distance between the stub-outs.
23. There are two stub-outs for a future pump station shown on Sheet 10 of the Drawings. The item cost is for each stub-out. The materials included for each stub-out are listed in the Details on Sheet 10.
24. The Contractor is not responsible for any costs relative to the presence of a Sonoco Pipeline representative during construction.
25. The window of October 15 through March 31 for cutting trees larger than 6-inches, relative to the environmental note on Sheet 2 of the Drawings, is within



approximately 3 weeks of closing. The Water District will investigate the possibility for resolving this issue internally.

26. Specification 15100, Subsection 2.2.5.1 specifies underground marking wire shall be solid copper. Copper Coated steel (CCS) is not acceptable.
27. Specification for positioning guides for carrier pipe inside encasement pipe is located in Section 15102, page 15102-2.

A handwritten signature in blue ink, appearing to read 'R. Vaughn Williams', is written over a horizontal line.

R. Vaughn Williams, P.E.
Kenvirons, Inc.
452 Versailles Road
Frankfort, Kentucky 40601
Telephone: (502) 695-4357
Fax: (502) 695-4363
Email: wwilliams@kenvirons.com

IMPORTANT NOTICE

The contractor must contact the KYTC district office to review permit details prior to beginning work on the right-of-way.

The applicant is responsible for ensuring that the contractor is aware of this requirement and that contact is made prior to construction.

KYTC Contact – Kevin Dixon
(270)766-5066.



Kentucky Transportation Cabinet
 Department of Highways
 Permits Branch

TC 99-1 (A)
 8/2012
 Page 1 of 4

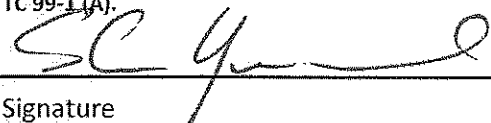
APPLICATION FOR ENCROACHMENT PERMIT

Permittee Information		KYTC No. 04-2014-00087	
Name	Hardin County Water District No. 2	Permit Information	
Address	P.O. Box 970	Address	
		City	
City	Elizabethtown	State	KY Zip
State	KY Zip 42702	County	Hardin 3.1 ~ 11.3 MP
Phone#	270 737-1056	Route No.	KY 434 Mile-Point 3.196
Contact	Shawn Youravich	Longitude (X)	+85.8558
Phone	270-737-1056 Cell 270 268-1255	Latitude (Y)	37.7812
Email	youravich@hardincountywater2.org	Information below to be filled out by KYTC	
Contact		<input type="checkbox"/> Air Right	<input type="checkbox"/> Entrance
Phone	Cell	<input checked="" type="checkbox"/> Utilities	<input type="checkbox"/> Other:
Email		water bore	
		<input type="checkbox"/> Left	<input type="checkbox"/> Right <input checked="" type="checkbox"/> X-ing
		Access: <input type="checkbox"/> Full	<input type="checkbox"/> Partial <input checked="" type="checkbox"/> by Permit

General Description of Work:

MM 4.84 to MM 11.26 Install 24" D.I. Waterline parallel to KY 434 as shown on attached plans. (Sheets 6-18)
 MM 5.15: Crossing KY 434 with 24" D.I. Waterline and Steel Encasement Pipe (Sheet 7)
 MM 5.9: Crossing KY 434 with 24" D.I. Waterline and Steel Encasement Pipe (Sheet 8)
 MM 7.7: Crossing KY 434 with 24" D.I. Waterline and Steel Encasement Pipe (Sheet 12)

THE UNDERSIGNED PERMITTEE(s) (being duly authorized representative(s) or owner(s)) DO AGREE TO ALL TERMS AND CONDITIONS ON THE TC 99-1 (A).

 **Signature** **3-19-14** **Date**

This is not a permit unless and until the permittee(s) receives an approved TC 99-1(B) from KYTC. This application will become void if not approved by the cancellation date. The cancellation date will be one year from the date the permittee submits their application.



Kentucky Transportation Cabinet
 Department of Highways
 Permits Branch

TC 99-1 (A)
 8/2012
 Page 1 of 4

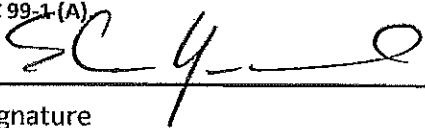
APPLICATION FOR ENCROACHMENT PERMIT

Permittee Information		KYTC No. 04-2014-00037	
Name	Hardin County Water District No. 2	Permit Information	
Address	P.O. Box 970	Address	
		City	
City	Elizabethtown	State	KY Zip
State	KY Zip 42702	County	Hardin
Phone#	270 737-1056	Route No.	KY 251 Mile-Point 4.6
Contact	Shawn Youravich	Longitude (X)	-85d 50' 56"
Phone	270-737-1056 Cell 270 268-1255	Latitude (Y)	37d 45' 30"
Email	youravich@hardincountywater2.org	<i>Information below to be filled out by KYTC</i>	
Contact		<input type="checkbox"/> Air Right	<input type="checkbox"/> Entrance
Phone	Cell	<input type="checkbox"/> Utilities	<input type="checkbox"/> Other:
Email		<input type="checkbox"/> Left	<input checked="" type="checkbox"/> Right <input type="checkbox"/> X-ing
		Access:	<input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial <input type="checkbox"/> by Permit

General Description of Work:

MM 4.6: Crossing KY 251 with 24" D.I. Water Line w/ steel encasement pipe

THE UNDERSIGNED PERMITTEE(S) (being duly authorized representative(s) or owner(s)) DO AGREE TO ALL TERMS AND CONDITIONS ON THE TC 99-1 (A)



3-19-14

Signature

Date

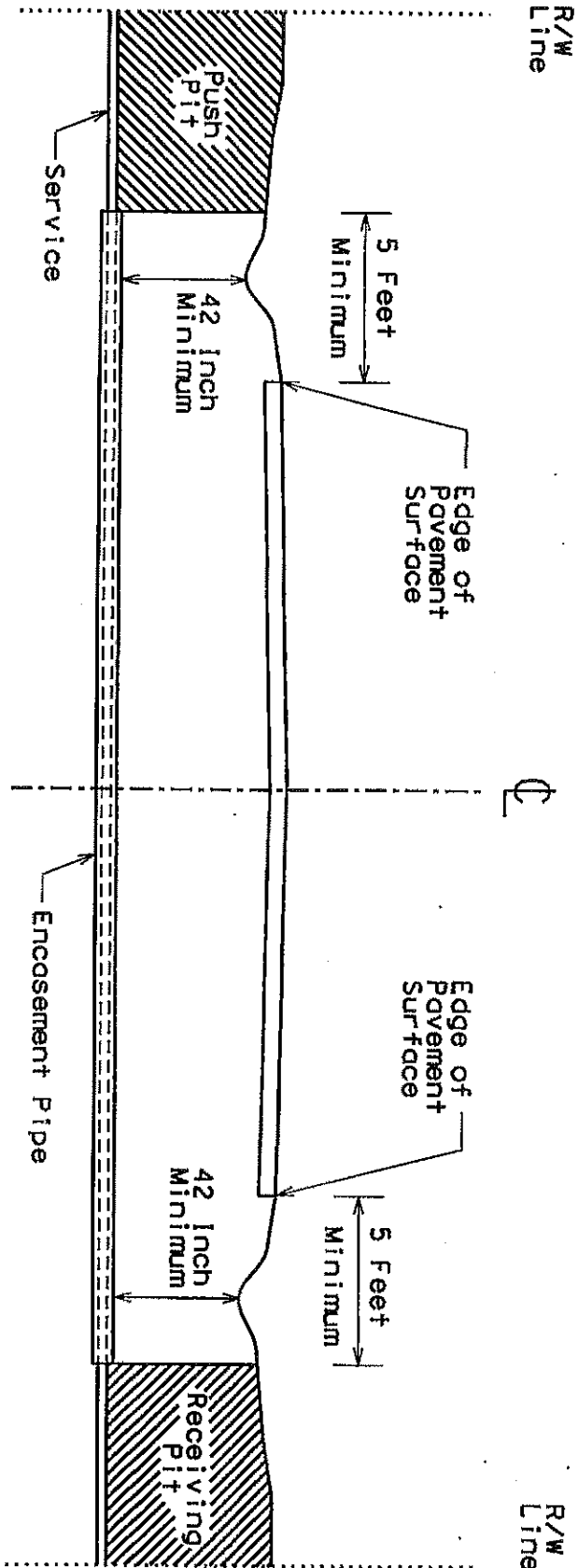
This is not a permit unless and until the permittee(s) receives an approved TC 99-1(B) from KYTC. This application will become void if not approved by the cancellation date. The cancellation date will be one year from the date the permittee submits their application.

Kentucky Transportation Cabinet
 Department of Highways
 Permits Branch

EXHIBIT 8

TC 99-10
 Rev. 9/2004

TYPICAL HIGHWAY BORING CROSSING DETAIL



Permit No. _____
 Route No. _____
 Pavement Width _____

1. Push Pit and Receiving Pit shall be backfilled and thoroughly compacted.
2. All ditch lines are to remain open at all times.
3. Seed and straw all disturbed areas immediately after completing the work.
4. Provide traffic control as required to insure the safety of the traveling public in accordance with the current edition of the "Manual on Uniform Traffic Control Devices".

ALL SERVICES OVER 2" IN DIAMETER SHALL REQUIRE ENCASEMENT.

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00430	Bid Bond	1 to 2
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	Notice to Prospective Subcontractors of Requirements for Certifications of Non-Segregated Facilities	1
	Certification Regarding Debarment, Suspension, Ineligibility & Voluntary Exclusion	1 to 2
	Certification for Contracts, Grants & Loans	1
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00521	Agreement	1 to 6
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00710	General Conditions	1 to 57
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	Change Order (Form RD 1924-7)	1
	Partial Payment Estimate (Form RD 1924-18)	2
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	Kentucky State Wage Determination	

TECHNICAL SPECIFICATIONS

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Division 2 - (not applicable)

Division 3 - (not applicable)

Division 4 - (not applicable)

Division 5 - (not applicable)

Division 6 - (not applicable)

Division 7 - (not applicable)

Division 8 - (not applicable)

Division 9 - (not applicable)

Division 10 - (not applicable)

Division 11 - (not applicable)

Division 12 - (not applicable)

Division 13 - (not applicable)

Division 14 - (not applicable)

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Division 16 - (not applicable)

Appendix No. 1—Report of Geotechnical Investigation

Battle Training Road Pump Station Site
LWC Master Meter Site

Appendix No. 2 – Nationwide Permit No. 12

Appendix No. 3 – Specific Conditions for Pipeline Installation

Alan E. Hack and Rebecca S. Hack Property
Ronald C. Hack and Jeanette Hack Property

**Section 00100
Advertisement for Bids**

**Hardin County Water District No. 2
360 Ring Road / P.O. Box 970
Elizabethtown, Kentucky 42701**

Separate Sealed BIDS for the construction of **Contract 27 – 24-Inch Transmission Pipeline** will be received by the Hardin County Water District No. 2, 360 Ring Road, Elizabethtown, KY 42701 until 1:00 PM local time, March 9, 2016 and then publicly opened and read aloud. This contract consists of construction of approximately 43,000 LF of 24-inch D.I. pipeline and appurtenances.

The CONTRACT DOCUMENTS may be examined at the following locations:
Hardin County Water District No. 2, 360 Ring Road, Elizabethtown, KY 42701
KENVIRONS, INC., 452 VERSAILLES ROAD, FRANKFORT, KY 40601
F. W. DODGE/AGC, 950 CONTRACT STREET, LEXINGTON, KY 40505

Copies of the CONTRACT DOCUMENTS may be obtained from Lynn Imaging, 328 Old Vine Street, Lexington, KY 40507 (859-226-5850) and www.lynnimaging.com upon payment of a nonrefundable price of \$200.00 for each set plus any shipping charges.

Each Bidder must accompany his bid with a Bid Bond in amount of not less than five (5) percent of the base bid. No Bidder may withdraw his bid for a period of ninety (90) days. The Bidder awarded the contract shall execute a 100% Performance Bond and a 100% Payment Bond and shall furnish insurance as required, in the General Conditions. This contract shall be completed within 270 calendar days after date of authorization to start work. Liquidated damages will be \$800 per calendar day.

Bidders must comply with the President's Executive Order Nos. 11246 and 11375, which prohibit discrimination in employment regarding race, creed, color, sex, or national origin. Bidders must comply with Section 3, Section 109, Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act and the contract Work Hours Standard Act. Bidders must certify that they do not, and will not, maintain or provide for their employees any facilities that are segregated on a basis of race, color, creed, or national origin.

Any bid that is obviously unbalanced may be rejected. The Hardin County Water District No. 2 reserves the right to reject any and all bids and waive informalities. Small, minority and women's businesses and labor surplus area firms are encouraged to bid this project.

By: Mike Bell, Chairman
Hardin County Water District No. 2

00100-1

**Section 00200
Instructions to Bidders**

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ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

- A. Issuing Office--The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the Advertisement for Bids may be obtained from the Issuing Office. *{If a refund of the deposit will be issued upon return of bidding documents, list here.}*
- 2.02 Complete sets of Bidding Documents must be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 Owner and Engineer in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, within five days of Owner's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be called for below.

- A. References
- B. Present Commitments

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 Subsurface and Physical Conditions

- A. The Supplementary Conditions identify:
 - 1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Bidding Documents.
 - 2. Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Bidding Documents.
- B. Copies of reports and drawings referenced in paragraph 4.01.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in paragraph 4.02 of the General Conditions has been identified and established in paragraph 4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 Underground Facilities

- A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

4.03 Hazardous Environmental Condition

- A. The Supplementary Conditions identify those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that ENGINEER has used in preparing the Bidding Documents.
- B. Copies of reports and drawings referenced in paragraph 4.03.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in paragraph 4.06 of the General Conditions has been identified and established in paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental

Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in paragraph 4.06 of the General Conditions.

- 4.05 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.
- 4.06 Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.
- 4.07 It is responsibility of each Bidder before submitting a Bid to:
- A. Examine and carefully study the Bidding Documents, the other related data identified in the Bidding Documents, and any Addenda;
 - B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
 - C. Become familiar with and satisfy Bidder as to all Federal, State, and local Laws and Regulations that may affect cost, progress, or performance of the Work;
 - D. Carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions, and (2) reports and drawings of Hazardous Environmental Conditions at the Site which have been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions;
 - E. Obtain and carefully study (or accept consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;
 - F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding;
 - G. Become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
 - H. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

- I. Promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and
 - J. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- 4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 - PRE-BID CONFERENCE

- 5.01 A pre-Bid conference will be held at *10:00 a.m. on March 3, 2016 at Hardin County Water District No. 2, 360 Ring Road, Elizabethtown, KY 42701 local time.* Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 - SITE AND OTHER AREAS

- 6.01 The Site is identified in the Bidding Documents. Easement for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than five days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

ARTICLE 8 - BID SECURITY

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 % of Bidder's maximum Bid price and in the form of a certified check or a Bid bond (EJCDC No. C-430, 2002 Edition) issued by a surety meeting the requirements of paragraphs 5.01 and 5.02 of the General Conditions.
- 8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the

Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 10 days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or 91 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

- 8.03 Bid security of other Bidders whom OWNER believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

- 9.01 The number of days within which, or the date by which, the Work is to be substantially completed. Upon substantial completion, if necessary, a date for final completion and payment should be determined between the Owner, Contractor, and Engineer based on remaining work, market, and weather conditions.

ARTICLE 10 - LIQUIDATED DAMAGES

- 10.01 Provisions for liquidated damages are set forth in the Agreement.

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

- 11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or "or-equal" materials and equipment as defined in paragraph 6.05 of the General Conditions, or those substitute materials and equipment approved by the Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function, and quality to be met by any proposed substitute or "or-equal" item. No item of material or equipment will be considered by Engineer as a substitute or equal until after the bids have been opened and the contract has been awarded. The burden of proof of the merit of the proposed item, and cost for review of a proposed substitute item, is upon the Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. Bidders shall not rely upon approvals made in any other manner. Any reduction made in contract price due to approval of a substitute item or equal, will be subtracted from the bidders contract and placed into contingency funds for the project.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, without an increase in the Bid.
- 12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest responsible Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner and Engineer makes no written objection prior to the giving

of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in paragraph 6.06 of the General Conditions.

- 12.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.
- 12.04 The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SC 6.06.

ARTICLE 13 - PREPARATION OF BID

- 13.01 The Bid form is included with the Bidding Documents. Additional copies may be obtained from Engineer.
- 13.02 All blanks on the Bid form shall be completed by printing in ink or by typewriter and the Bid signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each Bid item and alternative listed therein, or the words "No Bid," "No Change," or "Not Applicable" entered.
- 13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. If required by State where work is to be performed, the corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporation business address and state of incorporation shall be provided on the Bid Form.
- 13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The business address of the partnership shall be provided on the Bid Form.
- 13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the business address of the firm must be provided on the Bid Form.
- 13.06 A Bid by an individual shall show the Bidder's name and business address.
- 13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid form. The business address of the joint venture must be provided on the Bid Form.
- 13.08 All names shall be typed or printed in ink below the signatures.
- 13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers and dates of which shall be filled in on the Bid form.
- 13.10 The address and telephone number for communication regarding the Bid shall be shown.
- 13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number for the state of the Project, if any, shall also be shown on the Bid Form.

ARTICLE 14 - BASIS OF BID; COMPARISON OF BIDS

14.01 Lump Sum

- A. Bidders shall submit a Bid on lump sum basis as set forth in the Bid Form.

Unit Price

- A. Bidders shall submit a Bid on a unit price basis for each unit price item of Work listed in the Bid schedule.

ARTICLE 15 - SUBMITTAL OF BID

- 15.01 Bid Form is to be completed and submitted with all the attachments required.
- 15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement for Bids and shall be enclosed in an opaque sealed envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED." When using the mail or other delivery system, the Bidder is totally responsible for the mail or other delivery system delivering the Bid at the place and prior to the time indicated in the Advertisement for Bid. A mailed Bid shall be addressed to Owner at address in Article 1.01 of Bid Form.

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

- 16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.
- 16.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid or negotiated, that Bidder will be disqualified from further bidding on the Work. This provision to withdraw a Bid without forfeiting the Bid security does not apply to Bidder's errors in judgment in preparing the Bid.

ARTICLE 17 - OPENING OF BIDS

- 17.01 Bids will be opened at the time and place indicated in the Advertisement for Bids and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 18.01 All Bids will remain subject to acceptance for 90 days.

ARTICLE 19 - EVALUATION OF BIDS AND AWARD OF CONTRACT

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsible. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.
- 19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

- 19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- 19.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.
- 19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the contract Documents.
- 19.06 If the Contract is to be awarded, Owner will award the Contract to the responsible Bidder whose Bid, conforming with all the material terms and conditions of the Instructions to Bidders, is lowest in price and in the best interest of the Owner by considering other factors such as work history, recommendations, etc... In cases where the low bidder is not awarded the contract, submit an explanation of the selection process used, along with the recommendation for award, in order for all bidding requirements to be met for RD to concur in award of contract.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

- 20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by such bonds.

ARTICLE 21 - SIGNING OF AGREEMENT

- 21.01 When Owner gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within ten (10) days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within ten days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.
- 21.02 This Contract is expected to be funded in part with funds provided by the United States Department of Agriculture, Rural Development (RD). Refer to Article 18 of the General Conditions for information on the Federal Requirements.
- 21.03 Concurrence by RD in the award of the Contract is required before the Contract is effective.

**Section 00410
Bid Form**

Project Identification: Louisville Water Company Supplementary Supply

Contract Identification and Number: Contract 27 – 24-Inch Transmission Pipeline

ARTICLE 1 - BID RECIPIENT

- 1.01 This Bid Is Submitted To: Hardin County Water District No. 2, 360 Ring Road, Elizabethtown, Kentucky 42701
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in the Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - BIDDER'S ACKNOWLEDGMENTS

- 2.01 Bidder accepts all of the terms and conditions of the Advertisement and Instructions to Bidders, including without limitations those dealing with the dispositions of Bid security. The Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

- 3.01 In submitting this Bid, Bidder represents that:
 - A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
 - B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. Bidder is familiar with and is satisfied as to all Federal, State, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in SC-4.02, and (2) reports and drawings of a Hazard Environmental Condition, if any, which has been identified in SC-4.06.
 - E. Bidder has obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect

of the means, methods, techniques, sequences, and procedures of construction to be employed by the Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

- F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of the Work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.
- I. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
- J. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.
- K. Bidder will submit written evidence of its authority to do business in the State where the Project is located not later than the date of its execution of the Agreement.

ARTICLE 4 - FURTHER REPRESENTATIONS

4.01 Bidder further represents that:

- A. This Bid is genuine and not made in the interest of or on the behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

ARTICLE 5 - BASIS OF BID

See Attachment for Bid Item Descriptions.

Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Base Bid

<u>No.</u>	<u>Item</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Item Price</u>
1	24-inch D.I., Locked Joint, CL 350 Pipe	LF	6,090	\$ _____	_____
2	24-inch D.I., P.O., CL 350 Pipe	LF	12,350	_____	_____
3	24-inch D.I., Locked Joint, CL 350 Pipe with Nitrile Gaskets	LF	10,964	_____	_____
4	24-inch D.I., P.O., CL 250 Pipe	LF	12,755	_____	_____
5	6-inch D.I. P.O. Pipe with Field Lock Gaskets	LF	400	_____	_____
6	Polyethylene Wrap for D.I. Pipe	LF	42,200	_____	_____
7	Bored 36-inch Steel Encasement for 24" D.I. Carrier Pipe	LF	1,100	_____	_____
8	Open Cut 36-inch Steel Encasement for 24" D.I. Carrier Pipe	LF	80	_____	_____
9	Trenched Stream Crossing	LF	400	_____	_____
10	24-inch CL 250 Butterfly Valve	EA	10	_____	_____
11	24-inch CL 250 Gate Valve with Spur Gearing	EA	5	_____	_____
12	6-inch Fire Hydrant	EA	9	_____	_____
13	8-inch Blow-Off Assembly	EA	5	_____	_____
14	Air Release Valve	EA	5	_____	_____
15	Leak Detection Assembly	EA	1	_____	_____
16	Erosion Prevention and Sediment Control	LS	1	_____	_____
17	Pavement Restoration				
	17.1 Crushed Stone	LF	1,800	_____	_____
	17.2 Light Duty Bituminous	LF	260	_____	_____
	17.3 Heavy Duty Bituminous	LF	100	_____	_____
	17.4 Concrete Driveways	LF	100	_____	_____
18	24-inch Restrained Type Field Lock Gasket, CL350	EA	340	_____	_____
19	Stub-Out for Colesburg Pump Station	LS	1	_____	_____
20	Stub-Out for Future Pump Station	EA	2	_____	_____

21	Final Pipeline Restoration				
	21.1 Final Grade/Seed/Fertilizer/Straw	LF	33,200	2.00	66,400
	21.2 Final Grade/ Seed/ Fertilizer/Erosion Control Blanket	LF	8,400	3.00	25,200
22	Concrete Cut-Off Wall	LS	2		
23	Creek Bank Rip-Rap	Ton	60		
24	Concrete Thrust Collar	LS	1		
25	Mobilization, Bonds, Insurance & Project Sign	LS	1		
26	Demobilization	LS	1		
Total Base Bid					\$

- A. Unit Prices have been computed in accordance with paragraph 11.03.A of the General Conditions.
- B. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the contract Documents.

ARTICLE 6 - TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete in accordance with paragraph 14.07.B of the General Conditions on or before the date, or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the work within the Contract Times.

ARTICLE 7 - ATTACHEMENTS TO THIS BID

- 7.01 The following documents are attached to and made a condition of the Bid:
 - A. Required Bid security in the form of a Bid Bond (EJCDC No. C-430) or Certified Check (circle type of security provided);
 - B. If Bid amount exceeds \$10,000, signed Compliance Statement (RD 400-6). Refer to specific equal opportunity requirements set forth in paragraph 18.10 of the General Conditions; NA
 - C. If Bid amount exceeds \$25,000, signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier Covered Transactions (AD-1048); NA
 - D. If Bid amount exceeds \$100,000, signed RD Instruction 1940-Q, Exhibit A-1, Certification for Contracts, Grants and Loans. Refer to paragraph 18.11 of the General Conditions. NA

ARTICLE 8 - DEFINED TERMS

- 8.01 The terms used in this Bid with the initial capitol letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 - BID SUBMITTAL

9.01 This Bid submitted by:

Name (typed or printed): _____

By: _____

(Individual's signature)

SEAL, if required by State

Doing business as: _____

Bidder's Business address:

Business Phone No. (____) _____

Business FAX No. (____) _____

Business E-Mail Address _____

State Contractor License No. _____ (If applicable)

Employer's Tax ID No. _____

Phone and FAX Numbers, and Address for receipt of official communications, if different from
Business contact information:

9.02 Bid submitted on _____, 20__.

ATTACHMENT

BID ITEM DESCRIPTIONS

Bid Item No. 1 – 24-inch CL350 Ductile Iron Locked Joint Pipe

24-inch, CL350 locked joint pipe including the required locked joint fittings or CL350 MJ fittings with tandem Meg-a-Lug restraints each side, underground marking wire and detectable tape, concrete thrust blocks, furnishing, trenching, bedding, laying and backfilling, complete.

Bid Item No. 2 – 24-inch D.I., P.O., CL 350 Pipe

24-inch, ductile iron pipe, pressure Class 350, push-on joint, including the required compact mechanical joint ductile iron fittings with tandem Meg-a-Lug joint restraint each side, underground marking wire and detectable tape, concrete thrust blocks, furnishing, trenching, bedding, laying and backfilling, complete.

Bid Item No. 3 – 24-inch D.I., Locked Joint, CL 350 Pipe with Nitrile Gaskets

24-inch, ductile iron pipe, pressure Class 350, locked joint pipe with Nitrile Gaskets and the required locking joint fittings or MJ fittings with tandem Meg-a-Lug restraints each side, underground marking wire and detectable tape, concrete thrust blocks, furnishing, trenching, bedding, laying and backfilling, complete.

Bid Item No. 4 – 24-inch D.I., P.O., CL 250 Pipe

24-inch, ductile iron pipe, pressure Class 250, push-on joint, including the required compact mechanical joint ductile iron fittings with tandem Meg-a-Lug joint restraint each side, underground marking wire and detectable tape, concrete thrust blocks, furnishing, trenching, bedding, laying and backfilling, complete.

Bid Item No. 5 – 6-inch D.I., P.O., Pipe, Class 350

8-inch ductile iron pipe, P.O., CL350 with field lock gaskets, CL350, for fire hydrant extensions, underground marking wire and detectable tape, concrete thrust blocks, furnishing, trenching, bedding, laying and backfilling, complete. Field Lock Nitrile gaskets are required in one location as designated on the Drawings. This Bid Item shall be installed in conjunction with Bid Item No. 12 – 6-inch Fire Hydrant which is a separate pay item..

Bid Item No. 6 – Polyethylene Wrap for D.I. Pipe

Furnish and install polyethylene wrap around all 24-inch ductile iron pipe, valves and fittings in accordance with Specification Section 15221 and notes on the plans.

Bid Item No. 7 – Bored 36-inch Steel Encasement for 24" D.I. Carrier Pipe

Furnishing, bored and installation of 36-inch x 0.625-inch steel encasement pipe, complete.

Bid Item No. 8 – Open Cut 36-inch Steel Encasement for 24" D.I. Carrier Pipe

Furnishing, open-cut and installation of 36-inch x 0.625-inch steel encasement pipe, complete.

Bid Item No. 9 – Trenched Stream Crossing:

Trenched stream crossing in strict compliance with Nationwide Permit No. 12 and details contained in the Drawings.

Bid Item No. 10 – 24-inch CL250 Butterfly Valve

Furnish and install 24-inch CL250 ductile iron, mechanical joint butterfly valve, box, tandem Meg-a-Lug restraints each end, concrete collar, complete.

Bid Item No. 11– 24-inch CL250 Gate Valve with Spur Gearing

Furnish and install 24-inch, CL250, MJ x MJ, ductile iron gate valve, with spur gearing for vertical installation, tandem Meg-a-Lug restraints each end, concrete collar complete.

Bid Item No. 12 – 6-inch Fire Hydrant

Furnish and install 6-inch fire hydrant including main line tee, isolation valve and all restrained connecting fittings in accordance with detail contained in the Plans, complete. This Bid Item shall be installed in conjunction with Bid Item No. 5 – 6-inch D.I., P.O. Pipe, CL350 which is a separate pay item.

Bid Item No. 13 – 8-inch Blow-Off Assembly

Furnish and install 8-inch blow-off assembly including main line tee and all restrained connecting piping, valve and fittings in accordance with detail contained in Plans, complete.

Bid Item No. 14 – Air Release Valve

Furnish and install 2-inch automatic air release valve assembly, 2-inch valve, piping, fittings and vault, complete in accordance with detail contained in the Plans.

Bid Item No. 15 – Leak Detection Assembly

Furnish and install 1-inch leak detection meter assembly complete in accordance with detail contained in Drawings. 24-inch butterfly valve is separate Bid Item.

Bid Item No. 16 – Erosion Prevention and Sediment Control

Furnish and install erosion control elements to conform with erosion and sediment control practice per state and federal requirements.

Bid Item No. 17 – Pavement Restoration

Furnish and install the specific pavement restoration in conformance with the Specifications and details contained in the Plans.

Bid Item No. 18 – 24-inch Restrained Type Locking Gasket

Furnish and install restrained type locking gaskets for push-on joint ductile iron pipe in all bored and open-cut encasement pipe, each side of all fittings and valves and other locations specifically delineated on the Plans. The locking gaskets shall be pressure rated 350 psi for 24-inch ductile iron pipe.

Bid Item No. 19 – Stub-out for Colesburg Pump Station

Furnish and install all pipe, fittings, valves, restraint elements and all appurtenances complete and functional as shown in the Detail on Sheet 14 of the Plans.

Bid Item No. 20 – Stub-out for Future Pump Station

Furnish and install 24-inch tee, 24-inch pipe spool piece, 24-inch CL250 butterfly valve, tandem Meg-a-Lug restraints for all MJ fittings and valve ends, complete as shown in the detail on the Drawings.

Bid Item No. 21 – Final Pipeline Restoration

21.1 Seed/Fertilizer/Straw

Furnish and install seed/fertilizer/straw along the pipeline route per Specification Section 15102, Subsection 8 and General Note 17 in the Drawings. The unit price per linear foot for this item is fixed in the Bid Schedule. All other disturbed areas shall be restored likewise but considered incidental to the project work.

21.2 Seed/Fertilizer/Erosion Control Blanket

Furnish and install seed/fertilizer/erosion control blanket along the pipeline route per Specification 15102, Subsection 8 and General Note 17 in the Drawings for final pipeline restoration in locations designated on the Drawings and in conformance with the Manufacturer's recommendations and/or the details contained in the Drawings relative to the installation of the erosion control blanket. The unit cost per linear foot for this item is fixed in the Bid Schedule.

Bid Item No. 22 – Concrete Cut-off Wall

Furnish and install all materials for a reinforced concrete cut-off wall in stream bed crossing in locations shown on plans and in accordance with the detail contained in the Drawings and the property owner's easement stipulation.

Bid Item No. 23 – Creek Bank Rip-Rap

Furnish and install KDOT Class 2 stream bank stabilization in locations delineated on the Drawings.

Bid Item No. 24 – Concrete Thrust Collar

Furnish and install all materials for a reinforced concrete thrust collar in accordance with the detail on sheet 18 of the Drawings and in locations delineated on the Drawings, complete.

Bid Item No. 25 – Mobilization, Bonds, Insurance & Project Sign

Mobilization, acquisition of Performance and Payment Bonds, Insurance Certificates, permits and preparation/erection of project sign per detail contained in the Specifications and limited to 3% of Total Base Bid amount.

Bid Item No. 26 - Demobilization

Furnish and provide all materials and equipment for restoration of all areas, utilized during construction for storage of pipeline materials and equipment, to their pre-construction condition and satisfaction of the property owner.

BID BOND

Any singular reference to Bidder, Surety, Owner, or other party shall be considered plural where applicable.

BIDDER (Name and Address): _____

SURETY (Name and Address of Principal Place of Business): _____

OWNER (Name and Address): _____

BID

Bid Due Date: _____

Project (Brief Description Including Location): _____

BOND

Bond Number: _____

Date (Not later than Bid due date): _____

Penal sum _____

(Words)

(Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER

SURETY

(Seal
)

(Seal)

Bidder's Name and Corporate Seal

Surety's Name and Corporate Seal

By: _____
Signature and Title

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title

Attest: _____
Signature and Title

Note: Above addresses are to be used for giving required notice.

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

COMPLIANCE STATEMENT

This statement relates to a proposed contract with _____

(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Rural Housing Service (RHS), Rural Business-Cooperative Service (RBS), or the Rural Utilities Service (RUS) or their successor agencies, United States Department of Agriculture (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor, I represent that:

1. I have have not, participated in a previous contract or subcontract subject to Executive 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.
2. If I have participated in such a contract or subcontract, I have, have not, filed all compliance reports that have been required to file in connection with the contract or subcontract.

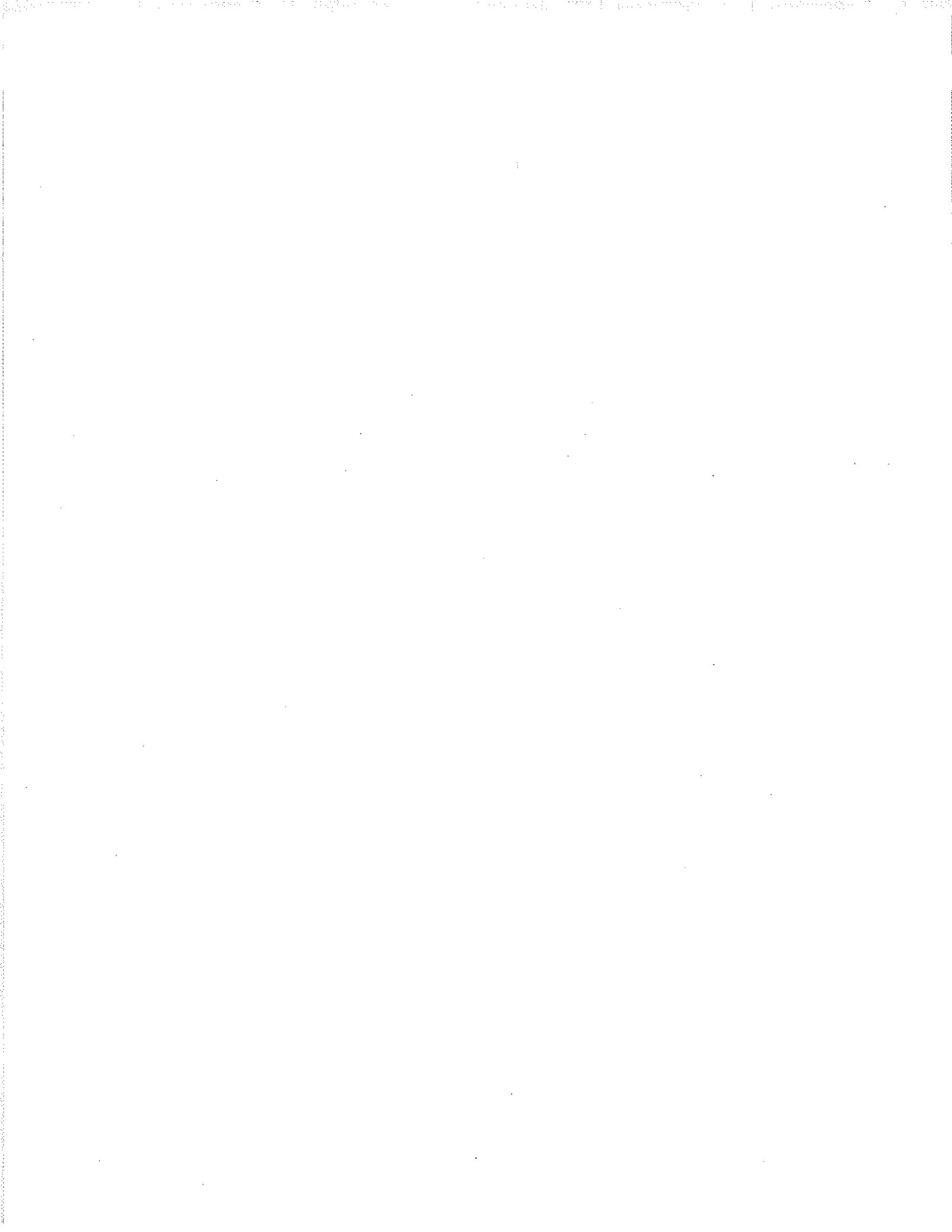
If the proposed contract is for \$50,000 or more and I have 50 or more employees, I also represent that:

3. I have, have not previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.
4. If I have participated in such a contract or subcontract, I have, have not developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the RHS, RBS or RUS, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, restaurants and other eating areas time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods): (See Reverse).

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays the valid OMB control number. The valid OMB control number for this information collection is 0575-0018. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.



**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR
CERTIFICATIONS OF NON-SEGREGATED FACILITIES**

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, may 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$ 10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

Date _____

(Signature of Bidder or Prospective Contractor)

Address (including Zip Code)



U.S. DEPARTMENT OF AGRICULTURE

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY
AND VOLUNTARY EXCLUSION - LOWER TIER COVERED TRANSACTIONS**

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 7 CFR Part 3017, Section 3017.510, Participants' responsibilities. The regulations were published as Part IV of the January 30, 1989, Federal Register (pages 4722-4733). Copies of the regulations may be obtained by contacting the Department of Agriculture agency with which this transaction originated.

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)

- (1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
- (2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Organization Name

PR/Award Number or Project Name

Name(s) and Title(s) of Authorized Representative(s)

Signature(s)

Date

Instructions for Certification

1. By signing and submitting this form, the prospective lower tier participant is providing the certification set out on the reverse side in accordance with these instructions.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later than determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms "covered transactions," "debarred," "suspended," "ineligible," "lower tier covered transactions," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this form that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

CERTIFICATION FOR CONTRACTS, GRANTS AND LOANS

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant or Federal loan, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant or loan.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant or loan, the undersigned shall complete and submit Standard Form - LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including contracts, subcontracts, and subgrants under grants and loans) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

(name)

(date)

(title)

oOo

NOTICE OF AWARD

To: _____

PROJECT

Description: Contract 27 – 24-inch Transmission Pipeline

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated _____, 2014, and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of \$ _____.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this ____ day of _____.

Hardin County Water District No. 2
Owner

By: _____

Title: _____ Chairman _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by _____ This the ____ day of _____.

By: _____

Title: _____

**SUGGESTED FORM OF AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)
FUNDING AGENCY EDITION**

THIS AGREEMENT is by and between Hardin County Water District No. 2 ("Owner") and _____ ("Contractor").

Owner and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1 – WORK

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

Construction of one booster pump station and all appurtenant work.

ARTICLE 2 – THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

Contract 27: 24-inch Transmission Main

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by Kenvirons, Inc. (Engineer), who is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

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

4.02 *Days to Achieve Substantial Completion and Final Payment*

A. The Work will be substantially completed within 210 days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and completed and ready for final payment at a date determined by Owner, Contractor, and Engineer after substantial completion, based on remaining work, weather and market conditions.

4.03 *Liquidated Damages*

Contractor and Owner recognize that time is of the essence on this Project and that the Owner will suffer financial loss if the Work is not substantially completed within the time specified in Paragraph 4.02 above, plus any extensions allowed

in accordance with Article 12 of the General Conditions. Accordingly, Contractor shall pay Owner \$500 for each day that expires after the time specified in Paragraph 4.02 until the work is substantially complete. After substantial completion, retainage may be reduced to an amount agreed upon by Owner, Contractor, and Engineer. It should be no less than 150% of the amount required for the completion and ready for final payment. Liquidated damages may not be assessed after substantial completion has been achieved.

ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraphs 5.01.A, 5.01.B, and 5.01.C below:

A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

_____ \$ _____

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 25th day of each month during performance of the Work as provided in Paragraphs 6.02.A.1 and 6.02.A.2 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements:

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions:
 - a. 95 percent of Work completed (with the balance being retainage); and
 - b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
2. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, plus any reduction in retainage that has been agreed upon by Owner, Contractor, and Engineer.

6.03 *Final Payment*

A. Upon receipt of the final Application for Payment accompanied by Engineer's recommendation of payment in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay Contractor as provided in Paragraph 14.07 of the General Conditions the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages.

ARTICLE 7 – INTEREST

7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the maximum legal rate.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Agreement Contractor makes the following representations:

- A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
- B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 4.02 of the General Conditions.
- E. Contractor has obtained and carefully studied (or assumes responsibility for doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto.
- F. Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.
- G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
- I. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

- A. The Contract Documents consist of the following:

1. This Agreement (pages 1 to 6, inclusive).
 2. Performance bond (pages 1 to 2, inclusive).
 3. Payment bond (pages 1 to 2, inclusive).
 4. Other bonds (pages _____ to _____, inclusive).
 - a. _____ (pages _____ to _____, inclusive).
 - b. _____ (pages _____ to _____, inclusive).
 - c. _____ (pages _____ to _____, inclusive).
 5. General Conditions (pages 1 to 57, inclusive).
 6. Supplementary Conditions (pages 1 to 4, inclusive).
 7. Specifications as listed in the table of contents of the Project Manual.
 8. Drawings consisting of 9 sheets with each sheet bearing the following general title: Contract 22: Valley Creek Pump Station.
 9. Addenda (numbers 1 to _____, inclusive).
 10. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid (pages 1 to 4, inclusive).
 - b. Documentation submitted by Contractor prior to Notice of Award (pages NA to _____, inclusive).
 - c. _____.
 11. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
 - a. Notice to Proceed (pages 1 to _____, inclusive).
 - b. Work Change Directives.
 - c. Change Order(s).
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

- A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Other Provisions*

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement in four copies. One counterpart each has been delivered to Owner, Contractor, Engineer, and Agency. All portions of the Contract Documents have been signed, initialed, or identified by Owner and Contractor or identified by Engineer on their behalf.

NOTE(S) TO USER

See I-21 and correlate procedures for format and signing between the two documents.

This Agreement is dated _____, This Agreement shall not be effective unless and until Agency's designated representative concurs.

OWNER:

CONTRACTOR

Hardin County Water District No. 2

By: _____

By: _____

Title: Chairman

Title: _____

[CORPORATE SEAL]

[CORPORATE SEAL]

Attest: _____

Attest: _____

Title: General Manager

Title: _____

Address for giving notices:

Address for giving notices:

P.O. Box 970

Elizabethtown, KY 42701

Agent for service of process:

(If Contractor is a corporation or a partnership, attach evidence of authority to sign.)

Agency Concurrence: NA

As lender or insurer of funds to defray the costs of this Contract, and without liability for any payments thereunder, the Agency hereby concurs in the form, content, and execution of this Agreement.

Agency: _____

By: _____

Date: _____

Title: _____

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address): Hardin County Water District No. 2
360 Ring Road
Elizabethtown, Kentucky 42701

CONTRACT

Date:

Amount:

Description (Name and Location): Contract 27: 24-inch Transmission Main
Hardin County, Kentucky

BOND

Bond Number:

Date (Not earlier than Contract Date):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Company:

Signature: _____ (Seal)

Name and Title:

(Seal)

Surety's Name and Corporate Seal

By:

Signature and Title

(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest:

Signature and Title

CONTRACTOR AS PRINCIPAL

SURETY

Company:

Signature: _____ (Seal)

Name and Title:

(Seal)

Surety's Name and Corporate Seal

By:

Signature and Title

(Attach Power of Attorney)

Attest:

Signature and Title:

EJCDC No. C-610 (2002 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, and the American Institute of Architects.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.
2. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 3.1.
3. If there is no Owner Default, Surety's obligation under this Bond shall arise after:
 - 3.1. Owner has notified Contractor and Surety, at the addresses described in Paragraph 10 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and
 - 3.2. Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 3.1; and
 - 3.3. Owner has agreed to pay the Balance of the Contract Price to:
 1. Surety in accordance with the terms of the Contract;
 2. Another contractor selected pursuant to Paragraph 4.3 to perform the Contract.
4. When Owner has satisfied the conditions of Paragraph 3, Surety shall promptly and at Surety's expense take one of the following actions:
 - 4.1. Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or
 - 4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
 - 4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and Contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or
 - 4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:
 1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or
 2. Deny liability in whole or in part and notify Owner citing reasons therefor.
5. If Surety does not proceed as provided in Paragraph 4 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 4.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.
6. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To a limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:
 - 6.1. The responsibilities of Contractor for correction of defective Work and completion of the Contract;
 - 6.2. Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions or failure to act of Surety under Paragraph 4; and
 - 6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.
7. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.
8. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.
9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
10. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.
11. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
12. Definitions.
 - 12.1. Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.
 - 12.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
 - 12.3. Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
 - 12.4. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

FOR INFORMATION ONLY – Name, Address and Telephone
 Surety Agency or Broker
 Owner's Representative (engineer or other party)

PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address): Hardin County Water District No. 2
360 Ring Road
Elizabethtown, Kentucky 42701

CONTRACT

Date:
Amount:
Description (Name and Location): Contract 27: 24-inch Transmission Main
Hardin County, Kentucky

BOND

Bond Number:
Date (Not earlier than Contract Date):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Payment Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

Company:

Signature: _____ (Seal)
Name and Title:

SURETY

Surety's Name and Corporate Seal (Seal)

By: _____
Signature and Title
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest: _____
Signature and Title

CONTRACTOR AS PRINCIPAL

Company:

Signature: _____ (Seal)
Name and Title:

SURETY

Surety's Name and Corporate Seal (Seal)

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title:

EJCDC No. C-615 (2002 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, the American Institute of Architects, the American Subcontractors Association, and the Associated Specialty Contractors.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.
2. With respect to Owner, this obligation shall be null and void if Contractor:
 - 2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and
 - 2.2. Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.
4. Surety shall have no obligation to Claimants under this Bond until:
 - 4.1. Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the addresses described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
 - 4.2. Claimants who do not have a direct contract with Contractor:
 1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and
 2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and
 3. Not having been paid within the above 30 days, have sent a written notice to Surety and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.
5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.
6. When a Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at Surety's expense take the following actions:
 - 6.1. Send an answer to that Claimant, with a copy to Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.
 - 6.2. Pay or arrange for payment of any undisputed amounts.
7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.
8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.
9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.
10. Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.
11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.
13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.
14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.
15. DEFINITIONS
 - 15.1. Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
 - 15.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
 - 15.3. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

FOR INFORMATION ONLY -- Name, Address and Telephone
Surety Agency or Broker:
Owner's Representative (engineer or other party):

NOTICE TO PROCEED

TO: _____ DATE: _____

Project: _____
Contract 27: 24-inch Transmission
Pipeline

You are hereby notified to commence WORK in accordance with the Agreement dated _____, on or before _____, _____ and you are to complete the WORK within 210 consecutive calendar days thereafter. The date of completion of all WORK is therefore _____, _____.

Hardin County Water District No. 2
Owner

By _____
Title Chairman

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED

is hereby acknowledged by _____

_____ this the

_____, 2014.

By _____

Title _____

Employer Identification
Number _____

SECTION 00625

Certificate of Substantial Completion

Project: James Road and Bandy Area Reinforcements and Extensions	Owner: Southeastern Water Association	Owner's Contract No.:
Contract: Contract 8 - James Road and Bandy Area Pump Stations		Date of Contract:
Contractor:		Engineer's Project No.: 2007269

This [tentative] [definitive] Certificate of Substantial Completion applies to:

- All Work under the Contract Documents:
 The following specified portions:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

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

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:

- Amended Responsibilities
 Not Amended

Owner's Amended Responsibilities:

Contractor's Amended Responsibilities:

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

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

Executed by Engineer

Date

Accepted by Contractor

Date

Accepted by Owner

Date

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the Controlling Law.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT FUNDING AGENCY EDITION

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By



PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
a practice division of the
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AMERICAN COUNCIL OF ENGINEERING COMPANIES

AMERICAN SOCIETY OF CIVIL ENGINEERS

This document has been approved and endorsed by

The Associated General Contractors of America



and the

Construction Specification Institute



Knowledge for Creating
and Sustaining
the Built Environment

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor Funding Agency Edition No. C-521 (2002 Edition). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the EJCDC Construction Documents, General and Instructions (No. C-001, 2002 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (No. C-800, 2002 Edition).

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GENERAL CONDITIONS

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda* – Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agency* – The Federal or state agency named as such in the Agreement.
 3. *Agreement* – The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 4. *Application for Payment* – The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 5. *Asbestos* – Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 6. *Bid* – The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 7. *Bidder* – The individual or entity who submits a Bid directly to Owner.
 8. *Bidding Documents* – The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 9. *Bidding Requirements* – The Advertisement or Invitation to Bid, Instructions to Bidders, bid security of acceptable form, if any, and the Bid Form with any supplements.
 10. *Change Order* – A document recommended by Engineer which is signed by Contractor and Owner and Agency and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
 11. *Claim* – A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 12. *Contract* – The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
 13. *Contract Documents* – Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor's submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

14. *Contract Price* – The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
15. *Contract Times* – The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any, (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
16. *Contractor* – The individual or entity with whom Owner has entered into the Agreement.
17. *Cost of the Work* – See Paragraph 11.01.A for definition.
18. *Drawings* – That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
19. *Effective Date of the Agreement* – The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
20. *Engineer* – The individual or entity named as such in the Agreement.
21. *Field Order* – A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
22. *General Requirements* – Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.
23. *Hazardous Environmental Condition* – The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.
24. *Hazardous Waste* – The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
25. *Laws and Regulations; Laws or Regulations* – Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens* – Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
27. *Milestone* – A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.
28. *Notice of Award* – The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
29. *Notice to Proceed* – A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
30. *Owner* – The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
31. *PCBs* – Polychlorinated biphenyls.

32. *Petroleum* – Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
33. *Progress Schedule* – A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
34. *Project* – The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
35. *Project Manual* – The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
36. *Radioactive Material* – Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
37. *Related Entity* – An officer, director, partner, employee, agent, consultant, or subcontractor.
38. *Resident Project Representative* – The authorized representative of Engineer who may be assigned to the Site or any part thereof.
39. *Samples* – Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
40. *Schedule of Submittals* – A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
41. *Schedule of Values* – A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
42. *Shop Drawings* – All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
43. *Site* – Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
44. *Specifications* – That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
45. *Subcontractor* – An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
46. *Substantial Completion* – The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.
47. *Successful Bidder* – The Bidder submitting a responsive Bid to whom Owner makes an award.

48. *Supplementary Conditions* – That part of the Contract Documents which amends or supplements these General Conditions.
49. *Supplier* – A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.
50. *Underground Facilities* – All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
51. *Unit Price Work* – Work to be paid for on the basis of unit prices.
52. *Work* – The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
53. *Work Change Directive* – A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and Agency upon recommendation of the Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

- A. The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.
- B. *Intent of Certain Terms or Adjectives*
 1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.
- C. *Day*
 1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents, or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or
 - c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement.

2.04 *Starting the Work*

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

2.05 *Before Starting Construction*

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

2.06 *Preconstruction Conference*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, Agency, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary, what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage

as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 Reference Standards

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

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

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 - 1. A Field Order;
 - 2. Engineer's approval of a Shop Drawing or Sample; (Subject to the provisions of Paragraph 6.17.D.3) or
 - 3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

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

3.06 *Electronic Data*

- A. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any,

of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

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

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and
2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb

such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

- A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and
 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data,
 - b. locating all Underground Facilities shown or indicated in the Contract Documents,

- c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and
- d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

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

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any.
- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06. H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

5.04 *Contractor's Liability Insurance*

- A. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
3. include completed operations insurance;
4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
6. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.
 - a. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (Contractor shall be responsible for any deductible or self-insured retention). This insurance shall:
1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
 2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.
- B. Contractor shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.
- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Contractor as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for:
1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Contractor and made payable to Contractor as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Contractor shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof.
- B. Contractor as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Contractor's exercise of this power. If such objection be made, Contractor as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Contractor as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Contractor as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of

non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
 - 1. "*Or-Equal*" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times, and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
 - b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
 - c. The procedure requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances.
 - d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) will perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;
 - b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
 - c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services;
 - 4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures.* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor
 - 2. shall anything in the Contract Documents create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's primary responsibility to make certain

that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 Taxes

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 Use of Site and Other Areas

A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work, Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 Record Documents

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved

Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
1. all persons on the Site or who may be affected by the Work;
 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or , or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract

Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

- A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.
1. *Shop Drawings*
 - a. Submit number of copies specified in the General Requirements.
 - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.
 2. *Samples*
 - a. Submit number of Samples specified in the Specifications.
 - b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
- B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Submittal Procedures*
1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:
 - a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;
 - c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and
 - d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.
 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
 3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its Related Entities shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
4. use or occupancy of the Work or any part thereof by Owner;
5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
6. any inspection, test, or approval by others; or
7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, consultants and subcontractors arising out of:
 1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
 - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 - 3. the extent of such authority and responsibilities will be provided.

- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

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

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

- A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

8.06 *Insurance*

- A. Owner's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

- A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

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

8.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

- A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and will not be changed without written consent of Owner and Engineer.

9.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

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

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, subject to written approval by Agency at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

10.03 Execution of Change Orders

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 Notification to Surety.

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

10.05 Claims

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).
- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part,
 2. approve the Claim, or
 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
 4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
 5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are

consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

- c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressages, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.

- C. **Contractor's Fee:** When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. **Documentation:** Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

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

11.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the Bid price of a particular item of Unit Price Work amounts to more than 5 percent of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and
2. there is no corresponding adjustment with respect to any other item of Work; and
3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
 1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. Contractor's Fee: The Contractor's fee for overhead and profit shall be determined as follows:
 1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

- e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
- f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.B.
 - 1. delays caused by or within the control of Contractor; or
- D. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of Engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

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

13.03 *Tests and Inspections*

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If, the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

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

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. repair such defective land or areas; or
 - 2. correct such defective Work; or
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
 - C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
 - D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
 - E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;

- b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
 - b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
- a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. the Contractor's performance or furnishing of the Work is inconsistent with funding Agency requirements;
 - d. there are other items entitling Owner to a set-off against the amount recommended; or
 - e. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.
3. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1.

14.03 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Agency, Contractor, and Engineer shall make a prefinal inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will within said 14 days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.
1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

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

14.07 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.7;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Engineer's Review of Application and Acceptance

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims. The remaining balance of any sum included in the final Application for Payment but held by OWNER for Work not fully completed and accepted will become due when the Work is fully completed and accepted.

14.09 *Waiver of Claims*

- A. The making and acceptance of final payment will constitute:
1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
 2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's disregard of the authority of Engineer; or
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),
 2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by

Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B, and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 - 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

- A. Owner and Contractor may mutually request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association. Timely submission of the request shall stay the effect of Paragraph 10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions, or
 2. agrees with the other party to submit the Claim to another dispute resolution process, or
 3. gives written notice to the other party of their intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or
 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

ARTICLE 18 – FEDERAL REQUIREMENTS

18.01 *Agency Not a Party*

- A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees is a party to this Contract.

18.02 *Contract Approval*

- A. Owner and Contractor will furnish Owner's attorney such evidence as required so that Owner's attorney can complete and execute the following "Certificate of Owner's Attorney" (Exhibit GC-A) before Owner submits the executed Contract Documents to Agency for approval.
- B. Concurrence by Agency in the award of the Contract is required before the Contract is effective.

18.03 *Conflict of Interest*

- A. Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer.
- B. Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.

18.04 *Gratuities*

- A. If Owner finds after a notice and hearing that Contractor, or any of Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, Owner may, by written notice to Contractor, terminate this Contract. Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.
- B. In the event this Contract is terminated as provided in paragraph 18.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of this Contract by Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, Owner may pursue exemplary damages in an

amount (as determined by Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.

18.05 *Audit and Access to Records*

- A. For all negotiated contracts and negotiated modifications (except those of \$10,000 or less), Owner, Agency, the Comptroller General, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Contractor, which are pertinent to the Contract, for the purpose of making audits, examinations, excerpts and transcriptions. Contractor shall maintain all required records for three years after final payment is made and all other pending matters are closed.

18.06 *Small, Minority and Women's Businesses*

- A. If Contractor intends to let any subcontracts for a portion of the work, Contractor shall take affirmative steps to assure that small, minority and women's businesses are used when possible as sources of supplies, equipment, construction, and services. Affirmative steps shall consist of: (1) including qualified small, minority and women's businesses on solicitation lists; (2) assuring that small, minority and women's businesses are solicited whenever they are potential sources; (3) dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women's businesses; (4) establishing delivery schedules, where the requirements of the work permit, which will encourage participation by small, minority and women's businesses; (5) using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce; (6) requiring each party to a subcontract to take the affirmative steps of this section; and (7) Contractor is encouraged to procure goods and services from labor surplus area firms.

18.07 *Anti-Kickback*

- A. Contractor shall comply with the Copeland Anti-Kickback Act (18 USC 874 and 40 USC 276c) as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.

18.08 *Clean Air and Pollution Control Acts*

- A. If this Contract exceeds \$100,000, Contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 USC 7401 *et seq.*) and the Federal Water Pollution Control Act as amended (33 USC 1251 *et seq.*). Contractor will report violations to the Agency and the Regional Office of the EPA.

18.09 *State Energy Policy*

- A. Contractor shall comply with the Energy Policy and Conservation Act (P.L. 94-163). Mandatory standards and policies relating to energy efficiency, contained in any applicable State Energy Conservation Plan, shall be utilized.

18.10 *Equal Opportunity Requirements*

- A. If this Contract exceeds \$10,000, Contractor shall comply with Executive Order 11246, "Equal Employment Opportunity," as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and as supplemented by regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."
- B. Contractor's compliance with Executive Order 11246 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative active obligations required by the Standard Federal Equal Employment

Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4 and its efforts to meet the goals established for the geographical area where the Contract is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting Contractor's goals shall be a violation of the Contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

- C. Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the Contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number; estimated dollar amount of subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the Contract is to be performed.

18.11 *Restrictions on Lobbying*

- A. Contractor and each subcontractor shall comply with Restrictions on Lobbying (Public Law 101-121, Section 319) as supplemented by applicable Agency regulations. This Law applies to the recipients of contracts and subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. If applicable, Contractor must complete a certification form on lobbying activities related to a specific Federal loan or grant that is a funding source for this Contract. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 USC 1352. Each tier shall disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Certifications and disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

18.12 *Environmental Requirements*

- A. When constructing a project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental constraints:
1. Wetlands – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
 2. Floodplains – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, i.e., alluvial soils on NRCS Soil Survey Maps.
 3. Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact shall be immediately reported to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the State Historic Preservation Officer (SHPO).
 4. Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

EXHIBIT GC-A

Certificate of Owner's Attorney

I, the undersigned, _____, the duly authorized and acting legal representative of _____, do hereby certify as follows:

I have examined the attached Contract(s) and performance and payment bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements is adequate and has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions, and provisions thereof.

Date: _____

Section 00800 Supplementary Conditions

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract Funding Agency Edition (No. C-710, 2002 Edition) and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions will have the meanings indicated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

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SC-1.01.A.2. Add the following language to the end of Paragraph 1.01.A.2:

The Project is financed in whole or in part by USDA Rural Development pursuant to the Consolidated Farm and Rural Development Act (7 USC Section 1921 et seq.).

SC-1.01.A.4. Add the following language to the end of Paragraph 1.01.A.4:

The Application for Payment form to be used on this Project is Form RD 1924-18. The Agency must approve all Applications for Payment before payment is made.

SC-1.01.A.10. Add the following language to the end of Paragraph 1.01.A.10:

The Change Order form to be used on this Project is Form RD 1927-7. Agency approval is required before Change Orders are effective.

SC-1.01.A.15. Delete in it's entirety and replace with the following:

Contract Times: The number of days or date stated in the Agreement to achieve substantial completion. Final completion date will be determined by Contractor, Owner and Engineer, after substantial completion, based on remaining work, weather and market conditions.

SC-2.03.A. Delete Paragraph 2.03.A in its entirety and insert the following in its place:

- A. The Contract Times will commence to run on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 10 days after the Effective Date of the Agreement.

SC-4.02. Delete Paragraphs 4.02.A and 4.02.B in their entirety and insert the following:

- C. In preparation of Drawings and Specification, Engineer relied upon the following reports of exploration and tests of subsurface conditions at the site: N/A

SC-4.06. Delete Paragraphs 4.06.A and 4.06.B in their entirety and insert the following:

- A. No reports or explorations or tests of subsurface conditions at or contiguous to the Site are known to the Owner or Engineer.
- B. Not used.

SC-5.03. Add the following new paragraph immediately after Paragraph 5.03.B:

- C. Failure of the Owner to demand such certificates or other evidence of full compliance with these insurance requirements or failure of the Owner to identify a deficiency from evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

SC-5.04. Add the following new paragraph immediately after Paragraph 5.04.B:

- C. The limits of liability for insurance required by Paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:
 - 1. Workers' Compensation, and related coverages under Paragraphs 5.04.A.1 and A.2 of the General Conditions:
 - a. State: Statutory
 - b. Applicable Federal (e.g., Longshoremen's) Statutory
 - c. Employer's Liability \$ 500,000
 - 2. Contractor's General Liability under Paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody, and control of the Contractor:
 - a. General Aggregate \$ 2,000,000
 - b. Products - Completed Operations Aggregate \$ 1,000,000
 - c. Personal and Advertising Injury \$ 1,000,000

- d. Each Occurrence
(Bodily Injury and
Property Damage) \$ 1,000,000
 - e. Property Damage liability
insurance will provide
Explosion, Collapse, and
Underground coverages where
applicable.
 - f. Excess or Umbrella Liability
 - 1) General Aggregate \$ 5,000,000
 - 2) Each Occurrence \$ 5,000,000
3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions:
- a. Bodily Injury:
 - Each Person \$ 1,000,000
 - Each Accident \$ 1,000,000
 - b. Property Damage:
 - Each Accident \$ 1,000,000
 - c. Combined Single Limit of \$ 1,000,000
4. The Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:
- a. Bodily Injury:
 - Each Person \$ 2,000,000
 - Each Accident \$ 2,000,000
 - b. Property Damage:
 - Each Accident \$ 2,000,000
 - Annual Aggregate \$ 2,000,000

SC-6.06 Add a new paragraph immediately after Paragraph 6.06.G:

- H. The Contractor shall not award work valued at more than fifty (50%) percent of the Contract Price to Subcontractor(s), without prior written approval of the Owner.

SC-9.03.A. Add the following language at the end of paragraph 9.03.A:

The Engineer will provide Resident Project Representative services for this project. The Duties, Responsibilities, and Limitations of Authority of the Resident Project Representative will be as stated in Exhibit D of the Agreement Between Owner and Engineer, E-510, 2002 Edition, as amended and executed for this specific Project.

SC-14.02.A.3 Add the following language at the end of paragraph 14.02.A.3:

No payments will be made that would deplete the retainage prior to substantial completion, nor place in escrow any funds that are required for retainage, or invest the retainage for benefit.

SC-14.02.C.1. Delete Paragraph 14.02.C.1 in its entirety and insert the following in its place:

- 1. The Application for Payment with Engineer's recommendations will be presented to the Owner and Agency for consideration. If both the Owner and Agency find the Application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 14.02.D will become due ten days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

SC-18.08 Delete paragraph 18.08.A in its entirety and insert the following in its place:

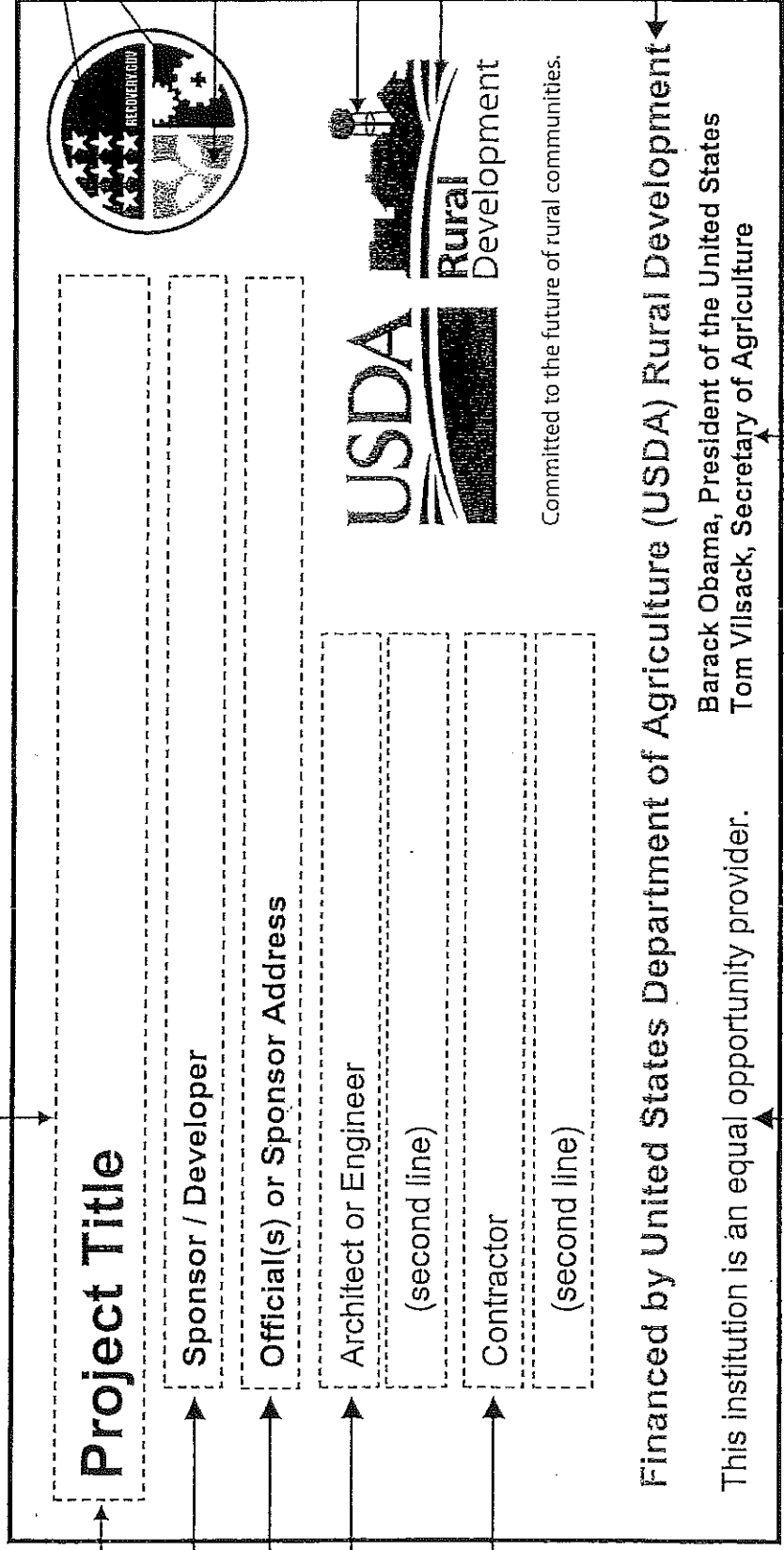
- A. If this Contract exceeds \$100,000, the Contractor shall comply with all applicable standards, orders, or requirements issued under Section 306 of the Clean Air Act (42 USC §1857(h)), Section 508 of the Clean Water Act (33 USC §1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR Part 15).



AMERICAN RECOVERY AND REINVESTMENT ACT TEMPORARY CONSTRUCTION SIGN FOR USDA RURAL DEVELOPMENT PROJECTS

- PANTONE SOLID COATED
- BLUE PMS 534C
- RED PMS, 484C
- GREEN, PMS 576
- TOWNSCAPE AND LETTER FORMS (BLUE, PMS 288)
- ROLLING FIELDS (GREEN, PMS 343)
- LETTERING (GREEN, PMS 343)

WHITE BACKGROUND



BLACK LETTERING

BLACK LETTERING

SIGN DIMENSIONS: 1200 mm x 2400 mm x 19 mm (approx. 4' x 8' x 3/4")
 PLYWOOD PANEL (APA RATED A-B GRADE-EXTERIOR)

KPDES STORM WATER GENERAL PERMIT

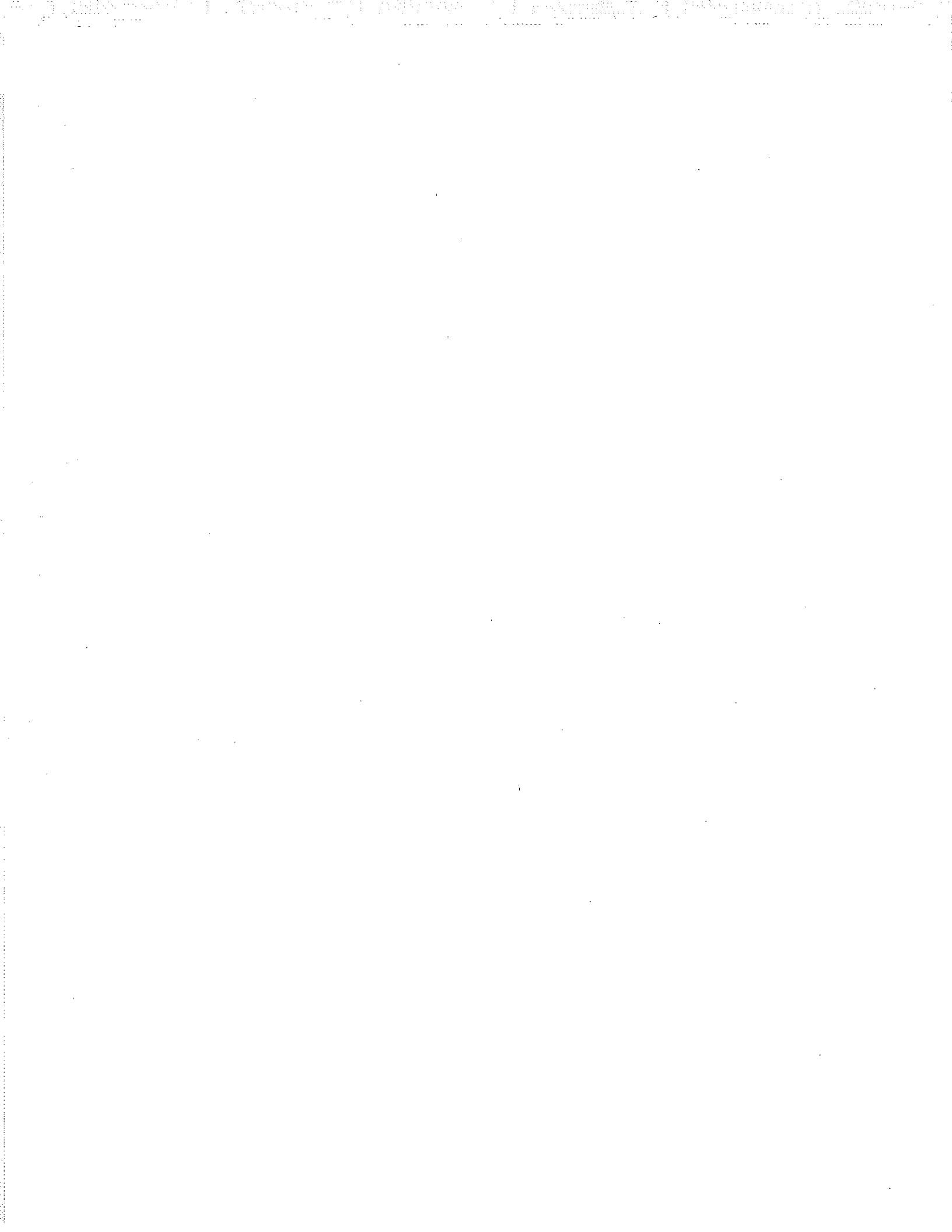
NOTICE OF INTENT

All construction projects with surface disturbance of more than 1 acre during the period of construction must have a KPDES Storm Water General Permit. The contractor must complete and submit the attached form at least 48 hours prior to start of construction to the address below:

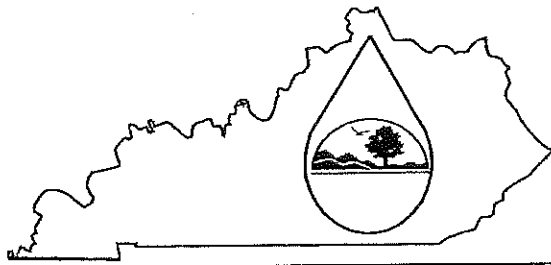
Section Supervisor
Permits Support Section
Surface Water Permits Branch
Kentucky Division of Water
200 Fair Oaks
Frankfort, Kentucky 40601

The electronic Notice of Intent (eNOI) for Stormwater Discharges Associated with Construction Activity (KPDES Form NOI-SWCA) under the KPDES General Permit is available on the Web.

For the eNOI, visit: <https://dep.gateway.ky.gov/eForms/default.aspx?FormID=7>.



FORM NOI-SWCA



KENTUCKY POLLUTION DISCHARGE ELIMINATION SYSTEM (KPDES)

Notice of Intent (NOI) for coverage of Storm Water Discharges Associated with Construction Activities Under the KPDES Storm Water General Permit KYR100000

This is an application for:

- New construction activity.
- Modification of coverage for additional area in same watershed.
- Modification of coverage for additional area in different watershed.

If Modification is checked, state reason for Modification:

For Agency Use	Permit No. (Leave Blank)	K	Y	R	1	0				
For Agency Use	AI ID (Leave Blank)									

SECTION I - FACILITY OPERATOR INFORMATION

Operator Name(s)*:		Phone*:	
Mailing Address*:		Status of Owner/Operator: <input type="checkbox"/> Private <input type="checkbox"/> State <input type="checkbox"/> Federal <input type="checkbox"/> Public (other than state or federal)	
City*:	State*:	Zip Code*:	

SECTION II - FACILITY/SITE LOCATION INFORMATION

Name of Project*:	Physical Address*:	City*:
State*:	Zip Code*:	County*:
Latitude (decimal degrees)*:	Longitude (decimal degrees)*:	SIC Code*:

SECTION III - SITE ACTIVITY INFORMATION

For single projects provide the following information

Total Number of acres in project*:	Total Number of acres to be disturbed*:	Start date:	Completion date:
------------------------------------	---	-------------	------------------

For common plans of development projects provide the following information

Total Number of acres in project*:	Number of individual lots in development:	Number of lots to be developed:
Total acreage intended to be disturbed*:	Number of acres intended to be disturbed at any one time:	
Start date:	Completion date:	List Contractors:

SECTION IV - DISCHARGE TO A WATER BODY

Name of Receiving Water*:	Anticipated number of discharge points:
Location of anticipated discharge points: Latitude (decimal degrees)*	Longitude (decimal degrees)*
Receiving Water Body Stream Use Designation	<input type="checkbox"/> Cold Water Aquatic Habitat <input type="checkbox"/> Domestic Water Supply <input type="checkbox"/> Outstanding State Resource Water <input type="checkbox"/> Secondary Contact Recreation <input type="checkbox"/> Primary Contact Recreation <input type="checkbox"/> Warm Water Aquatic Habitat
Antidegradation Categorization	<input type="checkbox"/> Outstanding National Resource Water <input type="checkbox"/> Exceptional Water <input type="checkbox"/> High Quality Water <input type="checkbox"/> Impaired Water
Name of Receiving Water*:	Anticipated number of discharge points:
Location of anticipated discharge points: Latitude (decimal degrees)*	Longitude (decimal degrees)*
Receiving Water Body Stream Use Designation	<input type="checkbox"/> Cold Water Aquatic Habitat <input type="checkbox"/> Domestic Water Supply <input type="checkbox"/> Outstanding State Resource Water <input type="checkbox"/> Secondary Contact Recreation <input type="checkbox"/> Primary Contact Recreation <input type="checkbox"/> Warm Water Aquatic Habitat
Antidegradation Categorization	<input type="checkbox"/> Outstanding National Resource Water <input type="checkbox"/> Exceptional Water <input type="checkbox"/> High Quality Water <input type="checkbox"/> Impaired Water

FORM NOI-SWCA

SECTION V – DISCHARGE TO AN MS4

Name of MS4: _____ Date of application /notification to the MS4 for construction site coverage: _____

Number of discharge points: _____ Location of each discharge point: Latitude (decimal degrees):* _____ Longitude (decimal degrees):*

SECTION VI – CONSTRUCTION ACTIVITIES IN OR ALONG A WATER BODY

Will the project require construction activities in a water body or the riparian zone: Yes No

If yes, describe scope of activity: _____

Is a Clean Water Act 404 permit required: Yes No Is a Clean Water Act 401 Water Quality Certification required: Yes No

SECTION VII – NOI PREPARER INFORMATION

First Name:* _____ Last Name:* _____ Phone :* _____ eMail Address:* _____

Mailing Address:* _____ City:* _____ State:* _____ Zip Code:* _____

SECTION VIII – ATTACHMENTS

Attach a full size color USGS 7½-minute quadrangle map with the facility site clearly marked. USGS maps may be obtained from the University of Kentucky, Mines and Minerals Bldg. Room 106, Lexington, Kentucky 40506. Phone number (859) 257-3896.

SECTION IX – CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature:* _____ First Name:* _____ Last Name:* _____

Phone:* _____ eMail Address: _____ Date:* _____

This completed application form and attachments should be sent to: SWP Branch, Division of Water, 200 Fair Oaks, Frankfort, Kentucky 40601. Questions should be directed to: SWP Branch, Operational Permits Section at (502) 564-3410.

KENTUCKY POLLUTANT DISCHARGE ELIMINATION SYSTEM FORM NOI-SWCA – INSTRUCTIONS

WHO MUST FILE A NOTICE OF INTENT (NOI) FORM

Federal law at 40 CFR Part 122 prohibits point source discharges of stormwater associated with industrial activity to a water body of the Commonwealth of Kentucky without a Kentucky Pollutant Discharge Elimination System (KPDES) permit. The operator of an industrial activity that has such a storm water discharge must submit a NOI to obtain coverage under the KPDES Storm Water General Permit. If you have questions about whether you need a permit under the KPDES Storm Water program, or if you need information as to whether a particular program is administered by the state agency, call the **Storm Water Contact, Operational Permits Section, Kentucky Division of Water at (502) 564-3410.**

WHERE TO FILE NOI FORM

NOIs must be sent to the following address or submitted in on-line at <https://dep.gateway.ky.gov/eForms/Default.aspx?FormID=3>:

Operational Permits Section
SWP Branch, Division of Water
200 Fair Oaks Lane
Frankfort, KY 40601

Electronic NOI-SWCAs are to be submitted a minimum of seven (7) working days prior to commencement of construction related activities. Paper NOI-SWCAs are to be submitted a minimum of thirty (30) working days prior to commencement of construction related activities.

COMPLETING THE FORM

Enter information in the appropriate areas only. (*) denotes a required field. Enter N/A (Not Applicable) for fields that are required but do not apply to your submission. If you have any questions regarding the completion of this form call the **Storm Water Contact, Operational Permits Section, at (502) 564-3410.**

SECTION I – FACILITY OPERATOR INFORMATION

Operator Name(s): Enter the name or names of all operators applying for coverage under KYR10 using this NOI.
Mailing Address, City, State, and Zip Code: Provide the mailing address of the primary operator
Phone No.: Provide the telephone numbers of the person who is responsible for the operation.
Status of Owner/Operator: Select the appropriate legal status of the operator of the facility from the dropdown list.

Federal
Public (other than federal or state)
State
Private

SECTION II – FACILITY/SITE LOCATION INFORMATION

Name of Project: Provide the name of the project.
Physical Address, City, State, Zip Code and County: Provide the physical address of the project.
Latitude/Longitude: Provide the general site latitude and longitude of the operation.
SIC Code: Enter the Standard Industrial Code for the project

SECTION III – SITE ACTIVITY INFORMATION

For single projects provide the following information:

Total number of acres in project: Indicate the total acreage of the project including both disturbed and undisturbed areas.
Total number of acres to be disturbed: Indicate the total number of acres of the project to be disturbed.
Anticipated start date: Indicate the approximate date of when construction activities will begin.
Anticipated completion date: Indicated the approximate date of when final stabilization will be achieved.

For common plans of development provide the following information:

Total number of acres in project: Indicate the total acreage of the project including both disturbed and undisturbed areas.
Number of individual lots in development, if applicable: Indicate the number of individual lots or unit in the common plan of development
Number of lots to be developed: Indicate the number of lots that you intend to develop.
Total acreage of lots intended to develop: Indicate the total acreage of the lots you intend to develop
Total acreage intended to disturb: Indicate the total acreage of the lots you intend to disturb
Number of acres intended to disturb at any one time: Indicate the maximum number of acres to be disturbed at any one time.
Anticipated start date: Indicate the approximate date of when construction activities will begin.
Anticipated completion date: Indicated the approximate date of when final stabilization will be achieved.
List of contractors: Provide the names of all known contractors that will be working on site.

**KENTUCKY POLLUTANT DISCHARGE ELIMINATION SYSTEM
FORM NOI-SWCA – INSTRUCTIONS**

SECTION IV – IF THE PERMITTED SITE DISCHARGES TO A WATER BODY THE FOLLOWING INFORMATION IS REQUIRED

Name of Receiving Water: Provide the names of the each water body receiving discharges from the site. Provide only official USGS names do not provide local names

Anticipated number of discharge points: Indicate the number of discharge points to each receiving water body.

Location of anticipated discharge points: Provide the latitude and longitude of each discharge point. Add points as necessary.

Receiving Water Body Stream Use Designation: Check all appropriate boxes

Antidegradation Categorization: Select from the drop down box one of the following:

Outstanding National Resource Water
Exceptional Water
High Quality Water
Impaired Water

SECTION V – IF THE PERMITTED SITE DISCHARGES TO A MS4 THE FOLLOWING INFORMATION IS REQUIRED

Name of MS4: Provide the name of the MS4 to which the activity will discharge

Number of discharge points to the MS4: Indicate the number of discharge points

Location of each discharge point: Provide the latitude and longitude of each discharge point. Add points as necessary

Date of application/notification to the MS4 for construction site permit coverage: Indicate the date the MS4 has or will be notified.

SECTION VI – CONSTRUCTION ACTIVITIES IN OR ALONG A WATER BODY

Will the project require construction activities in a water body or the riparian zone: Select Yes or No from the drop down box.

If Yes, describe scope of activity: Provide a brief description of the activity (ies) that will take place in the water body or the riparian zone.

Is a Clean Water Act 404 permit required: Select Yes or No from the drop down box.

Is a Clean Water Act 401 Water Quality Certification required: Select Yes or No from the drop down box.

SECTION VII – NOI PREPARER INFORMATION

Provide the name, mailing address, telephone number and eMail address of the person preparing the NOI.

SECTION VIII –Attachments

Attach a USGS topographic map indicating the location of the activity and the proposed discharge points.

SECTION IX – CERTIFICATION

Provide the name, mailing address, telephone number and eMail address of the person who is responsible for the activity

Signature: Provide full name of the responsibility party. This will constitute a signature.

The NOI must be signed as follows:

Corporation: by a principal executive officer of at least the level of vice president

Partnership or sole proprietorship: by a general partner or the proprietor respectively

WAGE DETERMINATIONS

KENTUCKY STATE WAGE DETERMINATION



Matthew G. Bevin
Governor

Jenean M. Hampton
Lt. Governor

Kentucky Labor Cabinet
Department of Workplace Standards
Division of Employment Standards, Apprenticeship
and Mediation

1047 US Hwy 127 S STE 4
Frankfort, Kentucky 40601
Phone: (502) 564-3070
Fax: (502) 696-1897
www.labor.ky.gov

Derrick K. Ramsey
Secretary

February 16, 2016

Carlos Miller
Kenvirons Inc.
452 Versailles Rd.
Frankfort KY 40601

Re: Hardin County Water District No. 2, Transmission Pipeline and Booster Pump Station

Advertising Date as Shown on Notification: February 18, 2016

Dear Carlos Miller:

This office is in receipt of your written notification on the above project as required by KRS 337.510 (1).

I am enclosing a copy of the current prevailing wage determination number CR 2-010, dated December 4, 2015 for HARDIN County. This schedule of wages shall be attached to and made a part of the specifications for the work, printed on the bidding blanks, and made a part of the contract for the construction of the public works between the public authority and the successful bidder or bidders.

The determination number assigned to this project is based upon the advertising date contained in your notification. There may be modifications to this wage determination prior to the advertising date indicated. In addition, if the contract is not awarded within 90 days of this advertising date or if the advertising date is modified, a different set of prevailing rates of wages may be applicable. It will be the responsibility of the public authority to contact this office and verify the correct schedule of the prevailing rates of wages for use on the project. Your project number is as follows: 047-H-00370-15-2, Heavy/Highway

Sincerely,

Michael C. Donta
Deputy Commissioner



KENTUCKY LABOR CABINET
PREVAILING WAGE DETERMINATION
CURRENT REVISION
LOCALITY NO. 010

HARDIN COUNTY

Determination No. CR 2-010 2015

Project No. 047-H-00370-15-2
Type: ___ Bldg HH

Date of Determination: December 4, 2015

This schedule of the prevailing rate of wages for Hardin County has been determined in accordance with the provisions of KRS 337.505 to 337.550. This determination shall be referred to as Prevailing Wage Determination No. CR 2-010 2015

Apprentices shall be permitted to work as such subject to Administrative Regulations 803 KAR 1:010. Copies of these regulations will be furnished upon request to any interested person.

Overtime is to be computed at not less than one and one-half (1 1/2) times the indicated BASE RATE for all hours worked in excess of eight (8) per day, and/or in excess of forty (40) per week. However, KRS 337.540 permits an employee and employer to agree, in writing, that the employee will be compensated at a straight time base rate for hours worked in excess of eight (8) hours in any one calendar day, but not more than ten (10) hours worked in any one calendar day, if such written agreement is prior to the over eight (8) hours in a calendar day actually being worked, or where provided for in a collective bargaining agreement. The fringe benefit rate is to be paid for each hour worked at a straight time rate for all hours worked. Fringe benefit amounts are applicable for all hours worked except when otherwise noted. Welders will receive rate for craft in which welding is incidental.

NOTE: The type of construction shall be determined by applying the following definitions:

BUILDING CONSTRUCTION

Building construction is the construction of sheltered enclosures with walk-in access for the purpose of housing persons, machinery, equipment, or supplies. It includes all construction of such structures, the installation of utilities and the installation of equipment, both above and below grade level, as well as incidental grading, utilities and paving.

HIGHWAY CONSTRUCTION

Highway construction includes the construction, alteration or repair of roads, streets, highways, runways, taxiways, alleys, trails, paths, parking areas, and other similar projects not incidental to building or heavy construction. It includes all incidental construction in conjunction with the highway construction project.

HEAVY CONSTRUCTION

Heavy projects are those projects that are not properly classified as either "building" or "highway". For example, dredging projects, water and sewer line projects, dams, flood control projects, sewage treatment plants and facilities, and water treatment plants and facilities are considered heavy.



Anthony Russell, Commissioner
Department of Workplace Standards
Kentucky Labor Cabinet

Determination No. CR 2-010 2015
December 4, 2015

ASBESTOS / INSULATION WORKERS:

(Including duct (hot/cold), pipe insulator & pipe wrapping):

BASE RATE \$27.53
 FRINGE BENEFITS 14.79

Hazardous Material Handlers: (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging & disposing of all insulation materials, whether they contain asbestos or not, from mechanical systems):

BASE RATE \$19.35
 FRINGE BENEFITS 10.35

BOILERMAKERS:

BASE RATE \$35.80
 FRINGE BENEFITS 24.26

BRICKLAYERS:

Bricklayers:

BASE RATE \$24.24
 FRINGE BENEFITS 8.25

Tile Setters: BUILDING

BASE RATE \$22.64
 FRINGE BENEFITS 6.10

Tile Finishers: BUILDING

BASE RATE \$15.42
 FRINGE BENEFITS 5.63

CARPENTERS:

Acoustical ceiling installation only:

BUILDING

BASE RATE \$25.77
 FRINGE BENEFITS 7.40

Drywall Hanging & metal stud installation: BUILDING

BASE RATE \$21.72
 FRINGE BENEFITS 13.52

Floor Laying, Carpet & Vinyl Only:

BUILDING

BASE RATE \$29.99
 FRINGE BENEFITS 1.32

Form Work Only: BUILDING

BASE RATE \$22.19
 FRINGE BENEFITS 12.25

All other work: BUILDING

BASE RATE \$23.54
 FRINGE BENEFITS 9.10

CARPENTERS/HEAVY:

Carpenters:

HEAVY

BASE RATE \$27.50
 FRINGE BENEFITS 16.06

Piledrivermen:

HEAVY

BASE RATE \$27.75
 FRINGE BENEFITS 14.96

Divers:

HEAVY

BASE RATE \$41.63
 FRINGE BENEFITS 14.96

Form Work Only:

HEAVY

BASE RATE \$27.50
 FRINGE BENEFITS 16.06

CEMENT MASONS / CONCRETE FINISHERS:

BUILDING

BASE RATE \$20.21
 FRINGE BENEFITS 9.70

ELECTRICIANS:

Electricians: BUILDING & HEAVY

BASE RATE \$30.01
 FRINGE BENEFITS 15.65

ELECTRICIANS / LINE CONSTRUCTION:

Cable Splicer:

BASE RATE \$32.19
 FRINGE BENEFITS 11.88

Equipment Operator A: John Henry Rock Drill, D6 (or equivalent) and above, Trackhoe Digger, Cranes (greater than 25 tons and less than 45 tons)

BASE RATE \$28.81
 FRINGE BENEFITS 11.13

Equipment Operator B: Cranes (6-25 tons), Backhoes, Road Tractor, Dozer up to D5, Pressure Digger-Wheeled Or Tracked, all Tension Wire Stringing Equipment

BASE RATE \$25.42
 FRINGE BENEFITS 10.38

Equipment Operator C: Trencher, Vibratory Compactor, Ground Rod Driver, Boom Truck (6 tons or below), Skid Steer Loaders

BASE RATE \$20.33
 FRINGE BENEFITS 9.25

Groundmen:

BASE RATE \$17.12
 FRINGE BENEFITS 8.55

Linemen and Technician

BASE RATE \$29.36
 FRINGE BENEFITS 11.25

Cranes 45 tons or larger to be paid 100% of journeyman lineman's rate

ELEVATOR MECHANICS:

BASE RATE \$36.94
 FRINGE BENEFITS 20.035

GLAZIERS:

BASE RATE \$25.18
 FRINGE BENEFITS 10.30

IRONWORKERS:

Structural & Reinforcing: BUILDING

BASE RATE \$27.56
 FRINGE BENEFITS 20.30

Ornamental: BUILDING

BASE RATE \$26.40
 FRINGE BENEFITS 19.15

Structural: HEAVY

BASE RATE \$25.46
 FRINGE BENEFITS 17.49

LABORERS / BUILDING:

Mason Tender-cement/concrete, Power Tool Operator:			
	BUILDING	BASE RATE	\$19.62
		FRINGE BENEFITS	9.48
LABORER	COMMON OR GENERAL	BASE RATE	\$18.86
		FRINGE BENEFITS	5.22
LABORER	MASON TENDER-BRICK	BASE RATE	\$19.24
		FRINGE BENEFITS	3.79
LABORER	PIPELAYER	BASE RATE	\$20.36
		FRINGE BENEFITS	9.90

LABORERS / HEAVY

Concrete Saw (hand held/walk behind):	HEAVY	BASE RATE	\$28.89
		FRINGE BENEFITS	9.85
Flagger	HEAVY	BASE RATE	\$28.72
		FRINGE BENEFITS	9.85
Concrete Finishing	HEAVY	BASE RATE	\$24.21
		FRINGE BENEFITS	11.45
Concrete Worker	HEAVY	BASE RATE	\$23.31
		FRINGE BENEFITS	11.45
Common or General:	HEAVY	BASE RATE	\$16.18
		FRINGE BENEFITS	10.43
Pipelayer	HEAVY	BASE RATE	\$18.56
		FRINGE BENEFITS	4.50

MILLWRIGHTS:

	BASE RATE	\$24.18
	FRINGE BENEFITS	15.64

OPERATING ENGINEERS / BUILDING:

Drill, Loader, Crane, Forklift:			
	BUILDING	BASE RATE	\$28.85
		FRINGE BENEFITS	14.40
Oiler:	BUILDING	BASE RATE	\$25.13
		FRINGE BENEFITS	14.40
Bulldozer:	BUILDING	BASE RATE	\$21.49
		FRINGE BENEFITS	3.84

OPERATING ENGINEERS / BUILDING CONTINUED

Backhoe/Excavator/Trackhoe: BUILDING	BASE RATE	\$24.35
	FRINGE BENEFITS	13.00

**CRANE WITH BOOM 150 FEET AND OVER, INCLUDING JIB, SHALL RECEIVE \$.75 ABOVE GROUP 1
 ALL CRANES WITH PILING LEADS WILL RECEIVE \$.50 ABOVE GROUP 1 REGARDLESS OF BOOM LENGTH**

Paver (asphalt, aggregate, concrete): BUILDING	BASE RATE	\$22.52
	FRINGE BENEFITS	4.00

Roller: BUILDING	BASE RATE	\$23.60
	FRINGE BENEFITS	12.65

OPERATING ENGINEERS / HEAVY:

GROUP 1: Crane, Drill, Pumpcrete: HEAVY	BASE RATE	\$29.95
	FRINGE BENEFITS	14.40

GROUP 2: Bobcat, skid steer/skid loader, concrete pump: HEAVY	BASE RATE	\$27.26
	FRINGE BENEFITS	14.40

GROUP 3: All Off Road Material Handling Equipment, including Articulating Dump Trucks HEAVY	BASE RATE	\$26.65
	FRINGE BENEFITS	14.15

GROUP 4: Oiler, Pump: HEAVY	BASE RATE	\$26.96
	FRINGE BENEFITS	14.40

Forklift: HEAVY	BASE RATE	\$27.38
	FRINGE BENEFITS	14.15

Backhoe/Excavator/Trackhoe: HEAVY	BASE RATE	\$20.85
	FRINGE BENEFITS	5.00

Bulldozer: HEAVY	BASE RATE	\$25.35
	FRINGE BENEFITS	16.74

Loader: HEAVY	BASE RATE	\$26.50
	FRINGE BENEFITS	13.00

Mechanic: HEAVY	BASE RATE	\$25.81
	FRINGE BENEFITS	13.00

Roller: HEAVY	BASE RATE	\$23.39
	FRINGE BENEFITS	13.00

OPERATING ENGINEERS / HEAVY CONTINUED:

Trencher:	HEAVY	BASE RATE	\$26.34
		FRINGE BENEFITS	12.58

*Cranes with booms 150 ft. & over (including jib) and where the length of the boom in combination with the length of the piling leads equals or exceeds 150 ft. - \$1.00 over Group 1.
 Employees assigned to work below ground level are to be paid 10% above basic wage rate.
 This does not apply to open cut work.

PAINTERS:

Brush, Roller:	BUILDING	BASE RATE	\$20.83
		FRINGE BENEFITS	11.84
Spray:	BUILDING	BASE RATE	\$22.81
		FRINGE BENEFITS	11.87
Sign Painter & Erector:	BUILDING	BASE RATE	\$20.23
		FRINGE BENEFITS	3.25
Brush & Roller Only:	HEAVY	BASE RATE	\$18.50
		FRINGE BENEFITS	12.02
Spray, Sandblast, Power Tools, Waterblast & Steam Cleaning:	HEAVY	BASE RATE	\$19.00
		FRINGE BENEFITS	12.02

PIPEFITTERS:

BASE RATE	\$31.54
FRINGE BENEFITS	14.78

PLUMBERS:

BASE RATE	\$22.73
FRINGE BENEFITS	7.67

ROOFERS

BASE RATE	\$20.61
FRINGE BENEFITS	5.12

SHEETMETAL WORKERS (including metal roofs):
 (Includes installation of HVAC duct & system)

BASE RATE	\$29.45
FRINGE BENEFITS	18.70

SPRINKLER FITTERS: (Fire Sprinklers)

BASE RATE	\$31.35
FRINGE BENEFITS	17.52

TRUCK DRIVERS / BUILDING:

10 Yard Truck:	BUILDING	BASE RATE	\$16.27
		FRINGE BENEFITS	1.50
Dump Truck:	BUILDING	BASE RATE	\$23.60
		FRINGE BENEFITS	8.03

TRUCK DRIVERS / HEAVY

Mobile Batch Truck Tender:	HEAVY	BASE RATE	\$16.57
		FRINGE BENEFITS	7.34

Greaser, Tire Changer, & Mechanic Tender:	HEAVY	BASE RATE	\$16.68
		FRINGE BENEFITS	7.34

Single Axle Dump & Flatbed, Semi-Trailer or Pole Trailer when used to pull building materials & equipment; Tandem Axle Dump; Distributor; Mixer, & Truck Mechanic:	HEAVY	BASE RATE	\$16.86
		FRINGE BENEFITS	7.34

Euclid, Other Heavy Earthmoving Equipment & Lowboy; Articulator Cat Truck & 5 Axle Vehicle; Winch & A-Frame when used in transporting materials; Ross Carrier; Fork Lift Truck when used to transport building materials; & Drivers on Pavement Breaker:	HEAVY	BASE RATE	\$16.96
		FRINGE BENEFITS	7.34

Dump Truck:	HEAVY	BASE RATE	\$16.80
		FRINGE BENEFITS	4.06

BRICKLAYER:	HIGHWAY	BASE RATE	\$25.96
		FRINGE BENEFITS	10.64

CARPENTER:	HIGHWAY	BASE RATE	\$27.50
		FRINGE BENEFITS	16.06

DIVER:	HIGHWAY	BASE RATE	\$41.63
		FRINGE BENEFITS	16.06

PILEDRIVER:	HIGHWAY	BASE RATE	\$27.75
		FRINGE BENEFITS	16.06

ELECTRICIAN:	HIGHWAY	BASE RATE	\$30.01
		FRINGE BENEFITS	15.65

IRONWORKERS	HIGHWAY	BASE RATE	\$27.56
		FRINGE BENEFITS	20.30

LABORERS / HIGHWAY:

Group 1: aging and curing of concrete, asbestos abatement worker, asphalt plant, asphalt, batch truck dump, carpenter tender, cement mason tender, cleaning of machines, concrete, demolition, dredging, environmental-nuclear, radiation, toxic & hazardous waste – level D, flagperson, grade checker, hand digging & hand back filling, highway marker placer, landscaping, mesh handler & placer, puddler, railroad, rip-rap & grouter, right of way, sign, guard rail & fence installer, signal person, sound barrier installer, storm & sanitary sewer, swamper, truck spotter & dumper, wrecking of concrete forms, general cleanup.

HIGHWAY	BASE RATE	\$22.71
	FRINGE BENEFITS	11.05

Group 2: batter board man (sanitary storm sewer), brickmason tender, mortar mixer operator, scaffold builder, Burner & welder, bushhammer, chainsaw operator, concrete saw operator, deckhand scow man, dry cement Handler, environmental – nuclear, radiation, toxic & hazardous waste – Level C, forklift operator for masonry, form setter, green concrete cutting, hand operated grouter & grinder machine operator, jackhammer, pavement breaker, paving joint machine, pipelayer, plastic pipe fusion, power driven Georgia Buggy & wheel barrow, power post hole digger, precast manhole setter, walk behind tamper, walk behind trencher, sand blaster, concrete chipper, surface grinder, vibrator operator, wagon driller.

HIGHWAY	BASE RATE	\$22.96
	FRINGE BENEFITS	11.05

Group 3: asphalt lutemen & raker, gunnite nozzleman, gunnite operator & mixer, group pump operator, side rail setter, rail paved ditches, screw operator, tunnel (free air) water blaster:

HIGHWAY	BASE RATE	\$23.01
	FRINGE BENEFITS	11.05

Group 4: Caisson worker (free air), cement finisher, environmental-nuclear, radiation, toxic & hazardous waste Levels A & B, miner & driller (free air), tunnel blaster & tunnel mucker (free air), directional & horizontal boring, air Track drillers (all types), powderman & blasters, troxler & concrete tester if Laborer is utilized.

HIGHWAY	BASE RATE	\$23.61
	FRINGE BENEFITS	11.05

OPERATING ENGINEERS/ HIGHWAY

GROUP 1 - A-Frame Winch Truck; Auto Patrol; Backfiller; Batcher Plant; Bituminous Paver; Bituminous Transfer Machine; Boom Cat; Bulldozer; Mechanic; Cableway; Carry-All Scoop; Carry Deck Crane; Central Compressor Plant; Cherry Picker; Clamshell; Concrete Mixer (21 cu. ft. or Over); Concrete Paver; Truck-Mounted Concrete Pump; Core Drill; Crane; Crusher Plant; Derrick; Derrick Boat; Ditching & Trenching Machine; Dragline; Dredge Operator; Dredge Engineer; Elevating Grader & Loaders; Grade-All; Gurries; Heavy Equipment Robotics Operator/Mechanic; High Lift; Hoe-Type Machine; Hoist (Two or More Drums); Hoisting Engine (Two or More Drums); Horizontal Directional Drill Operator; Hydrocrane; Hyster; KeCal Loader; LeTourneau; Locomotive; Mechanic; Mechanically Operated Laser Screed; Mechanic Welder; Mucking Machine; Motor Scraper; Orangepeel Bucket; Overhead Crane; Piledriver; Power Blade; Pumpcrete; Push Dozer; Rock Spreader, attached to equipment; Rotary Drill; Roller (Bituminous); Rough Terrain Crane; Scarifier; Scoopmobile; Shovel; Side Boom; Subgrader; Tailboom; Telescoping Type Forklift; Tow or Push Boat; Tower Crane (French, German & other types); Tractor Shovel; Truck Crane; Tunnel Mining Machines, including Moles, Shields or similar types of Tunnel Mining Equipment

HIGHWAY	BASE RATE	\$29.95
	FRINGE BENEFITS	14.40

OPERATING ENGINEERS / HIGHWAY CONTINUED:

Group 2: Air Compressor (Over 900 cu. ft. per min.); Bituminous Mixer; Boom Type Tamping Machine; Bull Float; Concrete Mixer (Under 21 cu. ft.); Dredge Engineer; Electric Vibrator; Compactor/Self-Propelled Compactor; Elevator (One Drum or Buck Hoist); Elevator (When used to Hoist Building Material); Finish Machine; Firemen & Hoist (One Drum); Flexplane; Forklift (Regardless of Lift Height); Form Grader; Joint Sealing Machine; Outboard Motor Boat; Power Sweeper (Riding Type); Roller (Rock); Ross Carrier; Skid Mounted or Trailer Mounted Concrete Pump; Skid Steer Machine with all Attachments; Switchman or Brakeman; Throttle Valve Person; Tractair & Road Widening Trencher; Tractor (50 H.P. or Over); Truck Crane Oiler; Tugger; Welding Machine; Well Points, & Whirley Oiler

HIGHWAY	BASE RATE	\$27.26
	FRINGE BENEFITS	14.40

Group 3: All off road material handling equipment, including articulating dump trucks, greaser on grease facilities servicing heavy equipment:

HIGHWAY	BASE RATE	\$27.68
	FRINGE BENEFITS	14.40

Group 4: bituminous distributor, burlap & curing machine, cement gun, concrete saw, conveyor, deckhand oiler, grout pump, hydraulic post driver, hydro seeder, mud jack, oiler, paving joint machine, power form handling equipment, pump, roller (earth), steerman, tamping machine, tractor (under 50 hp) & vibrator:

HIGHWAY	BASE RATE	\$26.96
	FRINGE BENEFITS	14.40

Cranes with booms 150 ft & over including JIB and where length of the boom in combination with the length of the piling leads equals or 150 ft - \$1.00 over Group 1 rate.

PAINTERS:

Brush & Roller	HIGHWAY	BASE RATE	\$18.50
		FRINGE BENEFITS	11.97

Spray, Sandblast, Power tools, Waterblast & Steam Cleaning:

HIGHWAY	BASE RATE	\$19.50
	FRINGE BENEFITS	11.97

PLUMBERS:

HIGHWAY	BASE RATE	\$32.00
	FRINGE BENEFITS	17.17

TRUCK DRIVERS

Group 1: Mobile batch truck tender:

HIGHWAY	BASE RATE	\$16.57
	FRINGE BENEFITS	7.34

Group 2: Greaser, tire changer, mechanic tender:

HIGHWAY	BASE RATE	\$16.68
	FRINGE BENEFITS	7.34

Group 3: Single axle dump, flatbed, semi trailer or pole trailer when used to pull building materials and equipment, tandem axle dump, distributor, mixer & truck mechanic

HIGHWAY	BASE RATE	\$16.86
	FRINGE BENEFITS	7.34

Group 4: Euclid & other heavy earth moving equipment & lowboy, articulator cat, 5-axle vehicle, winch & A frame when used in transporting materials, ross carrier, forklift when used to transport building materials & pavement breaker.

HIGHWAY

BASE RATE	\$16.96
FRINGE BENEFITS	7.34

End of Document
CR 2-010 2015
December 4, 2015

TECHNICAL SPECIFICATIONS

DIVISION 1
GENERAL REQUIREMENTS

SECTION 0101

SPECIAL CONDITIONS

1.0 DESCRIPTION OF THE WORK AND DESIGNATION OF OWNER

These Specifications and accompanying Drawings describe the work to be done and the materials to be furnished for the construction of the project entitled "24-inch Transmission Pipeline".

All references to the Owner in these Specifications, Contract Documents and plans shall mean the Hardin County Water District No. 2.

2.0 AVAILABLE FUNDS

This project is funded by Rural Development, BRAC, KIA and Hardin County Water District No. 2.

3.0 TIME OF COMPLETION

The time allowed for completion of this contract is 270 calendar days.

The time allowed for completion shall begin at midnight, Eastern Standard Time, on the date which the Owner, or his authorized representative, the Engineer, shall instruct the Contractor in writing to start work, but no later than 10 days after Notice to Proceed.

Additional time will be allowed the Contractor to cover approved over-runs or additions to the contract in the same proportion that the said over-run or addition in net monetary value bears to the original amount; the total of said additional time to be computed to the nearest whole calendar day.

4.0 LIQUIDATED DAMAGES

It is understood that time is the essence of this contract and that the Owner will sustain damages, monetary and otherwise, in the event of delay in completion of the work hereby contracted.

Therefore, if the said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part of the consideration for the awarding of these contracts, to pay to the Owner the amount specified in the contract, not as a penalty but as liquidated damages for such breach of contract

as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the Contract for completing the work.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

Liquidated damages are fixed at \$800 per calendar day of over-run beyond the date set for completion or authorized extension thereof.

5.0 INSURANCE

Insurance is to be furnished by the Contractor for the benefit of the Owner, Contractor, and Subcontractors as their interests may appear. The minimum amounts of insurance coverage to be furnished under these contracts, in accordance with the applicable provisions of the General Conditions.

All policies written for and applicable to the contract of which this Specification is a part shall provide for a minimum of fifteen (15) days written cancellation notice with notice to be given both to the Owner and the Engineer. The Owner and Engineer shall be included as additional insured parties.

6.0 BONDING

6.1 PERFORMANCE AND PAYMENT BOND

The Contractor shall furnish separate performance and payment bonds issued by an approved bonding company in an amount at least equal to one hundred (100%) per cent of the contract price, as security for the faithful performance of this contract and for the payment of persons performing labor and furnishing materials in connection with this contract. These bonds shall be executed by a company authorized to do business in the State of Kentucky and shall be signed or countersigned by a Kentucky resident agent. Bonds shall remain in effect for one year after date of final acceptance of the work.

6.2 DEPARTMENT OF TRANSPORTATION BONDING

See Section 15100 – WATER LINES, Subsection 1.1.

7.0 SITE DIMENSIONS

All Contractors furnishing materials and equipment for this contract shall obtain exact dimensions at the site. Scale or figure dimensions on the drawings and

- e) Installation Floater (Non-building Construction such as water and sewer pipe lines - - - - 100% of insurable values.

All policies written for and applicable to the contract of which this Specification is a part shall provide for a minimum of fifteen (15) days written cancellation notice with notice to be given both to the Owner and the Engineer. The Owner and Engineer shall be included as additional insured parties.

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6.2 DEPARTMENT OF TRANSPORTATION BONDING

See Section 15100 – WATER LINES, Subsection 1.1.

7.0 SITE DIMENSIONS

All Contractors furnishing materials and equipment for this contract shall obtain exact dimensions at the site. Scale or figure dimensions on the drawings and details show the correct size under ideal conditions and shall not, under any circumstances, be so construed as to relieve the Contractor from responsibility for taking measurements at the site and furnishing materials or equipment of the correct size.

8.0 DAMAGE TO EQUIPMENT STORED AND/OR IN PLACE PRIOR TO INITIAL OPERATION

Any equipment damaged or which has been subjected to possible damage by reason of inundation, improper storage and/or protection during the construction period of project, shall be handled only as follows:

- a) Be replaced with new equipment.
- b) With approval of the Engineer, be returned to the manufacturer of the equipment, or his authorized repair agency, for inspection and repair

provided, however, that such repair after inspection will place the equipment in new condition, and restore the manufacturer's guarantee the same as for new equipment.

9.0 SALVAGED MATERIALS AND EQUIPMENT

All materials and/or equipment to be removed from existing structures and not specifically specified to be re-used shall remain the property of the Owner. Such materials and/or equipment shall be stored on sites by the Contractor as directed by the Owner.

The use of second hand and/or salvaged materials will not be permitted, unless specifically provided for in the detailed specifications. Materials and equipment shall be new when turned over to the Owner.

10.0 TEMPORARY FACILITIES

- a) Build and maintain temporary offices and storage sheds as necessary for the work. Location of temporary buildings shall be subject to the approval of the Engineer.
- b) Provide temporary heat, light and power required by the work. Temporary telephone service shall be provided in the job office paid for by the General Contractor, except that the party placing a long distance call shall pay the toll charge.
- c) Each Contractor shall construct and maintain, in a sanitary condition, sanitary facilities for his employees and also employees of his subcontractors. At completion of the contract work these sanitary facilities shall be properly disposed of as directed by the Engineer.
- d) Temporary construction for safety measures, hoists and scaffolds shall be erected in accordance with the General Conditions.
- e) Construction yard shall be located on job site. Provide security and safety protection.
- f) The obtaining of all utilities for construction, including power and water, shall be the responsibility of the Contractor, and he shall bear the cost of all utilities used for construction. Cost of all connections and facilities for use of utilities shall be borne by the Contractor.

11.0 PROPERTY PROTECTION

Care is to be exercised by the Contractor in all phases of construction to prevent damage and injury to the Owner's or other property.

In connection with work performed on "private property" (property other than that belonging to the Owner), the Contractor shall confine his equipment, the storage of materials, and the operation of his workmen to the limits indicated on the plans, or to lands and right-of-way provided for the project by the Owner, and shall take every precaution to avoid damage to the private property Owner's buildings, grounds and facilities.

Fences, hedges, shrubs, etc. within the construction limits shall be carefully removed, preserved, and replaced when the construction is completed. Where ditches or excavations cross lawns, the sod shall be removed carefully and replaced when the backfilling has been completed. If sod is damaged or not handled properly, it shall be replaced with new sod equal to existing sod at the Contractor's expense. Grassed areas, other than lawns, shall be graded, fertilized and seeded when construction is completed. When construction is completed the private property Owner's facilities and grounds shall be restored to as good or better condition than found as quickly as possible at the Contractor's expense.

12.0 CONFLICT WITH OR DAMAGE TO EXISTING UTILITIES AND FACILITIES

Insofar as location data is available to the Engineers, existing underground utilities (such as waterlines, sewer lines, gas lines, telephone conduits, etc.) are accurately located on the drawings. Due, however, to the approximate nature of much of this data, the location of any particular facility cannot be certified to be correct. In general, locations and elevations shown are approximate only.

Before proceeding with the work, the Contractor shall confer with all public or private companies, agencies, or departments that own and operate utilities in the vicinity of the construction work. The purpose of the conference is to verify the location of, and possible interference with, the existing utilities that are shown on the Plans, arrange for necessary suspension of service, and make arrangements to locate and avoid interference with all utilities that are not shown on the Plans.

13.0 CONTROL OF EROSION

The Contractor shall be responsible for control of siltation and erosion from the project work. Control shall include all necessary ditching, check dams, mulching, etc. to prevent deposition of materials in roadside ditches. The Owner shall incur no extra costs from such work.

14.0 MEASUREMENT AND PAYMENT

14.1. Measurement of Quantities. All Work completed under the Agreement will be measured by the ENGINEER according to United States standard measure.

14.1.1. Unless otherwise specified, measurement of concrete quantities will include only that volume within the neat lines as shown on the Plans or as altered by the ENGINEER to fit field conditions. The prismatic formula will be used in computing the volumes of structures, or portions of structures, having end sections of unequal areas.

14.1.2. All items which are measured by the linear foot, such as pipe, will be measured along the centerline distance of the installed item with no allowance for connections, fittings or laps at connections.

14.1.3. In computing volumes of excavation, borrow and embankments, the average end-area method will be used. For the purpose of ascertaining quantities, it is agreed that the planimeter shall be considered an instrument of precision adapted to the measurement of areas.

14.2 Lump Sum. When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

14.3 Plan Quantities. When the plan quantities for a specific portion of the Work are designated as the pay quantities in the Contract Documents, they shall be the final quantities for which payment for such specific portion of the Work will be made, unless the dimensions of said portions of the Work shown on the plans are revised by the ENGINEER. When revised dimensions result in an increase or decrease in the quantities of such Work, the final quantities for payment will be revised in the amount represented by the authorized changes in dimensions.

14.4 Actual Quantities. When actual quantities for a specific portion of the Work are designated as the pay quantities in the Contract Documents, they shall be the final quantities for which payment for such specific portion of the Work will be made. The actual quantities will be determined by the difference in field measurements and cross sections before and after construction.

14.5 Scope of Payment. The contract unit prices whether based on lump sum, plan quantities or actual quantities for the various bid items of the Contract Documents shall be considered full compensation for all labor, materials, supplies, equipment, tools, and all things of whatever nature required for the complete incorporation of the item into the Work the same as though the items were to read "in Plan" unless the Contract Documents provide otherwise.

14.6 Payments. Estimates for payment, partial payments and final payments shall be in accordance with and follow procedures set forth in the General Conditions and Supplementary Conditions.

15.0 ACCESS ROADS

15.1 The CONTRACTOR, CONTRACTOR'S employees and all trucks delivering equipment, supplies or materials to the project shall use the access roads shown in the Plans for entering and leaving the project sites.

16.0 TESTING LABORATORY SERVICES

16.1 GENERAL

16.1.1 Work Included. From time to time during progress of the Work, the OWNER may require that testing be performed to determine that materials provided for the Work meet the specified requirements; such testing includes, but is not necessarily limited to:

- 1) Material Compaction
- 2) Cast-In-Place Concrete

16.1.2 Related Work Described Elsewhere. Requirements for testing may be described in various Sections of these Specifications; where no testing requirements are described, but the OWNER decides that testing is required, the OWNER may require testing to be performed under current pertinent standards for testing.

16.1.3 Selection of Testing Laboratory. The OWNER will select a testing laboratory.

16.1.4 Codes and Standards. Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

16.1.5 Product Handling. The CONTRACTOR shall promptly process and distribute all required copies of test reports for which he is responsible and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay in progress of the Work.

16.2 Payment for Testing Services.

16.2.1 Initial Services. The OWNER will pay for all initial testing services required by the OWNER.

16.2.2 Retesting. When initial tests indicate non-compliance with the Contract Documents, all subsequent retesting made necessary by the non-compliance shall be performed by a testing laboratory selected by the CONTRACTOR and approved by the ENGINEER and the costs thereof will be paid directly by the CONTRACTOR.

16.2.3 CONTRACTOR'S Convenience Testing. Inspection or testing performed exclusively for the CONTRACTOR'S convenience shall be the sole responsibility of the CONTRACTOR.

16.3 EXECUTION.

16.3.1 Cooperation with Testing Laboratory. Representatives of the testing laboratory shall have access to the Work at all times. The CONTRACTOR shall provide facilities for such access in order that the laboratory may properly perform its functions.

16.3.2 Schedules for Testing.

16.3.2.1 Establishing Schedule. By advance discussion with the testing laboratory selected by the OWNER, the CONTRACTOR shall allow for the time required for the laboratory to perform its tests and to issue each of its findings. The CONTRACTOR shall allow for this time within the construction schedule.

16.3.2.2 Revising Schedule. When changes of construction schedule are necessary during construction, the CONTRACTOR shall coordinate all such changes of schedule with the testing laboratory as required.

16.3.2.3 Adherence to Schedule. When the testing laboratory is ready to test according to the determined schedule but is prevented from testing or taking specimens due to incompleteness of the Work, all extra costs for testing attributed to the delay may be back-charged to the CONTRACTOR and shall not be borne by the OWNER.

16.3.3 Taking Specimens. All specimens and samples for testing, unless otherwise provided in these Contract Documents, will be taken by the testing laboratory; all sampling equipment and personnel will be provided by the testing laboratory; and all deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

17.0 **SUBMITTALS AND SUBSTITUTIONS**

17.1 GENERAL.

17.1.1 Work Included. Wherever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards. To insure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data and for its review and approval or rejection by the ENGINEER.

17.1.2 Related Work Described Elsewhere.

17.1.2.1 Contractual requirements for submittals are described in the General Conditions and Supplementary Conditions.

17.1.2.2 Individual submittals required are described in the pertinent sections of these Specifications.

17.2 SUBSTITUTIONS.

17.2.1 ENGINEER'S Approval Required. The Agreement is based on the materials, equipment, and methods described in the Contract Documents. The ENGINEER will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required by the ENGINEER to evaluate the proposed substitution. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this Work by the ENGINEER.

17.2.2 "Or Equal". Where the phrase "or equal" occurs in the Contract Documents, do not assume that material, equipment, or methods will be approved as equal by the ENGINEER unless the item has been specifically approved for this Work. The decision of the ENGINEER shall be final.

17.2.3 Availability of Specified Items. The CONTRACTOR shall verify prior to bidding that all specified items will be available in time for installation during orderly and timely progress of the Work. In the event the specified item or items will not be so available, the CONTRACTOR shall notify the ENGINEER prior to receipt of Bids.

17.3 Identification of Submittals. The CONTRACTOR shall completely identify each submittal and resubmittal by showing at least the following information:

- 1) Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.
- 2) Name of project as it appears in these Specifications.
- 3) Drawing number and Specifications Section number to which the submittal applies.
- 4) Whether this is an original submittal or re-submittal.

17.4 COORDINATION OF SUBMITTALS.

17.4.1 General. Prior to submittal for ENGINEER'S review, the CONTRACTOR shall use all means necessary to fully coordinate all material, including the following procedures:

- 1) Determine and verify all field dimensions and conditions, materials, catalog numbers, and similar data.
- 2) Coordinate as required with all trades and with all public agencies involved.
- 3) Secure all necessary approvals from public agencies and others and signify by stamp, or other means, that they have been secured.
- 4) Clearly indicate all deviations from the Contract Documents.

17.4.2 Grouping of Submittals. Unless otherwise specifically permitted by the ENGINEER, the CONTRACTOR shall make all submittals in groups containing all associated items; the ENGINEER may reject partial submittals as not complying with the provisions of the Contract Documents.

17.5 Timing of Submittals. The CONTRACTOR shall make all submittals far enough in advance of schedule dates of installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery. In scheduling, allow at least five full working days for the ENGINEER'S review following his receipt of the submittal.

18.0 INSTALLATION REQUIREMENTS

Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the respective manufacturers, unless otherwise specified.

19.0 PROOF OF COMPLIANCE

Whenever the Contract Documents require that a product be in accordance with Federal specification, ASTM designation, ANSI specification, or other association standard, the CONTRACTOR shall present an affidavit from the manufacturer certifying that the product complies therewith. Where requested or specified, the CONTRACTOR shall submit supporting test data to substantiate compliance.

20.0 PROJECT RECORD DOCUMENTS

20.1 As the Work progress, the CONTRACTOR shall keep a complete and accurate record of changes or deviations from the Contract Documents and the Shop Drawings, indicating the Work as actually installed. Changes shall be neatly and correctly shown on the respective portion of the affected document, using blackline prints of the Drawings affected, or the Specifications, with appropriate supplementary notes. This record set of Drawings, Shop Drawings, and Specifications shall be kept at the job site for inspection by the ENGINEER.

20.2 The records above shall be arranged in order, in accordance with the various sections of the Specifications, and properly indexed. Prior to application for final payment, and as a condition to its approval by the ENGINEER, deliver the record Drawings and Specifications, arranged in proper order, indexed, and endorsed as hereinbefore specified.

20.3 No review or receipt of such records by the ENGINEER or OWNER shall be a waiver of any deviation from the Contract Documents or the Shop Drawings or in any way relieve the CONTRACTOR from his responsibility to perform the Work in accordance with the Contract Documents and the Shop Drawings to the extent they are in accordance with the Contract Documents.

21.0 PROJECT MEETINGS

The CONTRACTOR'S Superintendent for the Work shall attend project meetings as required by either the OWNER or ENGINEER.

22.0 VIDEO TAPE

The line CONTRACTOR, before proceeding with any work, shall make or have made a video of all areas where work is to be performed and a copy of this video cassette shall be furnished to the ENGINEER to review for completeness. This video shall be utilized as backup and reference for claims and cleanup.



SECTION 0102

SPECIAL CONSTRUCTION CONSIDERATIONS

1.0 CONSTRUCTION SEQUENCE

It shall be the sole responsibility of the Contractor to plan and implement construction sequences, to follow the Plans and Specifications and to protect any portions of the Work already completed.

2.0 CLEAN-UP

The work will not be considered as complete, and final payment will not be made, until all areas in connection with the Work have been cleared of all rubbish, equipment, excess materials and temporary structures.

3.0 SECURITY BY CONTRACTOR

In addition to the other provisions of the Contract Documents, the Contractor shall be responsible for providing security as he deems necessary for his work areas, storage areas, office areas, equipment, and any other item or area that he is using. The Owner will not be responsible for any damages due to insufficient site security.

4.0 BID SCHEDULE QUANTITIES

The material quantities shown in the bid schedule are not guaranteed and should not be used indiscriminately when ordering materials. The Contractor shall be responsible for ordering material quantities necessary for installation to the limits as shown on the drawings unless otherwise instructed. Any left-over quantities shall be the property of the Contractor unless other arrangements are made. The Owner shall not be responsible for re-stocking or other charges associated with left-over materials or increased costs associated with increases in price for materials needed to complete the project as shown on the drawings.

5.0 PERMITS

The contractor shall obtain and pay for all grading, storm water, etc. permits, if any, required to complete the work. The contractor shall maintain compliance with all conditions, limitations and stipulations of all permits. The contractor shall not commence work, except mobilization, until he has obtained all required permits for said work. The contractor shall supply the owner with copies of all permits within 24 hours of receipt. A KPDES Storm Water Discharge Permit will be required for this project. The contractor shall fill out, sign and submit the Notice of Intent (NOI) and the Notice of Termination (NOT).

6.0 SPECIFIC PROPERTY OWNER CONDITIONS

Appendix 3 in the back of these Specifications contains certain conditions regarding the pipeline installation on two properties. Notes on the Drawings also refer to these Specific Conditions.

DIVISION 15

MECHANICAL



SECTION 15100

WATER LINES

1.0 GENERAL

The CONTRACTOR shall furnish all labor, materials and equipment to install the water lines as shown on the plans and as specified herein.

The water lines may either be pressure-rated plastic pipe (PVC), municipal plastic pipe (MPVC) or ductile iron (DI), all as specified hereinafter. The bid documents shall show the amounts of each type and class of pipe to be provided by the CONTRACTOR.

The OWNER will obtain all rights-of-way for operations through private property. It will also secure building permits and the permits for all pipe laid in highway rights-of-way. Any charges for inspections or other fees required will be the responsibility of the CONTRACTOR since the amounts of these are dependent upon the operation of the CONTRACTOR.

1.1 Department of Transportation Bonding. The Kentucky Department of Transportation will require that the OWNER post a bond for all work accomplished on their right-of-way. Each contract on which work is to be performed will be a separate application and will require a separate bond. Each permit will have conditions attached and these conditions will vary depending on the area where work is to be performed. In areas where traffic control may pose a problem, working hours may be limited. A copy of the encroachment permit will be provided to the CONTRACTOR. The CONTRACTOR will be responsible for knowledge of the permit's content and conditions in order that the construction may be accomplished in accordance with the specified requirements.

Should any additional bonds or requirements be imposed by the Kentucky Department of Transportation, the OWNER shall also be responsible for the bonding of the additional requirements.

2.0 PIPE AND FITTINGS

2.1 Polyvinyl Chloride Rigid Pipe and Fittings. This specification covers rigid, pressure-rated, polyvinyl chloride pipe and fittings, hereinafter called PVC pipe and PVC fittings, for sizes 1/2 inch through 12-inch. Pipe shall be as manufactured by North American, Diamond, J-M or approved equal.

2.1.2.1 PVC Pipe. PVC pipe shall be extruded from Type 1, Grade 1, polyvinyl chloride material with a hydrostatic design stress of 2,000 psi for water at 73.4°F, designated as PVC 1120, meeting ASTM Specifications D-1784 for

material and D- 2241 for pipe, latest revisions. Pipe shall also meet all applicable provisions of the Product Standards and shall bear the National Sanitation Foundation (NSF) seal of approval in compliance with NSF Standard No. 14. PVC pipe having a maximum hydrostatic working pressure of 160 psi (SDR26), 200 psi (SDR21), 250 psi (SDR17), or 315 psi (SDR13.5) shall be used as shown in the Bid Documents and Plans.

Samples of pipe and physical and chemical data sheets shall be submitted to the ENGINEER for review and determination of compliance with these specifications before pipe is delivered to job. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects.

The workmanship, pipe dimensions and tolerances, outside diameters, wall thickness, eccentricity, sustained pressures (ASTM D-1598), burst pressures (ASTM D-1599), flattening, extrusion quality (ASTM D-2152), marking and all other requirements of the Product Standard PS 22-70 shall be with in all respects. No pipe, 2 inches in diameter or larger, with a wall thickness less than 0.090 inches may be used.

Pipe shall be furnished in 20 feet or 40 feet lengths. The pipe shall be bell on one end. Male ends of pipe must be beveled on the outside. Pipe shall have a ring painted around the male end or ends in such a manner as to allow field checking of setting depth of pipe in the socket. This requirement is made to assist construction superintendents and inspectors in visual inspection of pipe installation.

Pipe must be delivered to job site by means which will adequately support it, and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Pipe must not be exposed to the direct rays of the sun for an extended period of time. If pipe is not to be installed shortly after delivery to the job site, it must be stored in a shaded location and strung as needed.

2.1.2 PVC Pipe Jointing. Pipe shall be joined with slip-type joints with rubber gaskets. Pipes with bells shall have all parts of the bell, including the gasket groove, made from the same extruded piece, integral with the pipe, and shall be thickened to meet standard dimension ratios of wall thickness to outside diameter. This manufacturing procedure shall be the normal practice of the pipe manufacturer and proven by past performance of pipe in service. The gasket groove shall be constructed such that gasket rollout will not occur. Rubber gasketing shall conform to ASTM 3139.

The pipe manufacturer shall have an experienced representative on the job for a minimum of one day at the commencement of joining and laying operations. Joint lubrication shall be of a type recommended by the manufacturer for their pipe subject to the Engineer's approval. Lubricant shall be water soluble, non-toxic and have no objectionable properties.

2.1.3 PVC Couplings. Where PVC couplings are used, they shall be of the same material as the pipe and may be of the molded, or extruded type. PVC couplings shall have a minimum rating of 200 psi for continuous operation at 73.4 degrees F.

2.1.4 Fittings Ductile iron mechanical joint type fittings with appropriate adaptors as manufactured by Tyler, U.S. Pipe, Clow, Union Foundry or approved equal, shall be used with PVC pipe. All such fittings shall be approved by the pipe manufacturer, and complete data sent to the ENGINEER, including the manufacturer's approval, for review. Fittings shall comply with AWWA C-110 or C-153 and shall be manufactured for the size and pressure class of the line on which they are used. Use of transition gaskets will not be allowed unless specifically approved by the pipe manufacturer. Coatings and lining shall be in accordance with 2.3.7.F of this section of the Specifications.

2.1.5 Service Connections. All service connections on PVC lines shall be made by means of tees, factory tapped couplings, or bronze service clamps manufactured specifically for use with PVC pipe as manufactured by Ford or approved equal. Whenever possible, corporation stops shall be installed in plastic lines before conducting hydrostatic tests.

2.2 Municipal Polyvinyl Chloride (MPVC) Pressure Pipe. This specification covers the requirements for AWWA approved Polyvinyl Chloride Pressure Pipe for water supply and distribution systems.

2.2.1 MPVC Pipe. MPVC Pipe shall meet the requirements of AWWA C900-75, latest revision, "Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4" through 12" for water" and shall be furnished in cast-iron pipe equivalent outside diameters with rubber gasketed separate couplings. Pipe shall be as manufactured by North American, Diamond, J-M or approved equal.

MPVC Pipe and couplings shall be made from Class 12454-A or Class 12454-B virgin compounds as defined in ASTM D-1784. The standard code designation shall be PVC 1120. The PVC compounds shall be tested and certified as suitable for portable water products by the NSF Testing Laboratory and shall carry the NSF approval marking.

Solvent-cement couplings or joints shall not be used. PVC joints using elastomeric gaskets shall be tested as assembled joints and shall meet the laboratory performance requirements specified in ASTM D-3139.

Pipe and coupling shall be pressure Class 100, DR 25 (Dimension Ratio), pressure Class 150, DR 18, or pressure Class 200, DR 14 as shown on the plans or the bid form.

Pipe and couplings shall be marked as follows:

- a. Nominal size and OD base.
- b. Material code designation (PVC 1120).
- c. Dimension ratio number.
- d. AWWA pressure class.
- e. AWWA designation number (AWWA C900).
- f. Manufacturers name or trade-mark and production record code.
- g. Seal of the NSF Laboratory.

<u>Sustained Pressure</u> <u>DR</u>	<u>ASTM D-1598 (1000 Hrs.)</u> <u>Sustained Pressure</u>
14	650 psi
18	500
25	350

<u>Burst Pressure</u> <u>DR</u>	<u>ASTM D-1599 (60-70 seconds)</u> <u>Minimum Burst Pressure</u>
14	985
18	755
25	535

Hydrostatic Integrity - Each standard and random length of pipe shall be proof-tested at four times its rated class pressure for a minimum of 5 seconds. Bells or couplings shall be tested with pipe.

Flattening - The pipe shall not split, crack, or break when tested by the parallel-plato method as specified by ASTM D- 2241.

Extrusion quality - The pipe shall not flake or disintegrate when tested by the acetone-immersion method as specified in ASTM D-2241.

Standard length - Pipe shall be furnished in standard laying lengths of 20 ft. \pm 1 in. A maximum of 15 percent of each pipe size may be furnished in random lengths of not less than 10 ft. each.

2.2.2 MPVC Pipe Jointing. Pipe shall be joined with slip-type joints with rubber gaskets. Manufacturing and installation procedures shall be as recommended by the manufacturer and as described for PVC Pipe in Section 2.1.2 of this specification.

2.2.3 Fittings. Fittings for municipal PVC shall be ductile iron only. Fittings shall be mechanical joint. Fittings shall be manufactured for the size and pressure class of the line on which they are used and shall comply with AWWA C-110 or C-153. Coatings and lining shall be in accordance with subsection 2.3.7.F of this

section of the Specifications. Fittings shall be as manufactured by Tyler, Clow, U.S. Pipe, Union Foundry or approved equal.

2.2.4 Service Connections. Service connections shall be made by means of bronze service clamps manufactured specifically for use with municipal PVC pipe. Clamps shall be Ford S90 Series or approved equal.

2.2.5 Underground Marking for Pipe. Underground marking for pipe shall be one of the following types. The type required for this project is specified in the notes on the Drawings.

2.2.5.1 Underground Marking Wire. At all locations where pipe is utilized, a detectable underground marking wire shall be placed in the trench as shown on the miscellaneous drawings. The wire used shall be No. 12 insulated solid copper wire. Copper split bolt screw connectors shall be used for splice connections, see miscellaneous drawings. Extreme care shall be exercised in connecting and taping splices and joints to assure continuity. At each valve box the wire shall be looped to the surface extending 12-inches above the concrete valve box pad (see Std. Dwg. for valve). When the entire project or pipeline segment is complete, including meter installation and leak repairs, the locating wire system shall be checked for continuity.

2.2.5.2 Underground Marking Tape. At all locations where pipe is utilized, a detectable underground marking tape shall be placed in the trench approximately twelve inches below the finished grade. The tape used shall be mylar encased aluminum foil with the printing "CAUTION - Buried Water Line Below". Printing shall be readable through the clear mylar and surface printing is not acceptable. Tape size shall be 2 inch width as provided by Lifeguard, Inc. or approved equal. Color of the tape shall be blue.

2.3 Ductile Iron Pipe. These specifications cover ductile iron pipe (3-inch diameter and greater) to be used in water transmission systems with mechanical joints, rubber ring slip type joints or flanged joints.

2.3.1 General. Ductile iron pipe shall be designed in accordance with AWWA H3 (ASA A21.50) and for pressures and conditions as stated in these specifications or called for on the plans. Ductile iron pipe shall conform to AWWA C-151 (ASA A21.51).

2.3.2 Minimum Nominal Thickness. The specified thickness will be determined for the given internal and external loading requirements in accordance with ASA A21.50. The class of pipe, wall thickness, and coatings required will be shown on the plans or the bid form for all ductile iron pipe installation.

2.3.3 River Crossing Pipe. River crossing pipe shall be ductile iron, Flex-Lok as manufactured by the American Cast Iron Pipe company or equal conforming to the appropriate requirements of AWWA C150/ANSI A21.50 and ANSI/AWWA C151/A21.5 with a thickness class of 54.

2.3.4 Lengths. Pipe may be furnished in 12, 16, 16 1/2, 18 or 20 feet nominal laying lengths.

2.3.5 Tests. Hydrostatic and acceptance tests shall be in accordance with AWWA Standard C-106 for "Cast Iron Pipe Centrifugally Cast In Metal Molds" or C-108 for sand molds. The ENGINEER shall be provided with five (5) copies of each of the following tests for each contract involved:

- a. Talbot strip test.
- b. Ring and full length bursting tests.
- c. Chemical analysis of pipe.
- d. Certification that pipe was hydrostatically tested.

Any pipe not meeting the AWWA Standard quoted above shall be rejected in accordance with the procedure outlined in the particular specifications.

2.3.6 Marking. The net weight, class or nominal thickness and sampling period shall be marked on each pipe.

2.3.7 Pipe Joints for Ductile Iron Pipe. Pipe joints shall be mechanical joint, rubber ring slip joint, flanged, or locked mechanical joint as shown on the plans.

A. Mechanical Joint

Mechanical joints are to be furnished according to AWWA Standards C-111. All pipe joints must be furnished complete with all accessories. Mechanical joint bolts and nuts shall be of alloy cast iron or alloy steel (Corten type such as U.S. Alloy) or approved equal. Rubber gaskets shall be made of plain first grade rubber, free of imperfections and porosity. Hardness shall be 70 to 75 durometer.

B. Rubber Ring Slip Joint

Rubber ring slip joint shall be equal to AWWA C-111-64 or latest revision. The joints shall be of the following materials:

- a. Rubber ring gasket compressed in groove in bell of pipe.
- b. Beveled spigot end of pipe for initial centering into rubber gasket in bell.

C. Locked Joint

Locked joints shall be Clow Super Lock, American Flex-Ring or approved equal.

D. Ductile Iron Flanged Pipe and Special Coupling

a. Flanged Pipe. All ductile iron flanged pipe shall have flanges faced and drilled, 125 pound in accordance with ASA A21.10 (AWWA C-110) unless otherwise specified on the Drawings. Flanges may be cast integrally with the

pipe or they may be screwed on specially designed long hub flanges, refaced across both face of flange and end of pipe. Flanged pipe shall be in accordance with ASA A21.6 (AWWA C-106) Standard, latest revision, and be the class called for on the plans or bid forms. Where plain ends of flanged and plain end pipe fit into mechanical joint bells, centrifugally cast pipe shall be used. Flanged pipe for water service shall be cement lined and bituminous coated the same as written herein for bell-joint pipe.

b. Special Coupling. Flexible couplings for flanged pipe shall be a mechanical joint cast to a special flanged joint using a neoprene O-ring in place of the usual 1/16 inch rubber ring gasket. The mechanical bell and special flanged joint piece shall be of high grade gray cast iron (ASTM A48-56, AWWA C-100-54T) with bolt circle, bolt size and spacing according to ASA Specifications. Mechanical joint follower flange shall be of ductile iron ASTM A399 or malleable iron ASTM A47, Grade 35018 or 32510, latest revision with high strength/weight ratio design.

Bolts shall be fine grained high tensile malleable iron with malleable iron hexagon nut. Stainless steel nuts shall be used in vaults and wet wells. Where pressures may exceed 20 pounds, anchor studs shall be included with spigots of pipes connected drilled to receive ends of studs.

E. All items used for jointing pipe shall be furnished with the pipe and tested before shipment. The joints shall be made with tools and lubricant in strict conformity with the manufacturer's instructions. Three (3) copies of such instruction shall be delivered to the ENGINEER at start of construction.

F. Coatings and Lining. All buried ductile iron pipe shall have manufacturer's outside coal tar or asphaltic base coating and a cement lining and bituminous seal coat on the inside. Cement mortar lining and a bituminous seal coat inside shall conform to ANSI A21.4 (AWWA C-104) latest revision.

All pipe and fittings housed and in vaults shall be lined and coated on the inside as specified herein for buried ductile iron pipe and fittings, but shall be left uncoated on the outside so that it may be painted without the use of tar stop.

G. Fittings for Ductile Iron Pipe. Ductile iron mechanical, rubber ring slip and flanged joints shall conform to ASA Specifications A21.10 (AWWA C-110) for centrifugally cast iron water pipe. Mechanical joints shall also conform in all respects to ASA 21.11 (AWWA C-111). All fittings shall be manufactured for the size and pressure class of the pipeline in which they are to be used. All fittings shall be furnished complete with all joint accessories. All ductile iron pipe fittings for water, sewer, air, gas and force main service shall be bituminous coated outside and lined on the inside same as the line on which they are installed.

2.4 Polyethylene Pipe. This pipe is used primarily for stream crossings and other special applications in locations indicated on the DRAWINGS. The required pressure class shall be as shown on the DRAWINGS.

The pipe shall be PE 3408 high density, high molecular weight polyethylene pipe equal to Performance Pipe or Endopoly Premium. The pipe shall meet or exceed the following standards:

- a. ASTM 3350 having a cell classification of PE34534C
- b. ASTM F714 - Dimensions and Workmanship
- c. AWWA C901 - Potable Water Pipe
- d. ASTM D1248 - Type III, Class C, Category 5, Grade P34
- e. ASTM D3261 - Fittings Standard
- f. NSF - Listed, Standard #14

The pipe shall be joined by the butt fusion technique utilizing controlled temperatures and pressures to produce a fused, leak-free joint that has equal or greater strength than the pipe itself in both tension and hydrostatic loading. The joining system shall be equal to Phillips butt fusion joint system.

Transitions to the continuing pipeline shall be made with the appropriate fittings to maintain the integrity of the piping system as recommended by the pipe manufacturer.

Drawings showing details of the installation shall be submitted to the ENGINEER for approval prior to installation.

3.0 HAULING AND STORAGE

The CONTRACTOR shall notify the ENGINEER when pipe will be received on the job so that proper arrangements may be made for inspecting the unloading and stringing, as well as inspecting and examining the pipe materials.

All pipe shall be covered with tarpaulin during hauling from the manufacturer to the job site. It is acceptable for the front end only to be covered. The intent is to prevent diesel exhaust residue from coating the pipe and/or contaminating the gaskets.

Care must be exercised in the handling of all materials and equipment and the CONTRACTOR will be held responsible for all breakage or damage to same caused by his workmen, agents, or appliances for handling or moving. Pipes and other castings shall in no case be thrown or dropped from cars, trucks, or wagons to the ground, but same shall be lowered gently and not allowed to roll against or strike other castings and unyielding objects violently. Pipe and other castings may be distributed at places that will not interfere with other building operations and unloaded, or yarded and distributed as required, as the CONTRACTOR may elect.

Valves, castings, fabricated metal, reinforcing steel, etc. shall be yarded or housed in some convenient location by the CONTRACTOR and delivered on the ground as required. All equipment and materials subject to damage from the

weather, dampness, changes in temperature, or exposure shall be protected by a dry, weatherproof enclosure until ready for installation or use. The cost of all hauling, handling, and storage shall be included in the prices bid for equipment and materials in place. The OWNER takes no risk or responsibility for fire, flood, theft, or damage until after the final acceptance of the work.

4.0 LINES AND GRADES

The CONTRACTOR will be required to accomplish any detailed layout, including that required for establishing the grade of the pipe line.

5.0 TRENCH EXCAVATION

5.1 General. This section describes the acceptable methods of trenching for the installation of pressure pipe and casing pipe in an open trench.

Trenching may be accomplished by means of a backhoe, trenching machine or by hand depending on the construction area.

At the CONTRACTOR'S option, trenching, by a trenching machine or by backhoe is acceptable except as noted below:

Where the pipe line is being constructed close to other utilities, structures, building, or large trees, and it is reasonable to anticipate possible damage from the use of a backhoe, then trenching shall be made by hand methods.

The CONTRACTOR shall include in his unit price bid, all trenching necessary for installation of all pipelines as planned and specified. Trenching shall include all clearing and grubbing, including all weeds, briars, small trees, stumps, etc. encountered in the trenching. The CONTRACTOR shall dispose of any such material by burning, burial, or hauling away (or as noted on the drawings), at no extra cost to the OWNER. It shall be the CONTRACTOR'S responsibility to notify the appropriate State and local Air Pollution Control agencies when he conducts open burning of refuse. Ornamental shrubs shall be removed, protected, and replanted. Trenching also includes such items as minor street, road, sidewalk, pipe and small creek crossings; cutting, moving or repairing damage to fences, poles, or gates and other surface structures regardless of whether shown on the plans.

The CONTRACTOR shall protect existing facilities against danger or damage while pipeline is being constructed and backfilled, or from damage due to settlement of this backfill. In case of damage to any existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structures will be in as good condition and serve its purpose as completely as before and such restoration and repair shall be done without extra cost to the OWNER. The use of trench- digging machinery will be permitted except where its operations will cause damage to trees, buildings or existing structures above

or below the ground. At such locations hand methods shall be employed to avoid such damage. All excavated material shall be piled in a manner that will not endanger the work and will avoid obstructing sidewalks and driveways. Gutters shall be kept clear or other satisfactory provisions made for street drainage.

All excavation shall be open trenches, except where the drawings call for tunneling, boring, or jacking under structures, railroads, sidewalks and roads. The construction procedure for these types of excavation is described elsewhere in these specifications.

All trench excavation shall be termed unclassified and costs shall be included in the unit price bid for the pipe.

5.2 Clearing. The CONTRACTOR shall accomplish all clearing and/or grubbing as required for the construction under this contract. Clearing and grubbing shall include the cutting and removal of trees, stumps, brush, roots, logs, fences and other loose or projecting material and natural obstructions which, in the opinion of the ENGINEER, must be removed to properly prosecute the construction and operate the facilities upon completion of construction. Trees, unless designated otherwise on the plans, shall remain and be properly protected. Ornamental shrubs, plantings, fences, walls, etc. shall be removed and replanted or replaced or protected from the construction activity. Clearing and/or grubbing shall be incidental to the various bid items and no additional compensation will be paid for same.

5.3 Trench Depth. Trenches shall be excavated to the line and grade required for the installation of pipe at the elevations indicated on the plans. The minimum depth of cover shall be thirty inches (30") above the top of the pipe, unless shown otherwise on the plans or on the Standard Details. When the pipe is laying in or on solid rock, the minimum depth of cover shall also be thirty inches (30") above the top of the pipe. No additional compensation will be made for extra depth where required by the plans or due to CONTRACTOR error. Excavation, except as required for exploration, shall not begin until the proposed work has been staked out. Materials which are not required for backfill and site grading shall be removed and disposed of as directed by the ENGINEER. Hauling, bedding, and backfilling shall be considered incidental to the various bid items and will not be paid for directly. Excavation shall be of sufficient depth to allow the piping to be laid on the standard pipe bedding in accordance with the Section 6 of this section. The trenches shall be excavated to a minimum of six inches (6") below the bottom of the pipe barrel in rock. In all cases where lines are under traffic a minimum cover of thirty-six inches (36") shall be provided. Should it be necessary to avoid existing utilities, culverts, outlets, or other structures, the water line shall be carried deeper at no additional expense to the OWNER. Where the plans call for extra trench depth, this extra depth shall be provided at no extra cost.

5.4 Trench Width. Trench widths shall exceed the minimum width that will provide free working space on each side of the pipe and to permit proper backfilling around the pipe as shown in the accompanying table and unless specifically authorized by the ENGINEER, shall not be excavated to wider than two feet (2') plus the nominal diameter of the pipe at the top of the trench. Before laying the pipe, the trench shall be opened far enough ahead to reveal any obstruction that may necessitate changing the line and grade of the pipe. Should the CONTRACTOR fail to accomplish this, and changes are required, they shall be at his sole expense. In rock, all ledge rocks, boulders and large stones shall be removed to provide six inches (6") of clearance on each side and below all pipe and fittings.

MINIMUM TRENCH WIDTH

<u>Size</u>	<u>Width</u>	<u>Size</u>	<u>Width</u>
Up to 4" Pipe	2'-0"	15" Pipe	2'-8"
6" Pipe	2'-0"	16" Pipe	2'-8"
8" Pipe	2'-0"	18" Pipe	3'-0"
10" Pipe	2'-4"	20" Pipe	3'-2"
12" Pipe	2'-6"	21" Pipe	3'-4"
14" Pipe	2'-6"	24" Pipe	3'-8"

5.5 Shoring, Sheet piling, and Bracing of Excavation. Where unstable material is encountered, or where the depth of the excavation in earth exceeds five feet (5'), the sides of the trench or excavation shall be supported by substantial sheet piling, bracing, or shoring. The design and installation of all sheet piling, sheet piling, bracing or shoring shall be based on computations of pressure exerted by the materials to be retained under retaining conditions. Adequate and proper shoring of all excavations will be the entire responsibility of the CONTRACTOR. The Standards of the Federal Occupational Safety and Health Act and the Kentucky Department of Labor shall be followed.

The ENGINEER will not be responsible for determining requirements for bracing or sheet piling.

5.6 Removal of Water. The CONTRACTOR shall provide for adequate removal of all water and the prevention of surface water from entering the excavation. The CONTRACTOR shall maintain dry conditions within the excavations until the backfill is placed. No additional compensation will be paid for replacement and/or stabilization of prepared excavations due to flooding and/or deterioration from extended exposure. All water pumped or drained from the excavation shall be disposed of in a suitable manner without damage to adjacent property or to other work under construction.

5.7 Pavement Removal. Pavement removal shall be as indicated on the plans or directed by the ENGINEER. When so required, or when directed by the

ENGINEER, only one-half (1/2) of the street crossings or road crossings shall be excavated before placing temporary bridges over the side excavated, for the convenience of the traveling public. All backfilled ditches shall be maintained in such a manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and the property OWNERS abutting the improvements shall be taken into consideration. All public or private drives shall be promptly backfilled or bridged at the direction of the ENGINEER. Pavement replacement shall be in accordance with Section 15102 of these specifications. Excavated materials shall be disposed of so as to cause the least interference and in every case the disposition of excavated materials shall be satisfactory to the ENGINEER.

5.8 Traffic Maintenance. The CONTRACTOR must "red light" and guard all open trenches or obstructions placed on the streets or sidewalks. The lights must be burning from sunset to sunrise in order to effectually warn and safeguard the public against dangers connected with open trenches, excavations and other obstructions. The CONTRACTOR shall be held responsible for any damage that may occur to persons or property by reason of the failure of the CONTRACTOR to properly "red light" and guard all open trenches or obstructions along the routes of the water lines. This CONTRACTOR at his own expense shall also maintain warning signs, barricades and a watchmen or flagmen to control traffic at such times as his work would interfere with the flow of traffic. No excavation shall begin that may present a safety hazard unless the signs, barricades, lights, etc. are available to protect the open excavation at the conclusion of the day. The CONTRACTOR will comply with all Federal and State Occupational Safety and Health requirements for this type of construction. The CONTRACTOR shall also comply with all local and Kentucky Department of Highways requirements for signing and traffic control.

5.9 Line Location. The location of pipelines and their appurtenances as shown are those intended for the final construction. However, conditions may present themselves before construction on any line is started that would indicate desirable changes in location. In such cases, the OWNER reserves the right to make reasonable changes in line and structure locations without extra cost, except as may be determined by extra units of materials and construction actually involved. The OWNER is under no obligation to locate pipelines so they can be excavated by machine.

6.0 BEDDING OF PIPELINE

In all cases the foundation for pipe shall be prepared so that the entire load of the backfill on top of the pipe will be carried uniformly on the barrel of the pipe. The bells of the pipe shall not carry any of the load of the backfill. The CONTRACTOR should refer to the Standard Details for pipe bedding shown in the plans. The bedding specifications shall govern the backfill from the bottom of the trench up to the centerline or spring line of the pipe.

6.1 Stable Earth Foundation. On all PVC pipelines, the trench bottoms shall be smooth and free of frozen material, clodded dirt and stones over 1/2" diameter. Bottom dirt left by trenching equipment will usually provide adequate material to level the trench bottom and provide bedding support for the pipe barrel. If the trench bottom is free of dirt, soft material may be shoveled off the side walls or shoveled under the pipe to insure proper pipe barrel bedding. In areas where the trench bottom is hard, a layer of soft backfill must be provided to insure the pipe barrel is properly cushioned. See the plans for proper bedding material depth.

If the foundation is good firm earth the pipe may be laid directly on the undisturbed earth provided the pipe barrel is supported for its full length.

Bedding of No. 9 stone, fine gravel, sand or compacted finely graded select earth shall be used to correct irregularities in the subgrade. Where bell and spigot is involved, bell holes shall be excavated to prevent the bells from being supported on undisturbed earth.

As an alternative to the above method, excavation in earth may be undercut to a depth below the required invert elevation that will permit laying the pipe on a bed of granular material or finely graded select earth to provide continuous support for the pipe barrel. Bedding depth shall be as shown on the plans.

The bedding is not a separate pay item and shall be included as incidental expense in the unit price for the pipe bid per foot of pipe.

6.2 Trenches In Rock. All installation in rock will utilize the undercutting method. Bedding will be with six inches (6") crushed stone as shown in the Standard Details.

6.3 Unstable Trenches. If unstable material is encountered which may not provide a suitable foundation for the pipe, the unstable material will be removed and an adequate layer of encasement concrete or other special bedding shall be placed for the pipe foundation in accordance with the Standard Details in the plans. Such "special pipe foundation" shall only be installed if directed by the ENGINEER in writing or on the plans.

All ductile iron pipe shall be installed in accordance with Standard ANSI/AWWA C150/ANSI A21.50 Laying Condition Type 3 unless otherwise noted.

7.0 PIPE LAYING

7.1 General. Proper instruments, tools and facilities satisfactory to the ENGINEER shall be provided and used by the CONTRACTOR for the safe and convenient prosecution of the work. Each pipe manufacturer shall have an experienced representative on the job for at least one day at the commencement of jointing and laying operations.

Before any length of pipe is placed in the trench, a careful inspection shall be made of the interior of the pipe to see that no foreign material is in the pipe. In order to properly remove any foreign materials, a swab of necessary length is to be available at all times.

All pipe shall be lowered carefully into the trench, properly aligned and properly jointed by use of suitable tools and equipment, in such a manner as to prevent damage to water line materials and protective coatings and linings. Excessive scratching of the exterior surface of the pipe will be cause for rejection of the pipe.

Under no circumstances shall pipeline materials be dropped or dumped into the trench. The pipe and fittings shall also be inspected for the purpose of determining if they are sound and free from cracks. Laying of pipe shall be commenced immediately after excavation is started. Pipe shall be laid with bell ends facing in the direction of laying.

When pipe laying is not in progress, the open ends of pipe shall be closed by approved means to prevent entrance of trench water into the line. Whenever water is excluded from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent floating. Any pipe which has floated shall be removed from the trench and relayed as directed by the ENGINEER. No pipe shall be laid in water or on frozen trench bottom, or whenever the trench conditions or the weather are unsuitable for such work.

If any defective pipe and fittings shall be discovered after the pipeline is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge to the OWNER. Open ends of unfinished pipe lines shall be securely plugged or closed at the end of each day's work or when the line is left temporarily at any other time.

7.2 Laying Ductile Iron Pipe. Ductile iron pipe shall first be thoroughly cleaned at joints, then joined according to instructions and with tools recommended by the manufacturer. Three (3) copies of instructions shall be furnished the ENGINEER and one (1) copy shall be available at all times at the site of the work. The lining inside ductile iron pipe must not be damaged by handling.

All pipes must be forced and held together, or "homed" at the joints, before sealing or bolting. Pipe must be aligned as each joint is placed, so as to present as nearly true, straight lines and grades as is practical, and all curves and changes in grades must be laid in such a manner that the manufacturer's recommended maximum deflection is not exceeded at any joint.

Cutting of pipe may be done by wheeled pipe cutters or saws, or by hammer and chisel, as the CONTRACTOR may elect, but the CONTRACTOR will be held responsible for breakage or damage caused by careless cutting or handling.

All ductile iron pipe shall be installed with Standard ANSI/AWWA C150/A21.50 Laying Condition Type 3 unless otherwise noted, six (6") inches crushed stone bedding shall be used in rock. Sufficient space (limited to 2 feet longitudinally) shall be left out of 4 or 6 inch cushion for tightening of bolts where bolted joints are used. No pipe shall be laid resting on rock, blocking, or other unyielding objects. Jointing before placing in trench, and subsequent lowering of more than one section jointed together may be allowed, subject to the ENGINEER'S approval and direction.

When using pipe with push-on joints care must be exercised to make certain that the correct gasket is being used for the type of joint installed and that the gasket faces the proper direction. Before inserting the gasket, the groove and bell socket should be carefully cleaned of all dirt. If sand or dirt is permitted to remain in the groove, leaks may occur. Lubricant must be applied to bell socket, gasket and plain- end of pipe as required by manufacturer. Plain-end must be beveled before joint is made. Deflection required at the joint shall be obtained after the joint is made.

Cut pieces of ductile iron pipe 18 inches or more in length, shall be used in fitting to special conditions, and valves and fitting changes in grade and alignment, provided cutting is even enough to make first class joints and no cracks are evident.

7.3 Laying Plastic Pipe. The trench bottom must be smooth and uniform and the alignment must conform with the plans. Bedding and cover as specified herein and shown in the Standard Details is required.

To make a clean and unobstructed joint, it is necessary to wipe the ring, groove and pipe spigot free from all foreign materials at the time of assembly. The ring must be positioned properly in the fitting to receive the pipe by a worker who is not in contact with the lubricant. In general, the lubricant is applied to the spigot (not the ring or groove). However, the manufacturer's instructions are to be followed in all cases. Only an approved lubricant may be used in accordance with the manufacturer's recommendations. All plastic pipe shall be joined by hand.

Where good bedding conditions are attained PVC pipe smaller than 4 inches may be assembled outside the trench in longer sections (as conditions allow) and then lowered into the trench. At any time when improper bedding is discovered or the pipe is severely deflected the pipe will be removed from the trench and the condition corrected. Pipe in sizes 4 inch and above may be assembled outside the trench but must be lowered into the trench as each joint is assembled. Regardless of installation methods all couplings must be inspected after laying in trench for proper insertion and alignment. Field cuts and bevels will be allowed in accordance with the manufacturer's recommendations for these operations. A new reference mark shall be installed before joining any field cut pipe. The same requirements for clearance from rock or other objects,

thrust blocking and deflections shall apply to PVC pipe as for other pipe materials.

PVC pipe of all sizes must be assembled in the trench in strict accordance with the manufacturer's requirements.

7.4 Installation of River Crossing Pipe. The ball joint pipe shall be assembled and installed in accordance with manufacturer's recommendations. Installation shall be made at time of low flow, using cofferdams as necessary to divert stream flow. The ball joint pipe shall be laid and allowed to settle before joining to the pipe on each side of the stream. The ball and joint pipes shall be tested separately once in place to detect any leaks or bad joints. After connecting to the land pipe, it shall be tested the same as specified for the other water mains. See the DRAWINGS for additional installation requirements.

8.0 BACKFILLING

Backfilling must be started as soon as practicable after pipe has been laid and joints hardened sufficiently, and jointing and alignment approved. Spading of crushed rock, sand, or mechanical tamping of earth, around pipe (as specifically required) between joints shall be the usual procedure as the laying progresses. This is in order to avoid danger or misalignment from slides, flooding or other causes. The ENGINEER shall be given a minimum of 24 hours for inspection before backfilling. The backfill shall be crushed rock, sand, or finely divided earth free from debris, organic material and stones, placed simultaneously on both sides of pipe to the same level by hand.

In backfilling of the lower part of the trench beginning at the top of the bedding, the backfill material shall be carefully and solidly tamped by hand or approved mechanical methods in 6" layers around the pipe and up to a point 8 inches higher than the top of the pipe. For PVC only the backfill shall be select material and may be walked-in. Walking or working on the completed pipe line, except as necessary in tamping or backfilling, shall not be permitted until the trench has been backfilled to a point one diameter higher than the top of the pipe. The filling of the trench and the tamping of the backfill shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipe line will not be disturbed and injurious side pressures do not occur.

After the above specified backfill is hand placed, rock may be used in the backfill in pieces no larger than 18 inches in any dimension and to an extent not greater than one-half (1/2) the backfill materials used. If additional earth is required, it must be obtained and placed by the CONTRACTOR. Filling with rock and earth shall proceed simultaneously, in order that all voids between rocks may be filled with earth. Above the hand placed backfill, machine backfilling may be employed without tamping, (if not contrary to specified conditions for the location) provided caution is used in quantity per dump and uniformity of level of backfilling. Backfill material must be uniformly ridged over trench and excess hauled away, with no excavated rock over 1-1/2 inch in diameter or pockets of

crushed rock or gravel in top 6 inches of backfill. Ridged backfill shall be confined to the width of the trench and not allowed to overlap onto firm original earth and its height shall not be in excess of needs for replacement of settlement of backfill. All rock, including crushed rock or gravel from construction, must be removed from yards and fields. Streets, roadways and walks shall be swept to remove all earth and loose rock immediately following backfilling.

In the case of street, highway, railroad, sidewalk and driveway crossings or within any roadway paving or about manholes, valve and meter boxes, the backfill must be machine tamped in not over 4-inch layers, measured loose in accordance with the standard details. Where backfill is under paved driveways, streets, highways, railroads, sidewalks, paved parking areas and other areas where settlement is not allowed, crushed stone or coarse sand backfill only shall be used up to the paving surface. Crushed stone shall be Kentucky Department of Highways Standard Specification No. 78 or finer. Coarse sand backfill shall be spread in layers not over 4 inches thick and thoroughly compacted. Sand may be moistened to aide compaction. Tunnels shall be backfilled in not over 3-inch layers, measured loose, with selected material suitable for mechanically tamping. If material suitable for tamping cannot be obtained, sand, gravel or crushed rock (No. 78) shall be blown, packed or sluiced to complete fill all void spaces.

Where local conditions permit, pavement shall not be placed until 30 days have passed since placing backfill. Crushed stone is specified for roads and parking areas and sidewalks or their bases, shall be placed and compacted to the top of trench. Backfills shall be maintained easily passable to traffic at original ground level, until acceptance of project or replacement of paving or sidewalks.

Where the final surfacing is to be crushed stone, compacted earth backfill may be used in the trench to within 6 inches of the top as shown in the Standard Details.

Railroad Company and Highway Department requirements in regard to backfilling will take precedence over the above general specification where they are involved.

Excavated materials from trenches and tunnels in excess of quantity required for trench backfill shall be disposed as shown on the plans or as directed by the ENGINEER.

The CONTRACTOR shall protect all sewer, gas, electric, telephone, water and drain pipes or conduits, power and telephone poles and guy wires from danger of damage while pipelines are being constructed and backfilled, or from danger due to settlement of his backfill.

In case of damage to any such existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structure will be in as good

condition and serve its purpose as completely as before uncovering and such restoration and repair shall be done without extra charge.

No extra charge shall be made for backfilling of any kind, except as provided in the Bid. Backfilling shall be included as a part of the unit price bid for which it is subsidiary. No extra charge shall be made for supplying outside materials for backfill.

Before completion of contract, all backfills shall be reshaped, holes filled and surplus material hauled away, and all permanent walks, street, driveway and highway paving, and sod, replaced (if such surface replacement items are included in the contract) and reseeded performed.

The line CONTRACTOR shall be responsible for clean-up, grading, seeding, sodding or otherwise restoring all areas that he disturbs within the work limits of other CONTRACTORS on this project.

Any deficiency in the quantity of material for backfilling the trenches or for filling depressions caused by settlement, shall be supplied by the CONTRACTOR.

9.0 TIE-INS TO EXISTING PIPELINES

This work shall consist of connecting new water pipes to the existing system where shown on the plans and shall include the necessary fittings, tapping sleeves, valves and necessary equipment and material required to complete the connection.

Knowledge of pipe sizes in the existing system may not be accurate, therefore, it is recommended that the CONTRACTOR check outside diameters of existing pipe and types of pipe prior to ordering the required accessories. No additional payment will be allowed for matching pipe and/or accessories when the proper size is not ordered.

Neither the OWNER nor the ENGINEER can guarantee the location of the existing lines. The CONTRACTOR shall verify the location of all existing water mains and valves pertaining to the proposed improvements before excavation is started.

The necessary regulation or operation of the valves on existing mains, to allow for the connections being made, shall be supervised by the ENGINEER. Before shutting down an existing water main or branch main for a proposed connection, prior approval for a specific time and time interval shall be obtained from a representative of the OWNER. At no time shall an existing main be shut down without the OWNER'S knowledge and permission.

Excavation to existing water mains shall be carefully made, care being exercised not to damage the pipe. The excavation shall not be of excessive size or depth

beneath the pipe. The sides of the excavation shall be as nearly vertical as possible.

The CONTRACTOR shall be responsible for any damage to the existing system and any such damage shall be repaired to the satisfaction of the ENGINEER at the CONTRACTOR'S expense.

The CONTRACTOR shall verify, by field inspection, the necessary sizes, lengths and the types of fittings needed for each inter-connection. Typical connections are shown on the plans and any modifications or changes shall be subject to the approval of the ENGINEER. The exact length of the proposed water main needed for this work shall also be determined by field measurement as required.

The probing required to locate existing mains is not a separate pay item.

10.0 PIPE ENTERING STRUCTURES

Ductile iron, steel or PVC pressure pipe, 4-inch diameter or larger, entering structure below original earth level, unsupported by original earth for a distance of more than six (6') feet, shall be supported by Class B Concrete, where depth of such support does not exceed three (3') feet, and by Class B Concrete piers where depth exceeds three (3') feet in accordance with the Standard Details. All other pressure pipe entering buildings or basins below original earth level, which have more than 3 feet span between wall and original earth and having a cover of more than 24 inches of earth, or under roadway, shall be supported as shown on Standard Detail drawings, in order to prevent breakage from settlement of backfill about the structure. Concrete and reinforcing steel for such supports are to be included in the unit price of work to which it is subsidiary, and not as extra concrete, in order to discourage excessive excavation outside the limits of structures. Pipe entering structures shall have flexible joint within 16 inches of exterior of structure.

11.0 OWNERSHIP OF OLD MATERIALS

Pipe - Unless otherwise indicated, all existing pipe that is to be abandoned that interferes with construction or is easily removed shall become the property of the CONTRACTOR. All pipe that is not easily removed or not required to be removed as a result of the new construction, shall be abandoned in place by this CONTRACTOR.

Pipe Line Fittings and Appurtenances - All pipe line fittings, valves, hydrants and other like appurtenances that are removed as a result of new construction shall be removed by this CONTRACTOR but shall become the property of the OWNER. All such fittings and appurtenances shall be delivered to a point by the CONTRACTOR. Said point shall be on the OWNER'S property and shall be designated by the ENGINEER.

Other Materials - All other materials or items that are to be removed, demolished, or abandoned as a part of this contract shall become the property of the CONTRACTOR and shall be disposed of by him.

12.0 THRUST BLOCKS AND ANCHORAGE

Thrust blocks shall be installed whenever the pipe line changes direction, as at tees, bends, crosses, stops, as at a dead end; or at valves. The locations of thrust blocks depend on the direction of thrust and type of fitting. Their size and type depends on pressure, pipe size, kind of soil, and the type of fitting. Where thrusts act upward (as at vertical curves) the weight of the pipe, the water in the pipe and the weight of the soil over the pipe should be determined to make certain that the total weight is sufficient to resist upward movement. If there is not enough soil or if it will not compact over the pipe or it is too soft and mushy to resist movement, then ballast or concrete may be placed around the pipe in sufficient weight and volume to counteract the thrust. Where a fitting is used to make a vertical bend, the fitting may be anchored to a concrete thrust block designed to key in to undisturbed soil and to have enough weight to resist upward and outward thrust, since the newplaced backfill may not have sufficient holding power.

Thrust blocks shall be constructed of not less than Class B concrete conforming to KTC Specification 601 and placed between the fitting and the trench wall. It is important to place the concrete so it extends to undisturbed (freshly cut) trench wall.

13.0 MAINTENANCE OF FLOW OF DRAINS AND SEWERS

Adequate provision shall be made for the flow of sewers, drains and water courses encountered during construction. Any structures which are disturbed shall be satisfactorily restored by the CONTRACTOR.

14.0 INTERRUPTION OF UTILITY SERVICES

No valve, switch or other control on any existing utility system shall be operated for any purpose by the CONTRACTOR without approval of the ENGINEER and the Utility. All consumers affected by such operations shall be notified by the CONTRACTOR as directed by the ENGINEER and utility before the operation and advised of the probable time when service will be restored.

15.0 FENCING

Where water supply line is being constructed in fields where stock is being grazed, CONTRACTOR shall provide temporary fence as approved by the ENGINEER around open trenches to prevent stock from falling in trenches. Where trenching operations should isolate grazing stock from their source of water, CONTRACTOR will either provide temporary bridging over trench or else provide water for such stock.

Where trench crosses near sound existing corner posts and existing fence is in good condition, fence may be taken loose, rolled back and stored until pipe line is completed at this point, then replaced by stretching tightly and thoroughly stapling. Additional posts will be provided and additional new fence shall be provided when it is necessary to place the fence crossed by the water line in a condition equal to existing fence before water line was constructed.

Where it is necessary to cut existing fence, new end posts shall be installed on each side of the water line and the old fence thoroughly stapled to these new posts before cutting. After pipe line is completed at this point, a new fence of galvanized wire (No. 9 gauge with No. 11 filler wires) shall be stretched between these new end posts and thoroughly stapled to existing posts and any new intermediate posts necessary to provide a good fence. Replacement of fences shall be on a replacement in-kind basis, and shall be considered incidental to laying of the lines and any additional cost shall be included in the unit price bid per lineal foot of pipe. Contractor shall notify property owner prior to cutting fence.

16.0 PROTECTION OF ADJACENT LANDSCAPE

Reasonable care shall be taken during construction of the water lines to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

In the course of construction, the CONTRACTOR may deflect horizontal alignment of the water line to avoid trees and to keep from damaging their roots. The CONTRACTOR shall be fully responsible for settling all claims by private property owners concerning damage to trees and shrubs.

17.0 COORDINATION WITH UTILITIES

The Plans show the general location of existing utilities, such information having been determined from the utilities. However, such information shall be considered general and is not guaranteed by OWNER, ENGINEER or the UTILITY.

Prior to construction, the CONTRACTOR shall arrange to meet with representatives of all utilities, and provide them with his anticipated work schedule. The CONTRACTOR shall have the utilities make their best determination of utility locations in the areas in which he is working. Throughout the progress of the work, such field markings of utilities shall be kept current.

Repairs to any utilities damaged by the CONTRACTOR shall normally be performed by the utility at the CONTRACTOR'S expense, unless the CONTRACTOR and the utility negotiate other understandings and/or procedures.

18.0 BLASTING AND ROCK EXCAVATION

The CONTRACTOR shall make his own investigation as he deems necessary to ascertain the sub-surface conditions to be encountered in the work.

All blasting operations shall be conducted in accordance with municipal ordinances, state and federal laws and Section 9, Explosives, of the "Manual of Accident Prevention in Construction", published by the Associated General Contractors of America, Inc. Soil particle velocity shall not exceed limit set by Kentucky law. All explosives shall be stored in conformity with said ordinances, laws and safety regulations. No blasting shall be done within five feet of any water mains, sewer lines, natural or manufactured gas lines, liquid petroleum product lines or other utilities. Any damage done by blasting is the responsibility of the CONTRACTOR and shall be promptly and satisfactorily repaired by him.

The CONTRACTOR shall use delay caps or other approved methods to reduce earth vibrations and noise. Mud capping, as defined in the above manual, will not be permitted as a method of breaking boulders. No blasting shall be permitted on Sundays or after dark.

Prior to commencing with the work, the CONTRACTOR shall, during a preconstruction conference with the OWNER and ENGINEER, state clearly his approach to performing the excavations on the project. He shall be familiar with the laws and ordinances covering blasting and shall also give consideration to the use of hydraulically operated rock breaking devices in lieu of blasting where considered necessary. If blasting is not handled in an expert manner at all times, the ENGINEER reserves the right to suspend blasting and require the work to proceed without it.

Prior to blasting, the CONTRACTOR shall make his own detailed preblast survey of adjacent walks, curbs, retaining walls, house foundations, etc. to determine conditions prior to the work. Such a file of information, including photographs, may be certified in such a manner as the CONTRACTOR believes necessary since this information that may stand in his defense.

19.0 MEASUREMENT AND PAYMENT

Payment for supplying, transporting and storing pipe, trenching, standard bedding, pipe installation, fittings, thrust- blocking, pipe locating wire or tape, testing, backfilling, disinfection, seeding, crop damage, regular stream crossings, clean-up, tie-ins to other structures and other incidental items in this section shall be made on the basis of the unit price per lineal foot for the type and size of pipe installed. Payment will include all those items not specifically covered by another proposal. Pipe will be measured along the centerline of the pipe as installed with no deduction for valves and fittings.

SECTION 15101

INSTALLATION OF WATERLINE ACCESSORIES

1. GENERAL

The CONTRACTOR is to supply and install all valves, hydrants, blow offs and other equipment at the locations shown on the plans in complete accordance with these specifications.

2. GATE VALVES

Valves 3" – 66" shall be of the Resilient Wedge Gate Valve type design. All gate valves shall be rated for 250 psig cold water working pressure, with zero leakage. The rating shall be indelibly marked on the casting. The valves shall comply fully, in all applicable sizes, with the latest edition of ANSI/AWWA C-515, as well as all requirements detailed herein. Valves shall meet all requirements of ANSI/NSF 61 (3" – 48"). All valves shall be of the same manufacturer and shall clearly bear the manufacturer's name and valve size.

The valve maker is to supply the ENGINEER, through the bidder, within one week after award is made, complete catalogs or other material giving complete details and dimensions of valves and accessories. The ENGINEER's approval shall be received by manufacturer prior to shipment of materials.

All ferrous components of the valve shall be constructed of ductile iron. All valves shall be cast with the words "DI" or "Ductile Iron". The wrench nut shall be constructed of ductile iron, shall have four flats at stem connection to insure even transfer of torque to the stem. Valve supplier shall furnish two (2) standard stem iron wrenches for turning nut operated valves.

The wedge shall be ductile iron. It shall be fully encapsulated with EPDM rubber, symmetrical in design and shall seat equally well with flow in either direction. In sizes 4" – 48" the wedge shall incorporate the use of guides encapsulated with an engineered plastic. Double disc and/or metal style solid wedge valve designs are not allowed. The wedge to stem design on 4" – 48" shall employ the use of an independent stem nut. An integral stem nut design in those sizes is not allowed.

All body to body bolting material shall be Type 304 SS, develop the physical strength characteristics of ASTM A307 and shall have the dimensional requirements of AWWA C-515 and ANSI 18.2.1. All body to bonnet bolting shall be of the same size and length. All bolts shall have square or hexagonal heads. Metric bolts, socket head cap screws, or recessed allen head type bolts filled with hot melt type wax will not be allowed.

Designs employing two piece independent thrust collars will not be allowed. All stem diameters and the prescribed number of turns to open shall be as detailed in the applicable portions of Table 4 of AWWA C-515. The stem o-rings above the thrust collar shall be replaceable with the valve fully open and while subjected to full working pressure. O-rings set in a cartridge type design will not be allowed. Valve shall be equipped with thrust washers above and below the thrust collar to reduce the operating torque of the valve.

All internal and external surfaces of the valve shall be electrostatically coated prior to assembly, with a fusion bond epoxy. All valve body gaskets shall be of a pressure energized o-ring design.

All valves 14" and larger shall be equipped with lifting lugs or eyebolts for lifting. All valves 16" and larger shall be equipped with bevel gearing for horizontal or spur gearing for vertical installation to reduce operating torque. Valves equipped with bevel gears shall be equipped with flushing ports on each wedge guide channel. Where allowable, valves should be installed in the vertical position. Valves employing the use of an external and/or integral by-pass for torque reduction are not allowed.

Valves shall be manufactured by a company domiciled in the United States, as well as have a history in manufacturing Resilient Wedge Gate Valves greater than 25 years. All Resilient Wedge Gate Valves shall be American Flow Control Series 2500, Mueller, Kennedy or ENGINEER approved equal.

3. BUTTERFLY VALVES

All buried butterfly valves shall be with mechanical joint, tight closing, rubber or synthetic rubber seat type with seats securely fastened to valve body. No metal-to-metal seating surfaces will be permitted. Valves shall be bubble tight at the rated pressure in either direction and shall be satisfactory for applications involving throttling service and/or frequent operation and for applications involving valve operation after long periods of inactivity.

Cast Markings: valve size, manufacturer's name, class, direction of opening, and year of casting.

The valve discs shall rotate 90° from the full open position to the tight shut position.

Butterfly valves shall be manufactured for a full differential pressure rating of 250 psig and hydrostatic pressure test of 500 psig.

The body shall be constructed of Ductile Iron ASTM A536 Gr. 65-45-12, with mechanical joint ends drilled in accordance with AWWA C111. The body wall

thickness shall be in strict accordance with AWWA C504. Table #1, for gray iron 250B valves.

Valve seat shall be Buna-N rubber located on the valve body.

The disc shall utilize an on-center shaft and symmetrical design, cast from Ductile Iron ASTM A536 Gr. 65-45-12. The disc edge shall be stainless steel type 316. Discs shall be retained by pins that extend through the full diameter of the shaft. The pin material shall be the same as the shaft material. Torque plugs or tangential fasteners shall not be allowed.

The shaft shall be made of ASTM A-564 Type 630 condition H-1150. The shaft seals shall be "V" type packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft. No O-ring or "U" cup packing shall be allowed. The bearing shall be a stainless steel backed Teflon material. Bearing load shall not exceed 1/5 of the compressible strength of the bearing or shaft material.

Manual actuators shall be of the traveling nut, fully grease packed, self-locking type and shall be designed to hold the valve in any intermediate position between fully open and fully closed without fluttering or creeping. The actuator shall have mechanical stops that will withstand an input torque of 450 lb./ft. against each stop. Manual actuators shall conform to AWWA Standard C504. The traveling nut shall engage alignment grooves in the housing. The actuators shall have a built in packing leak bypass to eliminate possible leakage into the actuator housing.

3.1 OPERATORS

The valve operating mechanisms shall be for counterclockwise opening. There shall be no external moving parts on valve or operator except the operator input shaft. Input shaft is to be operated by a 2-inch square operating nut. Maximum required input force on the operator shaft to open and close the valve shall be 40 pounds. The total number of turns applied to the operating nut required to completely open the valve from a completely closed position shall be not less than twice the nominal valve diameter. An extension stem shall be furnished if required to bring the operating nut within 3 1/2 feet of finished grade. Extension stems shall be securely fastened to the valve stem. A stainless steel collar, 6-inches high, shall be welded to the operating gear box housing centered on the operating nut to hold the valve box in place and seal it against dirt. The diameter of the collar shall be such that it will accept the valve box.

The valves shall be manufactured by Pratt, M & H, Dresser, Dezurik or approved equal.

4. AIR VALVES

4.1 AIR RELEASE VALVES

A valve designed to allow exhaust of small pockets of air from the water main while in use shall be installed where shown on the plans or where directed by the ENGINEER. The air release valve shall have an iron pipe thread inlet in sizes shown in the valve schedule, cast iron body construction, bronze trim, with all internal parts of stainless steel or bronze. The valve shall have an orifice size as shown in the valve schedule. Valves shall be suitable for a working water pressure of 300 PSIG. The air release valve shall be mounted on Schedule 80, galvanized steel riser pipe. The riser pipe shall be connected to the water main by use of a service clamp and a corporation stop as shown in the standard details. The riser shall also have a bronze gate valve with a tee-handle, solid wedge type, inside I.P. threads, suitable for a 300 PSIG working water pressure. Equipment shall be as manufactured by Val-Matic or approved equal.

4.2 COMBINATION AIR VALVES (CAV)

Combination air release valves (single body, double orifice) shall be designed to allow large volumes of air to escape out the large air vacuum orifice when filling a pipeline and to close water tight when the liquid enters the valve. During large orifice closure, the small air release orifice shall open to allow small pockets of air to escape automatically and independently of the large orifice. The large air vacuum orifice shall also allow large volumes of air to enter through the orifice during pipeline drainage to break the vacuum. The body inlet must be baffled to protect the lower float from direct contact of the rushing air and water to prevent premature valve shut off. The top float must be protected in similar manner for the same purpose. The Buna-N seat must be fastened to the valve cover without distortion for drop tight shut off. All floats shall be heavy stainless steel, hermetically sealed; designed to withstand 1000 psi or more. The upper float shall be center guided for positive shut off. Valve exterior to be painted red lead TT86B Type IV for high resistance to corrosion. Materials certified to ASTM specifications as follows:

- Body & Cover & Baffle - Cast Iron
- Stainless Steel Float
- Buna-N Seat & Needle
- Plug & Bronze Forging
- Delrin Level Frame
- ASTM A48 Class 30
- ASTM A240
- Nitrile Rubber ASTM SB 800
- ASTM D638

Combination air release valves shall be as shown in the valve schedule manufactured by APCO or equal. The valve shall be built for 300 psi service.

4.3 CUSTOM COMBINATION AIR VALVES (CCAV)

Custom combination air valves (double body, double orifice) allow large volumes of air to escape out the large orifice when filling a pipeline, then close when liquid enters the valve. The small orifice Air Release Valve shall be an independent valve body, side connected to the large orifice Air and Vacuum Valve body with piping, and a 1" brass gate valve for isolation. While the large orifice is closed, the small air release orifice will open to allow small pockets of air to escape automatically and independently of the large orifice. The small orifice air release valve shall be an independently operated compound lever mechanism of cast stainless steel or bronze.

The large air and vacuum orifice shall also open and allow large volumes of air to enter the pipeline during pipeline drainage to break the vacuum. The large orifice float must be surrounded by a baffle for protection against direct forces of rushing air and water to prevent premature valve shutoff. The baffle must be a heavy integral cast part of the main valve body, not a loose piece.

The Buna-N seat shall be compression molded, a minimum 1/2" thick and fastened to the valve cover with shoulder screws to lock the seat in place without distortion, for drop tight shutoff. Both floats shall be heavy stainless steel, hermetically sealed. The large orifice float shall have a one piece rod to center guide it through stainless steel bushings into shut-off against seat. The custom combination air valve shall be rated 300 psi. The small orifice shall operate (open) up to 150 psi.

All materials of construction shall be certified in writing to conform to ASTM specifications as follows:

Body & Cover	Cast Iron	ASTM A48, Class 30
Floats	Stainless Steel	ASTM A240
Needle & seat	Buna-N	ASTM A296 T316
Leverage Mechanism	Stainless Steel	FDA Approved for Potable Water
Exterior paint	Phenolic Primer Red Oxide	Contact

Valve to be APCO Series 1800 custom combination air valve, as manufactured by Valve and Primer Corporation, or equal.

5. VALVE BOXES

All valves (gate, air release, check, etc.) installed underground shall be installed in an approved valve box. Each gate valve shall be installed in a vertical position with a valve box. Valve boxes shall be of a cast iron, two or three-piece, slip-type consisting of a base, a center section and a top section with a cover marked "water". Where valve box is constructed in a paved area the box shall be a screw type box. The entire assembly shall be adjustable for elevation and shall be set vertically and be properly adjusted so that the cover will be in the same plane as the finished street surface (no more than 1/2" above ground in yards or pastures or 2" in unsodded areas). The assembly must provide for the required cover over the pipe at the installation site and shall rest on concrete pads as shown in the Standard Details. The CONTRACTOR shall furnish 2 valve wrenches for the project.

6. BLOW-OFF VALVES

Blow-off valves shall be installed in accordance with the details and the specifications at locations shown on the plans and in other locations as directed by the ENGINEER. In some instances fire hydrants serve as blow-off valves. In general, blow-off valves are located at the end of mains for the purpose of clearing the main of sediment, obstacles or impure water. The CONTRACTOR should refer to the Standard Details for blow-off installation.

The blow off pipe from the main to the flush valve shall be connected to the main by means of a tee. Do not use a corporation stop for this connection. The gate valve for the blow-off connection shall be a double disc gate valve in conformance with AWWA C500 for sizes under 4" and resilient seat gate valves in conformance with AWWA C509 for sizes 4" and larger. All pipe shall be galvanized pipe, Schedule 80, with Class 300 malleable iron fittings. CONTRACTOR shall install a length of hose in each valve box as shown in the Standard Details. The valve enclosure shall be a Mueller Meter Box or equal with appropriate risers. The cover shall be of cast iron construction, 4 inches deep with a non-recessed lid, with cast letter "WATER" and a pentagon lock nut.

7. TAPPING SLEEVE AND VALVE

A Mueller H-615 MJ ductile iron tapping sleeve or equal shall be used for making wet taps and shall be rated for a minimum working water pressure of 200 psi unless otherwise specified on the Drawings. CONTRACTOR shall ascertain the type and size of pipe to which the connection is to be made prior to selection. The associated valve shall be an MJ resilient seat gate valve equal to Mueller or Kennedy.

8. MEASUREMENT AND PAYMENT

Payment for gate/butterfly valves, check valves and other special valves installed underground shall include all work necessary for a complete installation and shall include all valve stem boxes or other valve boxes and box covers. Payment will be made at the unit price bid for the type and size of valve installation.

Blow offs and air release valves will be paid for under their respective bid price and is to include box and six (6) feet of pipe for blow-offs only. Excess pipe will be paid under bid price for pipe installed.

SECTION 15102

SPECIAL ITEMS OF CONSTRUCTION IN WATERLINE INSTALLATION

1. GENERAL

These specifications govern special crossings, installations and construction procedures required to deal with unusual construction items or special requirements of governing agencies.

2. STATE HIGHWAY CROSSINGS

In all cases, these crossings will be made in compliance with the requirements of the State Highway Department. Such requirements will normally be described by the appropriate District Highway Office. In general, unless otherwise shown on the plans or directed otherwise by the ENGINEER, the crossing of all State Highways shall be accomplished by boring under the roadway. In addition, the crossing of service lines 1-1/2 inches and greater under rigid and flexible surfaced paved roads shall be accomplished by boring and jacking a casing pipe under said roadway. In certain cases, as shown on the plans, service lines of all sizes will require casing pipe installed with the crossing.

2.1 Materials. In general, the diameter, thickness, style, joints and materials selected for casing pipe shall be as shown on the plans and shall be considered as "minimum" requirements, all subject to prior approval of the ENGINEER. In all cases, the approval for construction by agreement with the private company and/or construction permit issued by the State, County, or Municipal agency will be required before construction starts.

Steel casing pipe for road and railroad crossings using the boring and jacking method shall be steel, plain end, uncoated and unwrapped, and shall be furnished in at least 18-foot lengths. Steel pipe shall meet the requirements of ASTM Specification A-120 and AWWA C200. Pipes up to and including 4 inches in diameter shall be Schedule 40. Pipe larger than 4 inches shall have a wall thickness equal to or greater than 0.312 inches under railroads and 0.250 for all other uses **or as specifically stipulated on the plans**. The inside diameter of all casing pipes shall be a minimum of four (4") inches greater than the largest outside diameter of the carrier pipe, joint or coupling.

The steel casing pipe shall be bored and/or jacked in place at the locations as shown on the plans or as directed by the ENGINEER. All joints between lengths shall be solidly welded with a smooth non-obstructing joint inside. Any field welding shall be performed by a certified welder and shall be in accordance with AWWA C206. The casing pipe may be extended beyond the boring limits by

open trenching as shown in the Standard Details. This would apply when the casing is required from right-of-way to right-of-way or ditch line to ditch line. Open trenching at jacked or bored locations will be allowed no closer than 5 feet from edge of pavement.

Positioning guides (insulators) shall be utilized on all carrier pipe which is within the casing pipe. Positioning shall be accomplished by the use of prebuilt spacers such as those manufactured by CALPICO or an approved equal. The CONTRACTOR shall submit the type of position guide proposed for use for the approval of the ENGINEER. Spacing of the positioning guides shall be in accordance with the Standard Drawings.

The ends of the casing pipe shall be plugged and made watertight in a manner acceptable to the ENGINEER prior to backfilling. Casing seals as manufactured by Pipeline Seal & Insulator, Inc. (PSI), Advance Products & Systems, Inc. (APS) or equal shall be used.

Where road crossings are made using plastic pipe or copper, the location of joints under the roadway should be avoided by using lengths of adequate dimension for the crossing. This principle also applies to other types of pipe where sufficiently long lengths are available.

2.2 Boring and Jacking. The work is herein defined as the operations in which both the boring by auger and the jacking of the casing pipe are done mechanically and in which the diameter of the casing pipe is too small to permit hand working at the heading of the casing pipe. Two basic methods are; (1) pushing the casing pipe into the fill or earth simultaneously as the boring auger drills out the ground; and (2) drilling the hole through the fill or earth and pushing the casing or carrying pipe into the hole after the drill auger has completed the bore.

A suitable approach trench shall be opened adjacent to the slope of the embankment, or adjacent to point of bored and jacked section as shown on the plans. The approach trench shall be long enough to accommodate the selected working room. Guide timbers or rails for keeping the casing pipe on line and grade shall be accurately set and maintained in the bottom of the approach trench and with heavy timber back-stop supports installed at the rear of the approach trench to adequately take thrust of the jacks without any movement or distortion. It is paramount to the securing of acceptable tolerance limits of workmanship in the boring and jacking operation that extreme care be taken in the setting of all guides, rails and jacks to the end that the casing pipe in final position be within the limits of acceptability for the placing and laying of the carrier pipe. The minimum cover of 36 inches under the roadway must be maintained. Additional depth may be required as shown on the plans.

2.3 Open Trench Crossings. The trench shall be excavated to a minimum width that will allow the pipe installation. The trench walls shall be kept as nearly vertical as possible. The minimum specified cover above the pipe shall be maintained. The Standard Details section shows the requirements for open trench crossings.

The backfill in the trench under any roads, driveways, or parking areas where the open trench method is used shall be of the type shown in the Standard Details and shall be deposited and compacted in uniform layers not to exceed the depth shown in the Standard Details.

The surface of the road, driveway, or parking area shall be replaced with the same type of material as specified under pavement replacement.

3. RAILROAD CROSSINGS

At all railroad crossings, cover pipe (casing) for water lines (carrier pipe) shall be jacked or pushed beneath tracks and the carrier pipe jointed and pushed through the cover pipe. Detailed drawings of railroad crossings including the length of casing and depth below track are shown in the plans. CONTRACTOR shall obtain and pay for services of a representative of the railroad to direct the CONTRACTOR's operations while on the railroad property when required by the railroad.

4. STREAM CROSSINGS

4.1 No-Flow Condition. Where required on the plans or instructed by the ENGINEER, the CONTRACTOR shall construct a special creek crossing as shown in the Miscellaneous Drawings. Crossings shall be scheduled for construction in times of no flow or very low flow, if practicable, otherwise the stream shall be directional bored. Concrete shall not be placed under water and CONTRACTOR shall provide suitable pumps to keep water out of trench excavation during stream crossing construction. Special creek crossings shall be designated as Type A or Type B as contained in the Standard Drawings.

4.2 Normal Earthen Stream Crossing. Where the stream crossing is made in earth or other beds which are stable (no casing or anchorage required), then the pipe will be laid in a narrow trench at the depth specified in the Standard Details to maintain the required cover between pipe and stream bed. Initial backfill will be mechanically compacted. Trench backfill in any stream crossing area from one (1) foot above the top of the pipe shall consist of trench excavated rock, if available. No extra payment will be made above normal construction for this type of creek crossing.

4.3 Blue Line Stream Crossings. All crossing of streams that appear as a blue line on a USGS 7.5 minute topographical map shall be accomplished in accordance with:

GENERAL CERTIFICATION
NATIONWIDE PERMIT #12
UTILITY LINE BACKFILL AND BEDDING

This document is bound in front of the specifications. The Contractor shall read, understand and comply with the requirements and procedures.

Stream size, for purposes of this specification, is differentiated as large or small. A stream is classified as small when the distance across the stream channel at top of banks is 15 L.F. or less. A stream is classified as large when this measurement is greater than 15 L.F.

It is the intent of the plans to identify a stream crossing at each blue line stream. Small stream crossings may frequently be accomplished by trenching when the stream is in a no-flow condition. If the stream is in a flow condition, irregardless of the size classification, the crossing shall be accomplished by directional boring or other method that complies with the General Certification and is approved by the Engineer. Specific details for stream crossings are contained in the Miscellaneous Drawings.

See Section 14 for Basis of Payment.

5. RIVER OR LAKE CROSSINGS

Crossings in rivers or lakes where the pipe cannot be laid in a trench shall normally be made with ductile iron pipe having ball and socket joints or polyethylene pipe or directional bored as indicated on the DRAWINGS. Details for any required installations of this type including pipe required; number, size and location of anchors; and, installation technique are shown in the plans and Miscellaneous Drawings. See Section 15100 for installation requirements.

6. BRIDGE CROSSINGS

Wherever possible bridges will not be utilized for stream crossings. However, where it is necessary for the water line to be attached to bridges, the pipe shall be securely fastened to bridge stringers or beams using supports as dimensioned and located in the plans. The carrier pipe shall be insulated with Vermiculite or other approved material to prevent freezing. Expansion joints to allow for movement of the bridge will be required as shown on the plans.

7. WATER LINE AND SEWER LINE SEPARATION

7.1 General. Wherever sewer lines cross, or are adjacent to, each other, special precautions shall be taken.

7.2 Parallel Water and Sewer Lines. Water lines must, if possible, be located a minimum lateral distance of 10 feet from any existing or future sewer lines measured from outside diameters. Where water lines and sewer lines must be placed in the same trench, the water line must be located on a shelf, 2 feet above and 2 feet to the side of the sewer line. Whenever this condition cannot be met, and upon direction from the ENGINEER, the water line shall be uncovered and encased with concrete per the standard encasement detail.

7.3 Crossing Water and Sewer Lines. Wherever sewer lines and water lines cross, it is desirable, if practical, that the sewer line be at least 24 inches below the water line.

Where it is not practical to provide such a separation, care shall be taken to ascertain that the existing water line or existing sewer line is in good sound condition and that no evidence of joint leakage is known in that vicinity. If any such evidence does exist, the existing line shall be exposed by the CONTRACTOR at least 10 feet each side of the new pipe crossing, carefully examined and any defects positively corrected. The OWNER will arrange for examining and correcting any defects in the existing lines, but the CONTRACTOR shall cooperate in every way possible.

When the water line must be below or less than 2 feet above the sewer line, the CONTRACTOR shall encase the water line 10 feet in each direction from the crossing as directed by the ENGINEER. This encasement should only be accomplished when directed by the ENGINEER and shall be accomplished in accordance with the details shown on the drawings. The encasement is a separate pay item.

8. CLEANUP, SEEDING AND SODDING

8.1 General. Upon completion of the installation of the work, the CONTRACTOR shall remove all debris and surplus construction materials resulting from the work. The CONTRACTOR shall fine grade all the disturbed surfaces around the area of the work and all areas utilized for storage of materials and equipment and any other uses in a uniform and neat manner leaving the construction area in a condition as near as possible to the original ground line or to the lines as directed by the ENGINEER. The Contractor shall provide effective cleanup of the work as it progresses. Procrastination of cleanup will not be tolerated.

8.2 Rough Grade Work and Cleanup. Rough Grade Work and Cleanup (Rough Cleanup) shall be defined to include the final backfill and windrowing of the ditch line, disposal of excess excavated material, level grading of the disturbed areas adjacent to the ditch line, filling and leveling street and driveway cuts, cleaning up and removal of rubbish, repair of fences and structures, and any other such work that may be required to result in a neat, orderly project area. Rough Cleanup shall be performed as other construction progresses and must be completed within **one week** of the adjacent pipeline construction.

Rough Cleanup is not a separate pay item. The cost for this work shall be included in the unit bid price for water lines. If Rough Cleanup is not performed as specified, the OWNER, after notification to the CONTRACTOR, will refuse payment for additional pipeline installation until the Rough Cleanup is accomplished.

8.3 Final Cleanup. Final cleanup, grade work and seeding shall be performed on each line or line segment of a pipeline of significant length when backfilled trenches have had adequate time to settle, but at least within **30 days** from the date each line is constructed. Final grade work and seeding on Kentucky Transportation Cabinet rights-of-way shall be done in accordance with said Cabinet specifications and the permit granted to the OWNER specifically for this project.

Where work was performed on private property in lawns, earth of good quality, free from rock shall be spread over the disturbed area and graded and compacted to match adjacent ground contours. The graded and seed bed area shall be prepared with a power landscape rake and further hand raked if necessary, until smooth and free from rock, potholes, and bumps. The disturbed area shall then be seeded with the seed variety used on the original lawn (e.g., a bluegrass lawn shall be reseeded with bluegrass seed). In the case of no preference by the OWNER, the mixture of grasses shall consist of one-third (1/3) Rye grass, one-third (1/3) Kentucky Fescue and one-third (1/3) Kentucky Bluegrass by weight and shall be applied in accordance with the supplier's recommendations. The area shall be fertilized with 12-12-12 fertilizer applied at a rate of 6 pounds per 1,000 square feet of area. Agricultural grade limestone shall be incorporated into the disturbed areas at a rate of 200 pounds per 1,000 square feet. After the seed, fertilizer and lime have been applied, the CONTRACTOR shall then lightly cover the seed by use of a drag or other approved device. The seeded area shall then be covered with clean straw to a depth of approximately one inch (1") or, where specified on the Drawings, an erosion control blanket.

Straw Mulch materials shall consist of wheat, oat or rye straw. The straw shall be air dry, reasonably light in color, and shall not be musty, moldy, caked or otherwise low quality. The use of straw that contains noxious weeds will not be permitted.

Erosion Control Blankets shall be a specific cut of Great Lakes Aspen curled wood excelsior with 80% six-inch fibers evenly distributed throughout the entire area of the blanket. The top of each blanket shall be covered with photodegradable or biodegradable netting. Material shall not contain any weed seed or chemical additives. The erosion control blankets shall be equal to Curlex Single Net (Curlex 1) as manufactured by American Excelsior Company. The blankets shall be installed in accordance with the Manufacturer's recommendations and/or the details in the Drawings.

Where work was performed on private property and not in lawns the trench line shall be graded and filled if necessary to match adjacent contours. All rock larger than 1-1/2" in diameter shall be removed from the disturbed area. In general, pasture and fallow land shall be fertilized and seeded with Kentucky 31 Fescue and plowed fields shall be left unseeded, however, the desire of each property owner shall govern regarding seeding. The entire pipeline length that is seeded shall be strawed.

In all cases on private property the rate of seed and fertilizer application shall be that recommended by the material supplier or the University of Kentucky Cooperative Extension Service for new plantings of the variety of grass seed used.

If the trench line settles following final grade work or if grass seed fails to germinate within a reasonable time, the CONTRACTOR shall regrade or reseed the area in question as specified above and as directed by the ENGINEER.

Final cleanup is a separate pay item.

9. PAVEMENT AND OTHER STRUCTURE REPLACEMENT

The CONTRACTOR shall replace all pavement cut or disturbed, with pavement similar in all respects to existing pavement in accordance with the Standard Details and at those locations approved by the ENGINEER. Every effort shall be made to avoid cutting the pavement. In restoring pavement, new pavement is required, except that granite paving blocks, sound brick or sound asphalt paving blocks may be reused. No permanent paving shall be placed within thirty (30) days after the backfilling has been completed. All concrete and asphalt paving materials shall be in conformance with the Standard Details shown in the plans. The pipeline trench through all paved areas (parking lots, driveways, roads, etc.) shall be fully backfilled with crushed stone.

9.1 Classification of Pavements

A. Concrete Pavement Replacement - This pavement replacement shall be Portland cement concrete construction in accordance with the requirements shown in the Standard Details. It shall include all pavement

replacement on concrete surfaced roads, concrete driveways, concrete sidewalks and concrete parking areas, both public and private.

B. Heavy-Duty Bituminous Pavement Replacement - This type of asphalt pavement replacement shall be bituminous concrete surface over concrete base in accordance with the details. This type of pavement replacement shall be used on all heavily trafficked roads having an existing pavement greater than 2", whether public or private, or in other locations as directed by the ENGINEER.

C. Light-Duty Bituminous Pavement Replacement - This type of pavement replacement shall be bituminous concrete constructed in accordance with the details. This item shall include all light-duty bituminous concrete roadways, bituminous driveways and bituminous parking lots, both public and private.

D. Crushed Stone Surface Replacement - This type of surface replacement shall include all graveled roadways, driveways, parking areas, or other gravel surfaced areas, both private and public. This type of surfacing may also be required as a base course for other pavement replacement.

9.2 Materials. The crushed stone backfill as noted on the drawings shall be dense graded aggregate per Kentucky Department of Highways Specifications or as noted on the Drawings. The CONTRACTOR shall continuously be responsible for the maintenance of the aggregate and the surface of the trenches until the pavement replacement is completed.

Portland cement concrete for pavement replacement shall contain a minimum of 6 sacks of cement per cubic yard, the maximum free water content shall be 6 gallons per sack of cement, the slump shall be between 2 and 4 inches, and the concrete shall have minimum 28-day compression strength of at least 3,500 PSI. Cement, aggregate and water shall be described in these specifications for Class "A" concrete. A set of cylinders shall be made and tested for each 25 cubic yards of concrete placed, or fraction thereof, to supply representative sampling and testing of the concrete, upon the direction of the ENGINEER. The CONTRACTOR shall produce a broomed, or burlaped uniformly smooth and nonskid surface, consistent with the existing pavement.

Bituminous materials and mixes shall be consistent with the recommended practice of the asphalt institute and it shall conform to the requirements of the Kentucky Department of Highways for prime coat and Class 1 bituminous concrete. The bituminous concrete shall consist of a binder or base course and a surface course.

9.3 Installation of Pavement Replacement. The CONTRACTOR shall cut back the surfacing adjacent to the trench for 12 inches on both sides of the trench and shall cut down the dense graded aggregate he has placed to a depth

required for either type of pavement replacement. The resulting surface shall be rolled to yield a smooth, dense surface and a uniform depth.

The concrete shall be placed in accordance with standard practice, with the welded wire mesh if required in proper position and thoroughly vibrated into place. The CONTRACTOR shall produce a surface consistent with the existing pavement. The CONTRACTOR shall apply a liquid curing component, sprayed on the surface of the concrete, and shall provide adequate protection to the pavement until it has set.

For bituminous concrete, the CONTRACTOR shall clean and broom the prepared surface, then apply the prime coat at the rate of 0.20 to 0.25 gallons per square yard, with a pressure distributor or approved pressure spray method. When the prime coat has become tacky but not dry and hard, the bituminous binder course, or base course, whichever applies, shall be placed and compacted. The CONTRACTOR shall then apply the surface course. It is recommended, but not required, that the base course remain in place for approximately one week before placing the surface course. The finished course shall be compacted and the completed surface shall match the grades and slopes of the adjacent existing surfacing and be free of offsets, depressions, raised places and all other irregular surfaces.

9.4 Seasonal and Weather Limitations for Pavement Replacement. In the event the progress and scheduling of the work is such that the bituminous pavement replacement would occur in the winter months, during adverse cold weather and/or during such times the asphalt plants are not in operation, then the final pavement replacement shall be postponed until favorable weather occurs in the spring and the asphalt plants resume normal operations. No bituminous concrete shall be laid when the temperature is below 40°F. except by written permission of the ENGINEER.

Concrete pavement shall not be placed when the temperature is such that the pavement placed will freeze before it has had adequate time to set and shall be placed in conformance with the temperature conditions specified in these specifications.

The CONTRACTOR shall be responsible for replacement of pavement which he has placed which has been damaged by cold weather or freezing without additional compensation.

In the meantime, the CONTRACTOR will be required to maintain the temporary surfacing until the permanent pavement is placed. Such labor, materials and equipment as is required for temporary maintenance of the streets, roadways and driveways shall be provided at the CONTRACTOR'S expense and is not a pay item. The CONTRACTOR will be required to use a cold mix asphaltic concrete as a temporary surface for trenches under heavy traffic use.

9.5 Guarantee. The one year guarantee as specified in the contract documents is also applicable to trench settlement and pavement replacement.

10. SIDEWALK AND DRIVEWAY REPLACEMENT

Sidewalks and driveways will be replaced if damaged by the CONTRACTOR in any way. Payment will be made for those pavements necessarily damaged by the line installation in accordance with the Standard Details. No pavements are to be replaced over a backfilled trench for at least 30 days after filling. Pavements damaged otherwise are to be replaced immediately at the CONTRACTOR'S expense.

Materials and dimensions are to be at least equal to existing pavement and are to conform with the Standard Details.

11. PAYMENT FOR WATER

All water used from the UTILITY shall be metered with meters supplied by the CONTRACTOR. The CONTRACTOR shall pay for such water monthly at the rates published by the District. Unmetered water lost through water line breakage shall also be paid at the rates published by the District. The quantity lost shall be computed on the basis of a discharge velocity of 7 feet/second, the diameter of the line, and the estimate duration of free uncontrolled discharge.

12. FINAL CLEAN-UP

The CONTRACTOR shall provide effective cleanup of the work as it progresses. Procrastination of cleanup will not be tolerated. At the time of final inspection, no trenches shall show any undue evidence of the previous construction. All areas shall be left free of ruts due to construction equipment and shall have a clean and neat appearance without rubble or debris. The areas shall not be mounded up and shall be completely restored, and all yards and fields shall be reseeded so land may be cultivated, mowed, etc. Straw and fertilizing shall accompany the seeding in accordance with Item 8 - Cleanup, Seeding and Sodding of this section. If necessary to hasten proper restoration of terraces, principally along ditch lines, the CONTRACTOR shall sod such areas at the ENGINEER'S direction. For all line segments, final cleanup shall be performed within 30 days from day of installation.

13. PROTECTION OF ADJACENT LANDSCAPE

Reasonable care shall be taken during construction of the water lines to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

In the course of construction, the CONTRACTOR may deflect horizontal alignment of the water line to avoid trees and to keep from damaging their roots. The CONTRACTOR shall be fully responsible for settling all claims by private property owners concerning damage to trees and shrubs.

14. MEASUREMENT AND PAYMENT

14.1 Payment for crushed stone, black top and concrete pavement replacement will not be based on the quantities purchased by the CONTRACTOR. Payment for surfacing will be paid on the basis of linear feet installed in accordance with the STANDARD DRAWINGS with a maximum width of pipe diameter plus 24 inches. Crushed stone or concrete sub-grade under paving and crushed stone trench backfill shall be included in paving price and not paid for separately. Any additional cost estimated by the CONTRACTOR must be included in the cost of pipe in place.

14.2 STREAM CROSSINGS

14.2.1 No-Flow Crossings

Payment for no-flow stream crossings delineated on the plans (excluding directional bores) will be at the unit price bid per lineal foot for that item and shall include encasement pipe, crushed stone, concrete, solid rock excavation and all other work necessary for a satisfactory installation. The carrier pipe installed in the casing shall be paid separately under the unit price bid for pipe installed.

14.2.2 Directional Bores. Payment shall be "Lump Sum" for specific individual Bid Items for Directional Bores of large stream crossings and/or some streams classified as small where the physical crossing characteristics differ significantly from the other small streams in the project. Determination of the required length to accomplish the bore is the responsibility of the Contractor.

Payment shall be "Each" for directional bores of small stream crossings with the exception of individual small streams covered in a specific bid item. All small stream crossings in the project shall be considered the same for payment regardless of width (up to 15 L.F.) or depth. It is the responsibility of the Contractor to determine an average unit price that will be used for payment in each instance a blue line stream is crossed. Small stream crossings may be added, for extended lines beyond those shown on the plans, at the same unit price providing the crossings are reasonably similar to those in the initial project. Stream crossings may be deleted, without affecting the unit price, if a line is deleted or shortened.

Payment shall include the directional bore, encasement pipe if specified on the plans, the carrier pipe as specified on the plans and the transition fittings.

Payment limits are shown on the Miscellaneous Drawing for Directional Bore for Stream Crossings.

14.3 Additional costs for normal earth creek crossings shall be included in the unit price bid for pipe installation and no special payment will be made for these crossings.

14.4 Casing pipe unit price bids shall include the cost of boring or jacking under railroads and highways and shall include the cost of steel casing pipe. Carrier pipe will be paid for under the unit price bid for installing lines as described in Article 2.2 of this section.

14.5 Sidewalk /driveway crossings when included as a bid item shall include the extra cost of free-boring or the removal and disposal of existing pavement and replacement with new construction. Payment for pavement replacement will be on the basis of linear feet installed. Width for payment for a standard trench crossing is shown in the Standard Details. When sidewalk/driveway crossings or replacement are not included as a bid item, their costs shall be considered subsidiary to the bid for pipe installation.

14.6 Where required by the Special Provisions or the Bid Proposal, the cost of pavement replacement, boring, crossings of all types and other incidental construction shall be included in the unit price bid for pipe line installation and shall comprise total compensation for all such work.

14.7 Final Cleanup. Payment for the performance of Final Cleanup work shall be made at the contract unit price per linear foot as specified on the Bid form. However, quantities for Final Cleanup shall be added to partial payment estimates only after Final Cleanup work is totally completed for an entire water line. In this case an entire water line shall be defined as all of the facilities along and appurtenances to a line with a particular identification designation such as "Line A" or "Name" or a line segment of a pipeline of significant length.

Disturbed areas in addition to the pipeline route are incidental to the project construction.

The unit price specified on the Bid form is an assigned allotment for the work specified in Specifications, Section 15102, Subsection 8.3, "Final Cleanup". The BIDDER shall not modify either the unit price or extended total for this item and modification of these figures may be cause for rejection of the Bid. It is expressly understood and agreed, by and between the CONTRACTOR and the OWNER that the assigned allotment for Final Cleanup work is a reasonable amount for the work to be performed.

SECTION 15103

SWABBING, PRESSURE TESTING AND STERILIZATION OF POTABLE WATER PIPELINES

1. SWABBING

1.1 General

Swabbing of the pipeline shall be done when directed in the General Notes on the Drawings.

1.2 Execution

The CONTRACTOR shall insert a flexible polyurethane foam "swab" (2 lb. per cubic foot density) complete with rear polyurethane drive seal into the first section of pipe. The "swab" shall remain in its initial position until construction of the specific pipeline segment is completed. Cleaning and flushing shall be accomplished by propelling the "swab" down the pipeline to the exit point with potable water. Flushing shall continue until the water is completely clear.

The maximum operational distance for each individual "swab" shall not exceed 1.0-1.5 miles.

Pressure testing and sterilization, as stipulated in this section of the specifications, shall follow cleaning and flushing.

1.3 Materials

The "swab" shall be Aqua-Swab as manufactured by GIRARD Industries or approved equal.

2. TESTING

2.1 After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure test of at least 1.5 times the working pressure at the point of testing, but in no case less than that required by other sections herein. In addition, a leakage test shall be conducted concurrently with the pressure test.

2.2 Pressure Test

2.2.1 Test pressure shall:

2.2.1.1 Not be less than 1.25 times the working pressure at the highest point along the test section.

2.2.1.2 Not exceed pipe or thrust restraint design pressures at the lowest point along the test section.

2.2.1.3 Be of at least six (6) hour duration unless otherwise stipulated by owner.

2.2.1.4 Not vary by more than plus or minus 5 psi.

2.2.1.5 Not exceed twice the rated pressure of the valves or hydrants when the pressure of the test section includes closed gate valves or hydrants.

2.2.1.6 Not exceed the rated pressure of resilient seat butterfly valves when used.

2.2.2 Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the ENGINEER.

2.2.3 Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged, or left in place at the discretion of the ENGINEER.

2.2.4. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the ENGINEER.

2.3 Leakage Testing

2.3.1 Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

2.3.2 No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = ND(P \text{ exp } 1/2)/7400$$

In which L is the allowable leakage, in gallons per hour; N is the number of joints in the length of pipeline tested; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge.

2.3.2.1 Allowable leakage at various pressures is shown in TABLE K-1.

2.3.2.2 When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/hr/in of nominal valve size shall be allowed.

2.3.2.3 When hydrants are in the test section, the test shall be made against the closed hydrant.

2.3.3 Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than that specified in Section 2.3.2 the contractor shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance.

2.3.3.1 All visible leaks are to be repaired regardless of the amount of leakage.

TABLE K-1
ALLOWABLE LEAKAGE PER 1,000 FT. OF PIPELINE (gph)

Avg. Test Pressure psi	Nominal Pipe Diameter (Inches)								
	2	3	4	6	8	10	12	14	16
450	0.32	0.48	0.64	0.95	1.27	1.59	1.91	2.23	2.55
400	0.30	0.45	0.60	0.90	1.20	1.50	1.80	2.10	2.40
350	0.28	0.42	0.56	0.84	1.12	1.40	1.69	1.97	2.25
300	0.26	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08
275	0.25	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99
250	0.24	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90
225	0.23	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80
200	0.21	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70
175	0.20	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59
150	0.19	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47
125	0.17	0.25	0.34	0.50	0.67	0.84	1.01	1.18	1.34
100	0.15	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20

Avg. Test Pres- sure psi	Nominal Pipe Diameter (Inches)							
	18	20	24	30	36	42	48	54
450	2.87	3.18	3.82	4.78	5.73	6.69	7.64	8.60
400	2.70	3.00	3.60	4.50	5.41	6.31	7.21	8.11
350	2.53	2.81	3.37	4.21	5.06	5.90	6.74	7.58
300	2.34	2.60	3.12	3.90	4.68	5.46	6.24	7.02
275	2.24	2.49	2.99	3.73	4.48	5.23	5.98	6.72
250	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41
225	2.03	2.35	2.70	3.38	4.05	4.73	5.41	6.03
200	1.91	2.12	2.55	3.19	3.82	4.46	5.09	5.73
175	1.79	1.98	2.38	2.98	3.58	4.17	4.77	5.36
150	1.66	1.84	2.21	2.76	3.31	3.86	4.41	4.97
125	1.51	1.68	2.01	2.52	3.02	3.53	4.03	4.53
100	1.35	1.50	1.80	2.25	2.70	3.15	3.60	4.05

3. STERILIZATION

3.1 General. It is the intent of this section to present essential procedures for disinfecting new and repaired water mains. The section is patterned after AWWA C651. The basic procedure comprises:

3.1.1 Preventing contaminating materials from entering the water mains during construction or repair and removing by flushing materials that may have entered the water main.

3.1.2 Disinfecting any residual contamination that may remain.

3.1.3 Determining the bacteriologic quality by laboratory test after disinfection.

3.2 Preventive Measures During Construction

3.2.1 Precautions shall be taken to protect pipe interiors, fittings, and valves against contamination. Pipe delivered for construction shall be strung so as to minimize entrance of foreign material. When pipelaying is not in progress, as, for example, at the close of the day's work, all openings in the pipe line shall be closed by water tight plugs. Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

If dirt, that, in the opinion of the ENGINEER, will not be removed by the flushing operation (ARTICLE 3.3) enters the pipe, the interior of the pipe shall be cleaned and swabbed as necessary, with a five (5%) percent hypochlorite disinfecting solution.

3.2.2 Gaskets and Joints - No contaminated material or any material capable of supporting prolific growth of micro-organisms shall be used for sealing joints. Gaskets shall be handled in such a manner as to avoid contamination. Gasket packing materials must conform to AWWA standards. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water. It shall be delivered to the job in enclosed containers and shall be kept clean.

3.3 Preliminary Flushing. The main shall be swabbed and flushed prior to disinfection. It is recommended that the flushing velocity be not less than 2.5 ft/sec. The rate of flow required to produce this velocity in various diameters is shown in Table K-2. No site for flushing should be chosen unless it has been determined that drainage is adequate at the site.

TABLE K-2
REQUIRED OPENINGS TO FLUSH PIPELINES
(40-psi Residual Pressure)

Pipe Size (in)	Flow Required to Produce 2.5 fps Velocity (gpm)	Orifice Size (in)	Hydrant Outlet Nozzles	
			Size Number	(in)
4	100	15/16	1	2 1/2
6	220	1 3/8	1	2 1/2
8	390	1 7/8	1	2 1/2
10	610	2 5/16	1	2 1/2
12	880	2 13/16	1	2 1/2
14	1,200	3 1/4	2	2 1/2
16	1,565	3 5/8	2	2 1/2
18	1,980	4 3/16	2	2 1/2

3.4 Form of Chlorine for Disinfection. The most common forms of chlorine used in the disinfecting solutions are liquid chlorine (gas at atmospheric pressure), calcium hypochlorite granules, sodium hypochlorite solutions.

3.4.1 Liquid Chlorine

3.4.1.1 Use: Liquid chlorine shall be used only when suitable equipment is available and only under the direct supervision of a person familiar with the physiological, chemical, and physical properties of this element and who is properly trained and equipped to handle any emergency that may arise. Introduction of chlorine-gas directly from the supply cylinder is unsafe and shall not be permitted.

NOTE: The preferred equipment consists of a solution fed chlorinator in combination with a booster pump for injecting the chlorine-gas water mixture into the main to be disinfected. Direct feed chlorinators are not recommended because their use is limited to situations where the water pressure is lower than the chlorine cylinder pressure.

3.4.2 Hypochlorites

3.4.2.1 Calcium Hypochlorite: Calcium hypochlorite contains seventy (70%) percent available chlorine by weight. It is either granular or tabular in form. The tablets, 6-8 to the ounce, are designed to dissolve slowly in water. Calcium hypochlorite is packaged in containers of various types and sizes ranging from small plastic bottles to one hundred (100) pound drums.

A chlorine-water solution is prepared by dissolving the granules in water in the proportion requisite for the desired concentration.

3.4.2.2 Sodium Hypochlorite: Sodium hypochlorite is supplied in strengths from five and one-quarter (5.25%) to sixteen (16%) percent available chlorine. It is packaged in liquid form in glass, rubber, or plastic containers ranging in size from one (1) quart bottles to five (5) gallon carboys. It may also be purchased in bulk for delivery by tank truck.

The chlorine-water solution is prepared by adding hypochlorite to water. Product deterioration must be reckoned with in computing the quantity of sodium hypochlorite required for the desired concentration.

3.4.2.3 Application: The hypochlorite solutions shall be applied to the water main with a gasoline or electrically powered chemical feed pump designed for feeding chlorine solutions. For small applications, the solutions may be fed with a hand pump, for example, a hydraulic test pump. Feed lines shall be of such material and strength as to withstand safely the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the hypochlorite solution is applied to the main.

3.5 Methods of Chlorine Application

3.5.1 Continuous Feed Method: This method is suitable for general application.

3.5.1.1 Water from the existing distribution system or other approved sources of supply shall be made to flow at a constant, measured rate into the newly-laid pipe line. The water shall receive a dose of chlorine, also fed at a constant, measured rate. The two rates shall be proportioned so that the chlorine concentration in the water in the pipe is maintained at a minimum of 50 mg/l available chlorine. To assure that this concentration is maintained, the chlorine residual should be measured at regular intervals in accordance with the

procedures described in the current edition of Standard Methods and AWWA M12--Simplified Procedures for Water Examination.

NOTE: In the absence of a meter, the rate may be determined either by placing a pitot gauge at the discharge or by measuring the time to fill a container of known volume.

TABLE K-3 gives the amount of chlorine residual required for each one hundred (100) feet of pipe of various diameters. Solutions of one (1%) percent chlorine may be prepared with sodium hypochlorite or calcium hypochlorite. The latter solution requires approximately one (1) pound of calcium hypochlorite in eight and five tenths (8.5) gallons of water.

TABLE K-3
CHLORINE REQUIRED TO PRODUCT 50 Mg/l CONCENTRATION
IN 100 FT. OF PIPE (BY DIAMETER)

Pipe Size (in)	100 Percent Chlorine (lb)	1 Percent Chlorine Solutions (gal)
4	0.027	0.33
6	0.061	0.73
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88

3.5.1.2 During the application of the chlorine, valves shall be manipulated to prevent the treatment dosage from flowing back into the line supplying the water. Chlorine application shall not cease until the entire main is filled with the chlorine solution. The chlorinated water shall be retained in the main for at least twenty-four (24) hours during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this twenty-four (24) hour period, the treated water shall contain no less than 25 mg/l chlorine throughout the length of the main.

3.5.2 Slug Method: This method is suitable for use with mains of large diameter for which, because of the volumes of water involved, the continuous feed method is not practical.

3.5.2.1 Water from the existing distribution system or other approved source of supply shall be made to flow at a constant, measured rate (see ARTICLE 3.5.1.1) into the newly laid pipe line. The water shall receive a dose of chlorine also fed at a constant, measured rate. The two rates shall be proportioned so that the concentration in the water entering the pipe line is maintained at no less than 300 mg/l. The chlorine shall be applied continuously and for a sufficient period to develop a solid column or "slug" of chlorinated water that will, as it

passes along the line, expose all interior surfaces to a concentration of at least 300 mg/l for at least three (3) hours. The application shall be checked at a tap near the upstream end of the line by chlorine residual measurements.

3.5.2.2 As the chlorinated water flows past tees and crosses, related valves and hydrants shall be operated as to disinfect appurtenances.

3.6 Final Flushing.

3.6.1 Clearing the Main of Heavily Chlorinated Water. After the applicable retention period, the heavily chlorinated water shall not remain in prolonged contact with the pipe. This water shall be flushed from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system, or less than 1 mg/l. Chlorine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the pipe line.

3.6.2 Disposing of Heavily Chlorinated Water. The environment into which the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, then a neutralizing chemical shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water. (See Appendix B of ANSI/AWWA C651-92 for neutralizing chemicals.) Federal, state, provincial, and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

3.7 Bacteriologic Tests

3.7.1 After final flushing, and before the water main is placed in service, a sample or samples shall be collected from the end of the line and tested for bacteriologic quality and shall show the absence of coliform organisms. If the number and frequency of samples is not prescribed by the public health authority having jurisdiction, at least one sample shall be collected from chlorinated supplies where a chlorine residual is maintained throughout the new main. From unchlorinated supplies at least two samples shall be collected at least twenty-four (24) hours apart.

3.7.2 Samples for bacteriologic analysis shall be collected in sterile bottles treated with sodium thiosulphate. No hose or fire hydrant shall be used in collection of samples. A suggested sampling tap consists of a standard corporation cock installed in the main with a copper tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed, and retained for future use.

3.8 Repetition of Procedure. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained. The tablet method cannot be used in these subsequent

disinfections. When the sample tests indicate that disinfection has been effective, the main may be placed in service.

3.9 Procedure After Cutting Into or Repairing Existing Mains. The procedures outlined in this Article apply primarily when mains are wholly or partially dewatered. Leaks or breaks that are repaired with clamping devices while the mains remain full of water under pressure present little danger of contamination and require no disinfection.

3.9.1 Trench "Treatment": When an old line is opened, either by accident or by design, the excavation will likely be wet and may be badly contaminated from nearby sewers. Liberal quantities of hypochlorite applied to open trench areas will lessen the danger from such pollution. Tablets have the advantage in such a situation because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation.

3.9.2 Main Disinfection: The following procedure is considered as a minimum that may be used.

3.9.2.1 Swabbing With Hypochlorite Solution: The interior of all pipe and fittings used in making the repair (particularly couplings and tapping sleeves) shall be swabbed with a five (5%) percent hypochlorite solution before they are installed.

3.9.2.2 Flushing: Thorough flushing is the most practical means of removing contamination introduced during repairs. If valving and hydrant locations permit, flushing from both directions is recommended. Flushing shall be started as soon as the repairs are completed and continued until discolored water is eliminated.

3.9.2.3 Slug Method: Where practicable, in addition to the procedures of ARTICLE 3.9.2.1, a section of main in which the break is located shall be isolated, all service connections shut off, and the section flushed and chlorinated as described in ARTICLE 3.5.2, except that the dose may be increased to as much as 500 mg/l, and the contact time reduced to as little as one-half (1/2) hour. After chlorination, flushing shall be resumed and continued until discolored water is eliminated.

3.9.3 Sampling: Bacteriologic samples shall be taken after repairs to provide a record by which the effectiveness of the procedures used can be determined. If the direction of flow is unknown, samples shall be taken on each side of the main break.

4. PAYMENT

Payment for swabbing, pressure testing and sterilization of pipelines shall be included in the unit price for pipeline installation unless otherwise itemized on the Bid Schedule. Pipeline swabbing may be included in the Bid Schedule as a separate Bid Item.

SECTION 15104

METERS, SERVICES AND INDIVIDUAL PRESSURE REDUCING VALVES

1.0 GENERAL

The CONTRACTOR shall furnish all labor, tools, equipment and materials for installing water services as shown on the plans and as directed.

2.0 WATER METER SETTINGS

2.1 Materials. Meter settings shall include meter box and cover, coppersetter (including cut-off valve), four feet of pipe, saddle and corporation stop, iron pipe or rod to hold meter plumb, plus two feet of pipe and plug or cap on the customer's side of meter. (This latter item is to prevent the customer or his plumber from disarranging or loosening the meter after the CONTRACTOR has already set the meter in its proper position.) Stainless steel inserts must be used when attaching CTS fittings to P.E. tubing. Where the main line is in the highway right-of-way, meters shall be set as close to the right-of-way fence as practicable but no meter on the same side of the road as the main line shall be set with more than 6 feet of service line unless prior approval has been obtained from the ENGINEER or his representative or as directed on the plans.

2.2 Corporation Stops, Setters and Saddles. The corporation stops shall be equal to Ford F-Series. The meter setter shall be equal to the Ford 170-Series Coppersetter VB-HH-72-7W 44-33 with seven inch rise. Saddles shall be equal to Ford S70 Series for PVC, S90 for C900 and 202 Series for Ductile Iron Pipe.

Service line connections are to be made with compression fittings only.

2.3 Meters. The meters for this project will be supplied by water district.

2.4 Meter Boxes. Meter boxes for 5/8" x 3/4" meters shall be AMETEK meter box No. 190156, Meter Lid No. 193101, 6" Riser No. 19011. Provide shop drawing or product detail before placing order.

2.5 Installation. Meters shall be set in a workmanlike manner with backfill neatly compacted in place. In yards, pastures and other grassed areas, top of meter box may be placed no higher than 1/2 inch above original ground and no lower than flush with original ground. Boxes in sidewalks or other concrete areas shall be flush with surface. In areas which have not been sodded, top of box shall be 2 inches above grade. The service line must meet the same cover requirements as the main line as described in these specifications except that the service line may be brought up to a depth of approximately 24 inches within 5 feet of each

side of the meter installation when a 24-inch deep meter box is used. In all other cases the service pipe will be brought up to a depth which accommodates installation at the bottom of the meter box. The service pipe must return to 30 inch cover (36 inches in traffic) within 5 feet from the box. If meter box area is subject to traffic a deeper box will be required to maintain 36 inches of cover over the service pipe.

2.6 Payment. The Unit Price Bid shall constitute full compensation for furnishing and installing the saddle, corporation stop, meter box, meter, cover, meter setter and valve, holding rod, and service tubing extension as shown and specified. Installation of the meters will be done by the utility.

3.0 SERVICES

3.1 General. Service lines up to four (4) feet on the inlet side of the meter and two (2) feet on the customer side is included in the meter setting. Additional service pipe is an extra pay item and must be approved by the ENGINEER or designated Construction Representative.

3.2 Service Lines Not Crossing a Road. Unless indicated otherwise on the plans, all Service Lines shall be 3/4" Type K Copper Tubing, or polyethylene plastic tubing using a corporation stop in accordance with the Standard Details. Service pipe shall meet all AWWA Specifications with a minimum pressure rating of 200 psi. Polyethylene service tubing shall be ultra high density type equal to Performance Pipe or Endopoly Premium.

3.3 Service Lines Crossing a County Road or City Streets. Same as above, except that in general all pipe shall be jacked beneath certain paved or blacktopped city streets or county roads, unless solid rock prevents using this method in which case, the open trench method may be used. The open trench method generally will be used on all unpaved city streets, county roads and private driveways. In general, blacktopped and concrete private driveways shall also be jacked under. In all cases where lines are under traffic, a minimum cover of thirty-six (36") inches shall be provided and the service line shall be encased per the Miscellaneous Drawings. All backfill shall be compacted by air tampers in layers no greater than 6-inch depth. In cases of open trench construction, crushed stone, blacktop and concrete paving shall be replaced in accordance with the specifications and the Standard Drawings.

3.4 Service Lines Crossing a State Highway. Same as Section 3.3 except the casing pipe shall be jacked or pushed under paving. If solid rock is encountered, the crossing may be relocated to permit boring or jacking. No additional compensation will be made for relocation of service crossing.

Where required and specifically noted on the DRAWINGS, service pipe shall be encased under highways. Schedule 40 steel or PVC pipe shall be used as

casing pipe unless otherwise indicated by the plans. Polyethylene pipe will normally be encased. Where permitted rigid PVC pipe will not be encased but soft connections with polyethylene pipe will be required on either side of the boring length.

3.5 Payment. The Unit Price bid for the specific service pipe size shall constitute full compensation for all materials, equipment and labor for installing the service pipe. There shall be no distinction between service pipe bored, pushed or trenched. There shall be no extra compensation for replacement of crushed stone, blacktop or concrete paving.

4.0 INDIVIDUAL METER PRESSURE REDUCING VALVES

4.1 Pressure Reducing Valves (PRV) will be installed for individual services on pipelines with operating pressures in excess of 150 psi, or as directed by the Owner and Engineer.

4.2 The PRVs shall be a Wilkins, Model No. 600-LUSC, three-fourths (3/4") inch or approved equal complete with a bronze strainer. Mueller and Watts are also acceptable. Each regulator to have an adjustable pressure range of 60-125 psi and is to be set at 70 psi. The regulators shall be installed in a separate meter box with coppersetter same as the ones utilized for the meter settings. The PRVs shall be located between the water main and meter setting. Use of tandem coppersettlers or burying the PRV will not be permitted.

4.3 Payment. Payment for individual pressure reducing valves shall be included in the Bid Item for "Meter Setting with Individual Pressure Reducing Valves" and shall constitute full compensation for furnishing and installing the PRV, meter box and lid, unions, fitting adapters, holding rod, and service tubing extension complete and operative.

FIELD TESTING PROCEDURES

The general field procedures employed by the Field Services Center are summarized in the following outline. The procedures utilized by the AEI Field Service Center are recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Soil Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the surface conditions. Borings are advanced into the ground using continuous flight augers. At prescribed intervals throughout the boring depths, soil samples are obtained with a split- spoon or thin-walled sampler and sealed in airtight glass jars and labeled. The sampler is first seated 6 inches to penetrate loose cuttings and then driven an additional foot, where possible, with blows from a 140 pound hammer falling 30 inches. The number of blows required to drive the sampler each six-inch increment is recorded. The penetration resistance, or "N-value" is designated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. The split spoon sampling procedures used during the exploration are in general accordance with ASTM D 1586. Split spoon samples are considered to provide *disturbed* samples, yet are appropriate for most engineering applications. Thin-walled (Shelby tube) samples are considered to provide *undisturbed* samples and obtained when warranted in general accordance with ASTM D 1587.

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Core Drilling Procedures for use on refusal materials. Prior to coring, casing is set in the boring through the overburden soils. Refusal materials are then cored according to ASTM D-2113 using a diamond bit attached to the end of a hollow double tube core barrel. This device is rotated at high speeds and the cuttings are brought to the surface by circulating water. Samples of the material penetrated are protected and retained in the inner tube, which is retrieved at the end of each drill run. Upon retrieval of the inner tube the core is recovered, measured and placed in boxes for storage.

The subsurface conditions encountered during drilling are reported on a field test boring record by the driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soil in general accordance with the procedures outlined in ASTM D 2487 and D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

Representative portions of soil samples are placed in sealed containers and transported to the laboratory. In the laboratory, the samples are examined to verify the driller's field classifications. Test Boring Records are attached which show the soil descriptions and penetration resistances.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designate the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

Water table readings are normally taken in conjunction with borings and are recorded on the "Boring Logs". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Sampling Terminology

Undisturbed Sampling: Thin-walled or Shelby tube samples used for visual examination, classification tests and quantitative laboratory testing. This procedure is described by ASTM D 1587. Each tube, together with the encased soil, is carefully removed from the ground, made airtight and transported to the laboratory. Locations and depths of undisturbed samples are shown on the "Boring Logs."

Bag Sampling: Bulk samples of soil are obtained at selected locations. These samples consist of soil brought to the surface by the drilling augers, or obtained from test pits or the ground surface using hand tools. Samples are placed in bags, with sealed jar samples of the material, and taken to our laboratory for testing where more mass material is required (i.e. Proctors and CBR's). The locations of these samples are indicated on the appropriate logs, or on the Boring Location Plan.

CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

COHESIVE SOILS (Clay, Silt, and Mixtures)

<u>CONSISTENCY</u>	<u>SPT N-VALUE</u>	<u>Qu/Op (tsf)</u>	<u>PLASTICITY</u>	
Very Soft	2 blows/ft or less	0 – 0.25	Degree of	Plasticity
Soft	2 to 4 blows/ft	0.25 – 0.49	Plasticity	Index (PI)
Medium Stiff	4 to 8 blows/ft	0.50 – 0.99	Low	0 – 7
Stiff	8 to 15 blows/ft	1.00 – 2.00	Medium	8 – 22
Very Stiff	15 to 30 blows/ft	2.00 – 4.00	High	over 22
Hard	30 blows/ft or more	> 4.00		

NON-COHESIVE SOILS (Silt, Sand, Gravel, and Mixtures)

<u>DENSITY</u>	<u>SPT N-VALUE</u>	<u>PARTICLE SIZE IDENTIFICATION</u>	
Very Loose	4 blows/ft or less	Boulders	12 inch diameter or more
Loose	4 to 10 blows/ft	Cobbles	3 to 12 inch diameter
Medium Dense	10 to 30 blows/ft	Gravel	Coarse – 1 to 3 inch
Dense	30 to 50 blows/ft		Medium – ½ to 1 inch
Very Dense	50 blows/ft or more		Fine – ¼ to ½ inch
		Sand	Coarse – 0.6mm to ¼ inch
			Medium – 0.2mm to 0.6mm
			Fine – 0.05mm to 0.2mm
		Silt	0.05mm to 0.005mm
		Clay	0.005mm

RELATIVE PROPORTIONS

<u>Descriptive Term</u>	<u>Percent</u>
Trace	1 – 10
Trace to Some	11 – 20
Some	21 – 35
And	36 – 50

NOTES

Classification – The Unified Soil Classification System is used to identify soil unless otherwise noted.

Standard “N” Penetration Test (SPT) (ASTM D1586) – Driving a 2-inch O.D., 1 3/8-inch I.D. sampler a distance of 1 foot into undisturbed soil with a 140-pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6-inches to seat the sampler into undisturbed soil, and then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6 inches of penetration on the field drill log (e.g., 10/8/7). On the report log, the Standard Penetration Test result (i.e., the N value) is normally presented and consists of the sum of the 2nd and 3rd penetration counts (i.e., N = 8 + 7 = 15 blows/ft.)

Soil Property Symbols

Qu:	Unconfined Compressive Strength	N:	Standard Penetration Value (see above)
Qp:	Unconfined Comp. Strength (pocket pent.)	omc:	Optimum Moisture content
LL:	Liquid Limit, % (Atterberg Limit)	PL:	Plastic Limit, % (Atterberg Limit)
PI:	Plasticity Index	mdd:	Maximum Dry Density



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CLIENT Kenvirons, Inc. PROJECT NAME Battle Training Road Pump Station
 PROJECT NUMBER 213-193 PROJECT LOCATION Hardin County, Kentucky
 DATE STARTED 8/27/13 COMPLETED 8/28/13 GROUND ELEVATION 471.9 ft
 DRILLER James Felts GROUND WATER LEVELS:
 DRILLING METHOD HSA/ Diamond impregnated coring bit AT TIME OF DRILLING —
 LOGGED BY Jason Childress CHECKED BY Dusty Barrett AT END OF DRILLING —
 NOTES _____ AFTER DRILLING —

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (10 inches)									
0-10		(CL) lean CLAY, trace to some fine sand, trace to some fine to medium gravel, brown, moist to wet	ST 1	82		4.5+	24	37	20	17	
5			ST 2	67		4.5+	18	39	19	20	
10			ST 3	85		4.0	22				
10			ST 4	85		2.5	21				
15			ST 5	100		2.75	26				
20			ST 6	85		2.25	23				
25		weathered SHALE, gray	SPT 7	100	8-17-20 (37)	4.5+	16				vertical fracture noted from 26.0 to 26.6 feet
25-30		SHALE, silty to arenaceous, medium gray to bluish gray, soft to moderately hard, laminated to thin bedded	RC 8	100 (0)							
30			RC 9	100 (0)							
35			RC 10	100 (0)							

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CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		SHALE, silty to arenaceous, medium gray to bluish gray, soft to moderately hard, laminated to thin bedded (continued)									
			RC 11	100 (0)							
40			RC 12	100 (0)							
45											
Refusal at 25.5 feet. Bottom of borehole at 46.2 feet.											



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CLIENT Kenvrons, Inc.
 PROJECT NUMBER 213-193
 DATE STARTED 8/27/13 COMPLETED 8/27/13
 DRILLER James Felts
 DRILLING METHOD HSA/ Diamond impregnated coring bit
 LOGGED BY Jason Childress CHECKED BY Dusty Barrett
 NOTES _____

PROJECT NAME Battle Training Road Pump Station
 PROJECT LOCATION Hardin County, Kentucky
 GROUND ELEVATION 467.3 ft
 GROUND WATER LEVELS:
 AT TIME OF DRILLING —
 AT END OF DRILLING —
 AFTER DRILLING —

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (8 inches) (CL) lean CLAY, trace to some fine to medium sand, trace to some fine to medium gravel, brown, moist to wet, stiff to medium stiff									
3			SPT 1	100	4-5-6 (11)	4.5+	18				
5			SPT 2	100	4-5-6 (11)	4.5+	18				
10			SPT 3	67	3-3-5 (8)	2.25	24				
10			SPT 4	100	2-5-4 (9)	2.5	23				
15			SPT 5	100	2-3-4 (7)	1.25	25				
20			SPT 6	67	3-7-6 (13)	1.25	26				
25			SPT 7	67	8-6-8 (14)	<0.25	28				
30		weathered SHALE, gray									
30		SHALE, silty to arenaceous, medium gray to bluish gray, soft to moderately hard, laminated to thin bedded	RC 8	100 (0)							
35			RC 9	100 (0)							

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CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		SHALE, silty to arenaceous, medium gray to bluish gray, soft to moderately hard, laminated to thin bedded (continued)									
			RC 10	100 (0)							

Refusal at 29.3 feet.
Bottom of borehole at 39.8 feet.

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CLIENT Kenvirons, Inc. PROJECT NAME Battle Training Road Pump Station
 PROJECT NUMBER 213-193 PROJECT LOCATION Hardin County, Kentucky
 DATE STARTED 8/27/13 COMPLETED 8/27/13 GROUND ELEVATION 463.3 ft
 DRILLER James Felts GROUND WATER LEVELS:
 DRILLING METHOD Hollow-stem augers AT TIME OF DRILLING --
 LOGGED BY Jason Childress CHECKED BY Dusty Barrett AT END OF DRILLING --
 NOTES AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (10 inches)									
		(CL) lean CLAY, trace to some fine to medium sand, trace to some fine gravel, brown with gray mottle, moist to wet, stiff	SPT 1	87	6-7-6 (13)	4.5	16				
5			ST 2	100		3.75	17	33	18	15	
			SPT 3	87	3-5-5 (10)	3.0	18				
10			ST 4	80		4.5	22				
15			ST 5	100		0.75	24				
20			ST 6	75		1.0	21				
25		(CL) silty lean CLAY, trace to some fine sand, some fine gravel, gray, wet	ST 7	50		4.0	21				
Refusal at 29.3 feet. Bottom of borehole at 29.3 feet.											

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CLIENT Kenvirons, Inc. PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193 PROJECT LOCATION Hardin County, Kentucky

DATE STARTED 8/26/13 COMPLETED 8/26/13 GROUND ELEVATION 461.3 ft

DRILLER James Felts GROUND WATER LEVELS:

DRILLING METHOD HSA/ Diamond Impregnated coring bit AT TIME OF DRILLING —

LOGGED BY Jason Childress CHECKED BY Dusty Barrett AT END OF DRILLING —

NOTES AFTER DRILLING —

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (16 inches)	SPT 1	100	3-5-7 (12)	3.5	16				
		(CL) lean CLAY, trace to some fine to medium sand, trace to some fine to coarse gravel, brown to gray, moist to wet, stiff to very stiff	SPT 2	100	5-6-9 (15)	4.5	16				
5			ST 3	50		4.5	16	35	20	15	
			SPT 4	100	3-7-12 (19)	4.5	19				
10			ST 5	100		3.5	19				
15			ST 6	75		2.5	22				
20			SPT 7	100	4-5-6 (11)	3.5	19				
25			SPT 8	100	4-6-7 (13)	4.5	18				
30			SPT 9	100	4-6-14 (20)	3.0	21				
35		SHALE, silty to arenaceous, medium gray to bluish gray, moderately hard, laminated to thin bedded	RC 10	100 (0)							
			RC 11	100 (0)							

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PAGE 2 OF 2

CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35											
		SHALE, silty to arenaceous, medium gray to bluish gray, moderately hard, laminated to thin bedded (continued)	RC 12	100 (0)							
40											
Refusal at 31.7 feet. Bottom of borehole at 42.9 feet.											

GEOTECH BH COLUMNS - CINT STD US LAB.GDT - 10/8/13 08:07 - T:113 PROJECTS\213-193 BATTLE TRAINING ROAD PUMP STATION\213-193 BATTLE TRAINING ROAD PUMP STATION.GPJ



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S-1A

PAGE 1 OF 1

CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky

DATE STARTED 8/28/13 COMPLETED 8/28/13

GROUND ELEVATION _____

DRILLER James Felts

GROUND WATER LEVELS:

DRILLING METHOD Hollow-stem augers

AT TIME OF DRILLING --

LOGGED BY Jason Childress CHECKED BY Dusty Barrett

AT END OF DRILLING --

NOTES _____

AFTER DRILLING --

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 10/8/13 08:07 - T:\13 PROJECTS\213-193 BATTLE TRAINING ROAD PUMP STATION\213-193 BATTLE TRAINING ROAD PUMP STATION.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS	
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0		OVERBURDEN										
5												
10												
15												
20												
25												
Refusal at 28.8 feet. Bottom of borehole at 28.8 feet.												

Offset 15 feet and redrilled; original sounding refused at 2.2 feet



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KEY TO SYMBOLS

CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky

LITHOLOGIC SYMBOLS (Unified Soil Classification System)



CL: USCS Low Plasticity Clay



SHALE: Shale



TOPSOIL: Topsoil

SAMPLER SYMBOLS



Rock Core



Standard Penetration Test






Shelby Tube

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
 PI - PLASTIC INDEX (%)
 W - MOISTURE CONTENT (%)
 DD - DRY DENSITY (PCF)
 NP - NON PLASTIC
 -200 - PERCENT PASSING NO. 200 SIEVE
 PP - POCKET PENETROMETER (TSF)

TV - TORVANE
 PID - PHOTOIONIZATION DETECTOR
 UC - UNCONFINED COMPRESSION
 ppm - PARTS PER MILLION
 Water Level at Time
 Drilling, or as Shown
 Water Level at End of
 Drilling, or as Shown
 Water Level After 24
 Hours, or as Shown

KEY TO SYMBOLS - GINT STD US LAB.GDT - 10/8/13 08:08 - T:113 PROJECTS\213-193 BATTLE TRAINING ROAD PUMP STATION\213-193 BATTLE TRAINING ROAD PUMP STATION.GPJ

APPENDIX C

Laboratory Testing Results



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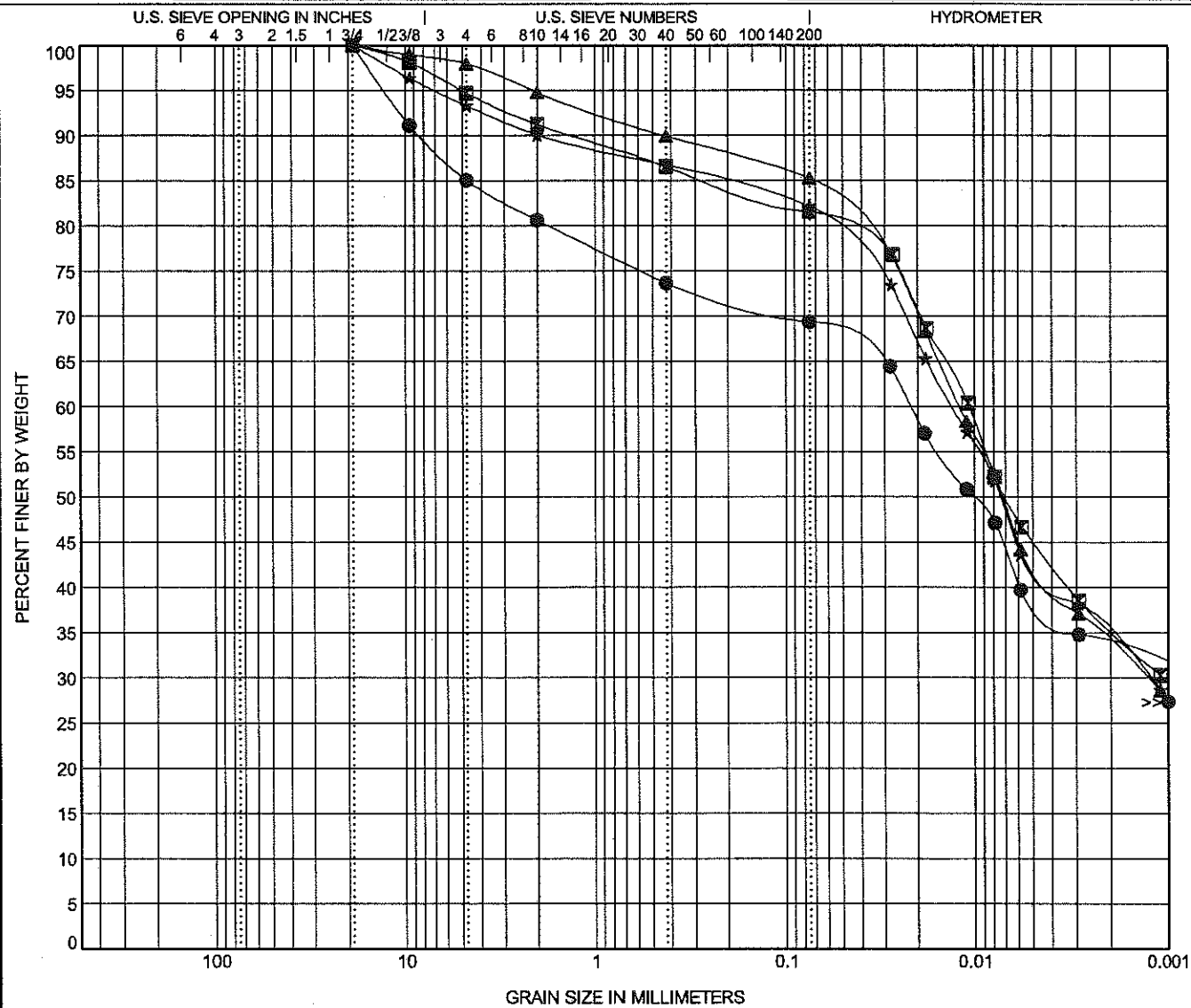
GRAIN SIZE DISTRIBUTION

CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-1	2.5	lean brown clay	37	20	17		
■ B-1	4.5	lean brown clay	39	19	20		
▲ B-3	5.0	lean brown clay	33	18	15		
★ B-4	5.0	lean brown clay	35	20	15		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-1	2.5	19	0.022	0.001		14.9	15.7	30.7	38.7
■ B-1	4.5	19	0.011			5.3	13.1	36.5	45.1
▲ B-3	5.0	19	0.012	0.001		2.0	12.7	42.6	42.7
★ B-4	5.0	19	0.013	0.001		6.7	11.1	39.7	42.4

GRAIN SIZE - GINT STD US LAB.GDT - 10/08/13 08:09 - T:113 PROJECTS\213-193 BATTLE TRAINING ROAD PUMP STATION\213-193 BATTLE TRAINING ROAD PUMP STATION.GPJ



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UNCONFINED COMPRESSION TEST

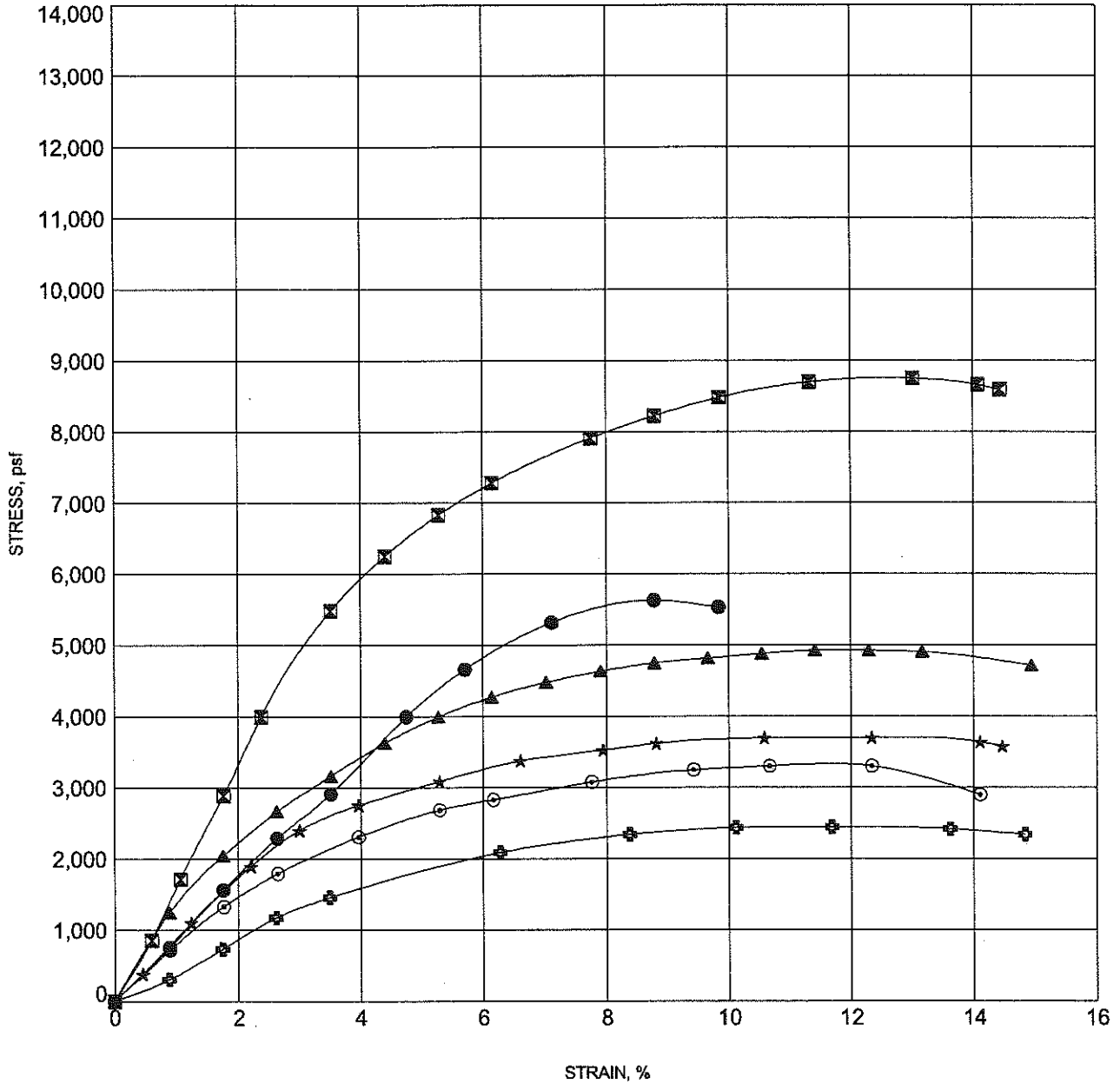
CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky

UNCONFINED - GINT STD US LAB.GDT - 10/8/13.06:09 - TX13 PROJECTS\213-193 BATTLE TRAINING ROAD PUMP STATION\213-193 BATTLE TRAINING ROAD PUMP STATION.GPJ



BOREHOLE	DEPTH	Classification	γ_d	Qu	
●	B-1	2.5	lean brown clay	100	5630
■	B-1	4.5	lean brown clay	110	8750
▲	B-1	7.5	lean brown clay	105	4926
★	B-1	9.5	lean brown clay	98	3695
⊙	B-1	14.5	lean brown clay	100	3299
◻	B-1	19.5	lean brown clay	106	2443



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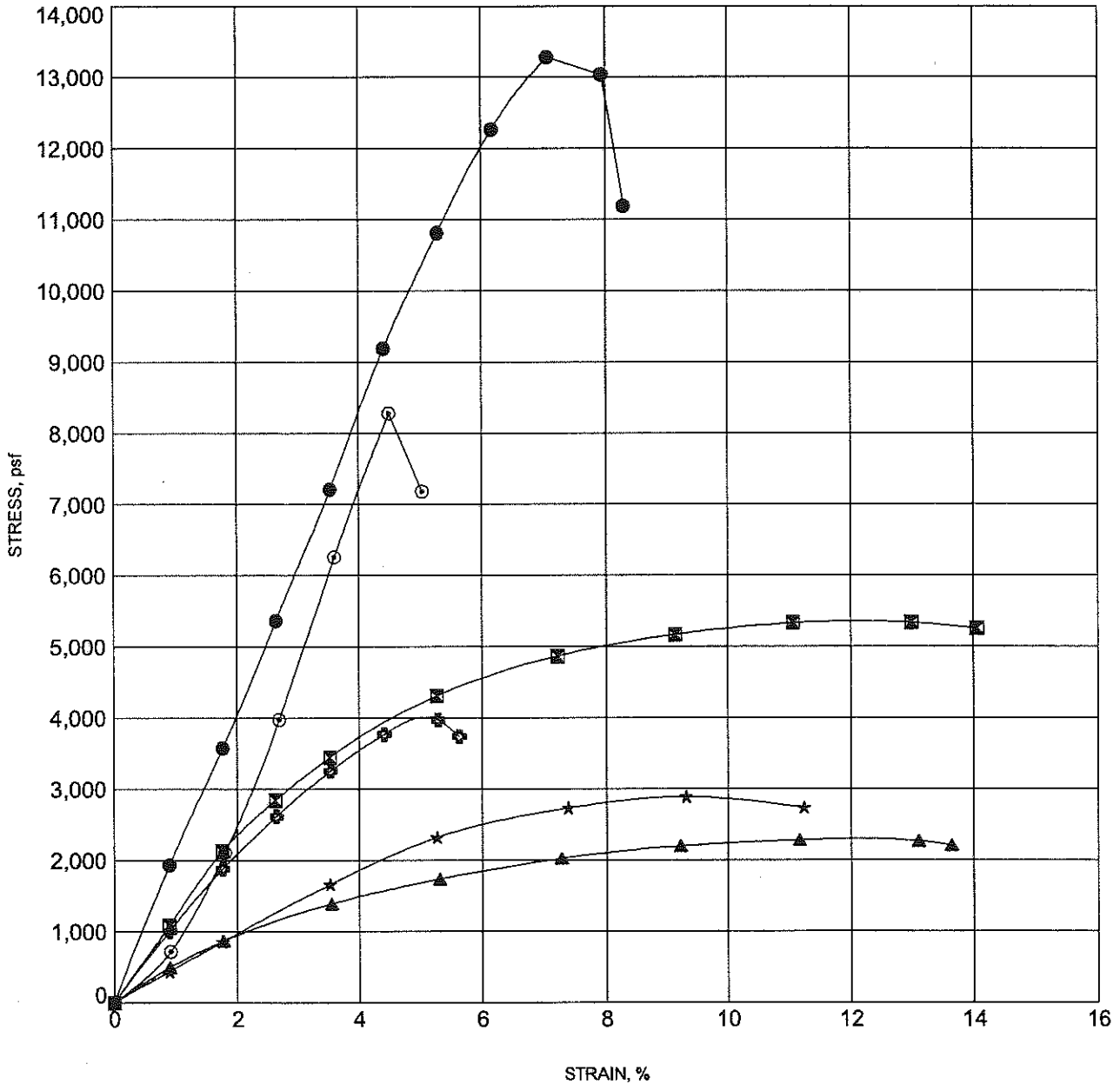
UNCONFINED COMPRESSION TEST

CLIENT Kenvirons, Inc.

PROJECT NAME Battle Training Road Pump Station

PROJECT NUMBER 213-193

PROJECT LOCATION Hardin County, Kentucky



UNCONFINED - GINT STD. US LAB. GDT - 10/6/13 08:09 - T:\13 PROJECTS\213-193 BATTLE TRAINING ROAD PUMP STATION\213-193 BATTLE TRAINING ROAD PUMP STATION.GPJ

BOREHOLE	DEPTH	Classification	γ_d	Qu
●	B-3 5.0	lean brown clay	113	13279
■	B-3 10.0	lean brown clay	103	5338
▲	B-3 15.0	lean gray tobrown clay	100	2277
★	B-3 20.0	lean brown clay	111	2889
○	B-4 5.0	lean brown clay	108	8278
◇	B-4 10.0	lean brown clay	100	3970

Your Geotechnical Engineering Report

To help manage your risks, this information is being provided because subsurface issues are a major cause of construction delays, cost overruns, disputes, and claims.

Geotechnical Services are Performed for Specific Projects, Purposes, and People

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering exploration conducted for an engineer may not fulfill the needs of a contractor or even another engineer. Each geotechnical engineering exploration and report is unique and is prepared solely for the client. No one except the client should rely on the geotechnical engineering report without first consulting with the geotechnical engineer who prepared it. The report should not be applied for any project or purpose except the one originally intended.

Read the Entire Report

To avoid serious problems, the full geotechnical engineering report should be read in its entirety. Do not only read selected sections or the executive summary.

A Unique Set of Project-Specific Factors is the Basis for a Geotechnical Engineering Report

Geotechnical engineers consider a numerous unique, project-specific factors when determining the scope of a study. Typical factors include: the client's goals, objectives, project costs, risk management preferences, proposed structures, structures on site, topography, and other proposed or existing site improvements, such as access roads, parking lots, and utilities. Unless indicated otherwise by the geotechnical engineer who conducted the original exploration, a geotechnical engineering report should not be relied upon if it was:

- not prepared for you or your project,
- not prepared for the specific site explored, or
- completed before important changes to the project were implemented.

Typical changes that can lessen the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a multi-story hotel to a parking lot
- finished floor elevation, location, orientation, or weight of the proposed structure, anticipated loads or
- project ownership

Geotechnical engineers cannot be held liable or

responsible for issues that occur because their report did not take into account development items of which they were not informed. The geotechnical engineer should always be notified of any project changes. Upon notification, it should be requested of the geotechnical engineer to give an assessment of the impact of the project changes.

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that exist at the time of the exploration. A geotechnical engineering report should not be relied upon if its reliability could be in question due to factors such as man-made events as construction on or adjacent to the site, natural events such as floods, earthquakes, or groundwater fluctuation, or time. To determine if a geotechnical report is still reliable, contact the geotechnical engineer. Major problems could be avoided by performing a minimal amount of additional analysis and/or testing.

Most Geotechnical Findings are Professional Opinions

Geotechnical site explorations identify subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field logs and laboratory data and apply their professional judgment to make conclusions about the subsurface conditions throughout the site. Actual subsurface conditions may differ from those indicated in the report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risk associated with unanticipated conditions.

The Recommendations within a Report Are Not Final

Do not put too much faith on the construction recommendations included in the report. The recommendations are not final due to geotechnical engineers developing them principally from judgment and opinion. Only by observing actual subsurface conditions revealed during construction can geotechnical engineers finalize their recommendations. Responsibility and liability cannot be assumed for the recommendations

within the report by the geotechnical engineer who developed the report if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject To Misinterpretation

Misinterpretation of geotechnical engineering reports has resulted in costly problems. The risk of misinterpretation can be lowered after the submittal of the final report by having the geotechnical engineer consult with appropriate members of the design team. The geotechnical engineer could also be retained to review crucial parts of the plans and specifications put together by the design team. The geotechnical engineering report can also be misinterpreted by contractors which can result in many problems. By participating in pre-bid and preconstruction meetings and providing construction observations by the geotechnical engineer, many risks can be reduced.

Final Boring Logs Should not be Re-drawn

Geotechnical engineers prepare final boring logs and testing results based on field logs and laboratory data. The logs included in a final geotechnical engineering report should never be redrawn to be included in architectural or design drawings due to errors that could be made. Electronic reproduction is acceptable, along with photographic reproduction, but it should be understood that separating logs from the report can elevate risk.

Contractors Need a Complete Report and Guidance

By limiting what is provided for bid preparation, contractors are not liable for unforeseen subsurface conditions although some owners and design professionals believe the opposite to be true. The complete geotechnical engineering report, accompanied with a cover letter or transmittal, should be provided to contractors to help prevent costly problems. The letter states that the report was not prepared for purposes of bid

development and the report's accuracy is limited. Although a fee may be required, encourage the contractors to consult with the geotechnical engineer who prepared the report and/or to conduct additional studies to obtain the specific types of information they need or prefer. A prebid conference involving the owner, geotechnical engineer, and contractors can prove to be very valuable. If needed, allow contractors sufficient time to perform additional studies. Upon doing this you might be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Closely Read Responsibility Provisions

Geotechnical engineering is not as exact as other engineering disciplines. This lack of understanding by clients, design professionals, and contractors has created unrealistic expectations that have led to disappointments, claims, and disputes. To minimize such risks, a variety of explanatory provisions may be included in the report by the geotechnical engineer. To help others recognize their own responsibilities and risks, many of these provisions indicate where the geotechnical engineer's responsibilities begin and end. These provisions should be read carefully, questions asked if needed, and the geotechnical engineer should provide satisfactory responses.

Environmental Issues/Concerns are not Covered

Unforeseen environmental issues can lead to project delays or even failures. Geotechnical engineering reports do not usually include environmental findings, conclusions, or recommendations. As with a geotechnical engineering report, do not rely on an environmental report that was prepared for someone else.



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**LOUISVILLE WATER COMPANY
MASTER METER SITE**





April 17, 2014

Mr. Carlos F. Miller, PE
Kenvirons, Inc.
452 Versailles Road
Frankfort, Kentucky 40601

Re: Report of Geotechnical Exploration
Hardin County Water District No. 2
LWC Water Supply Transmission Main to HCWD#2
Crossing Rolling Fork River
Hardin & Bullitt Counties, Kentucky
AEI Project No. 214-023

Dear Mr. Miller:

American Engineers, Inc. (AEI) is pleased to submit this geotechnical report that details the results of our geotechnical exploration performed at the above referenced site.

Available geologic mapping (*Geologic Map of the Lebanon Junction, Central Kentucky, USGS 1967, and the Kentucky Geological Survey Geologic Map Information Service* online) shows the site to be underlain by Quaternary Lacustrine Deposits and Alluvium. Bedrock underlying the overburden appears to be the Devonian Beechwood Limestone Member of the Sellersburg Limestone.

Mapping describes the lacustrine deposits and alluvium as clay, silt, sand and gravel. Dominantly the material is described as yellowish-brown silty clay. A layer of sand and clay of fluvial origin as much as ten feet thick lies on the bedrock beneath the lacustrine deposits. The Beechwood Limestone is described as fine to very coarse grained in texture, weathers to grayish orange to light brown in color and commonly weathers with a deeply pitted surface.

AEI completed two soil test borings with rock core at the locations indicated on the attached layout. Sandy lean clays were encountered in both borings and can further be described as light brown to brown in color, moist to saturated and soft to very stiff in strength. Near the bedrock surface, the sandy lean clay transitions to clayey sand. The SPT-N values in the residual clay ranged from three to 23 blows per foot (bpf) with most values between four and eight blows per foot. Corresponding Q_p values ranged from less than 0.25 to 2.5 tons per square foot (tsf) with most values between 0.5 and 1.5 tsf. Together, the SPT-N and Q_p values within the residual clays are indicative of medium stiff strength consistencies with soft and very stiff zones. The SPT-N values in the residual clayey sand ranged from eight to 50 bpf indicating a density of loose to very dense.

Refusal, as would be indicated by the Driller on the field boring logs, indicates a depth where either essentially no downward progress can be made by the auger. It is normally indicative of a very hard or very dense material such as large boulders or the upper bedrock surface or where the N-value indicates essentially no penetration of the split-spoon sampler. Auger refusal in the borings ranged from about 43 to 64 feet. Rock coring was performed beyond the auger refusal depths in each boring. The recovered

rock core was described as limestone. The limestone can be further described as arenaceous, very fine to medium crystalline, light to medium gray, moderately to very hard, very thin to thin bedded, vuggy, stylolitic and very porous. Recovery percentages of individual core runs ranged from 99 to 100 percent, while RQD (Rock Quality Designation) percentages ranged from zero to 84 percent. Overall, the recovered rock core can be classified as poor quality.

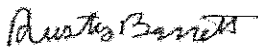
Groundwater was encountered in Boring B-2 at a depth of 14 feet. Rock coring was performed in both borings making long term readings invalid. It is probable the water level in the area is highly variable based on precipitation events and proximity to the Rolling Fork River.

Laboratory testing consisted of natural moisture content, Atterberg limits and grain size testing. Moisture contents of the residual soils ranged from about 22 to 33 percent with most values between 26 and 29 percent. Atterberg limits testing results indicated liquid limits results ranging from 31 to 36 percent, with a corresponding plasticity indices ranging from 13 to 17 percent.

A copy of the boring logs and laboratory data is attached.

We appreciate the opportunity to be of service to you on this project and hope to provide further support on this and other projects in the future. Please contact us if you have any questions regarding this report.

Respectfully,
AMERICAN ENGINEERS, INC.


Dusty Barrett, PE
Geotechnical Project Manager


Dennis Mitchell, PE
Director of Geotechnical Services

attachments



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 85 Abardoch Drive
 Glasgow, KY 40241
 (270) 851-7226

CLIENT Kenvirons, Inc. PROJECT NAME LWC Water Supply Transmission Line
 PROJECT NUMBER 214-023 PROJECT LOCATION Hardin & Bullitt Counties, KY
 DATE STARTED 2/25/14 COMPLETED 3/4/14 GROUND ELEVATION 445.4 ft
 DRILLER Adam Thompson GROUND WATER LEVELS:
 DRILLING METHOD HSA/ Diamond impregnated coring bit AT TIME OF DRILLING —
 LOGGED BY Cole Poynter CHECKED BY Dusty Barrett AT END OF DRILLING —
 NOTES 208+15 CL AFTER DRILLING —

GEO TECH BH COLUMNS - GINT STD US LAB GDT - 4/7/14 16:05 - T:114 PROJECTS\214-023 LWC WATER SUPPLY TRANSMISSION LINE\LAB TESTING\LWC TRANS LINE GEOTECH.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		(CL) sandy lean CLAY- light brown- moist to wet- medium stiff to very stiff									
5			X SS 1	100	3-6-9 (15)	2.5	22				
10			X SS 2	100	2-3-4 (7)	1.75	24				
15			X SS 3	100	3-9-14 (23)	<0.25	24	31	18	13	
20			X SS 4	100	3-4-6 (10)	2.5	26				
25			X SS 5	100	3-3-6 (9)	1.5	26				
30		(CL) sandy lean CLAY- gray- wet- medium stiff to stiff	X SS 6	53	2-3-5 (8)	1.25	28	35	20	15	
35			X SS 7	80	3-2-4 (6)	2.25	29				

(Continued Next Page)



CLIENT Kenvirons, Inc.

PROJECT NAME LWC Water Supply Transmission Line

PROJECT NUMBER 214-023

PROJECT LOCATION Hardin & Bullitt Counties, KY

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		(CL) sandy lean CLAY- gray- wet- medium stiff to stiff <i>(continued)</i>									
40			X SS 8	100	2-3-4 (7)	2.25	28	36	19	17	
45			X SS 9	100	1-3-6 (9)	1.5	26				
50			X SS 10	67	1-3-1 (4)	0.75	31				
55			X SS 11	0	2-3-5 (8)	n/a					
60		(SC-SM) clayey SAND- coarse grained- gray- wet to saturated- loose	X SS 12	80	3-3-5 (8)	<0.25	32	NP	NP	NP	
65		LIMESTONE- very fine to fine crystalline- light to medium gray- very hard to hard- very thin to thin bedded- vuggy- stylolitic	RC 13	100 (0)							
			RC 14	100 (53)							
70			RC 15	99 (78)							
75											Clay seam @ 73.1'

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PAGE 3 OF 3

CLIENT Kenvirons, Inc. PROJECT NAME LWC Water Supply Transmission Line
 PROJECT NUMBER 214-023 PROJECT LOCATION Hardin & Bullitt Counties, KY

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
75		LIMESTONE- very fine to fine crystalline- light to medium gray- very hard to hard- very thin to thin bedded- vuggy- stylolitic (continued).	RC 16	100 (84)							Clay seams @ 76' and 76.9'
80			RC 17	100 (59)							
85											
Refusal at 64.0 feet. Bottom of borehole at 85.2 feet.											

GEO TECH BH COLUMNS - GINT STD US LAB.GDT - 4/7/14 16:05 - T314 PROJECTS214-023 LWC WATER SUPPLY TRANSMISSION LINE LAB TESTING\GWT TRANS LINE GEOTECH.GPJ



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B-2

PAGE 1 OF 2

CLIENT Kenvirons, Inc. PROJECT NAME LWC Water Supply Transmission Line
 PROJECT NUMBER 214-023 PROJECT LOCATION Hardin & Bullitt Counties, KY
 DATE STARTED 2/24/14 COMPLETED 2/24/14 GROUND ELEVATION 422 ft
 DRILLER Adam Thompson GROUND WATER LEVELS:
 DRILLING METHOD Hollow Stem Auger ∇ AT TIME OF DRILLING 14.0 ft / Elev 408.00 ft
 LOGGED BY Cole Poynter CHECKED BY Dusty Barrett AT END OF DRILLING —
 NOTES 201+40 CL AFTER DRILLING —

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (9 inches) (CL) sandy lean CLAY- brown- wet to saturated- soft to medium stiff									
5			SS 1	73	2-3-4 (7)	0.5	33				
			SS 2	87	1-2-3 (5)	0.5	27				
			SS 3	87	1-2-1 (3)	<0.25	31				
			SS 4	87	1-2-1 (3)	0.25	30				
15	∇		SS 5	93	1-2-2 (4)	<0.25	32				
20			SS 6	100	1-2-1 (3)	<0.25	29				
25			SS 7	93	2-2-2 (4)	0.5	26				
30			SS 8	100	2-2-3 (5)	<0.25	29				
35											

(Continued Next Page)

GEO TECH BH COLUMNS - GINT STD US LAB.GDT - 4/7/14 16:05 - T:114 PROJECTS\214-023 LWC WATER SUPPLY TRANSMISSION LINE\LAB TESTING\LWC TRANS LINE GEOTECH.GPJ



CLIENT Kenvirons, Inc.

PROJECT NAME LWC Water Supply Transmission Line

PROJECT NUMBER 214-023

PROJECT LOCATION Hardin & Bullitt Counties, KY

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		(CL) sandy lean CLAY- brown- wet to saturated- soft to medium stiff <i>(continued)</i>	SS 9	0	2-3-2 (5)	n/a					
40		(SP-SC) clayey SAND- coarse grained- bluish gray- wet to saturated- very dense	SS 10	60	12-23-27 (50)	<0.25	27				
45		Auger Refusal/ Begin Core @ 43.3									
		LIMESTONE- arenaceous- fine to medium crystalline- medium to light gray- moderately hard to hard- thin bedded- very porous	RC 11	100 (0)							
			RC 12	100 (24)							
50			RC 13	100 (60)							

Refusal at 43.3 feet.
 Bottom of borehole at 54.6 feet.

GEO TECH BH COLUMNS - GINT STD US LAB.GDT - 4/7/14 16:05 - T:\14 PROJECTS\214-023 LWC WATER SUPPLY TRANSMISSION LINE\LAB TESTING\LWC TRANS LINE GEOTECH.GPJ



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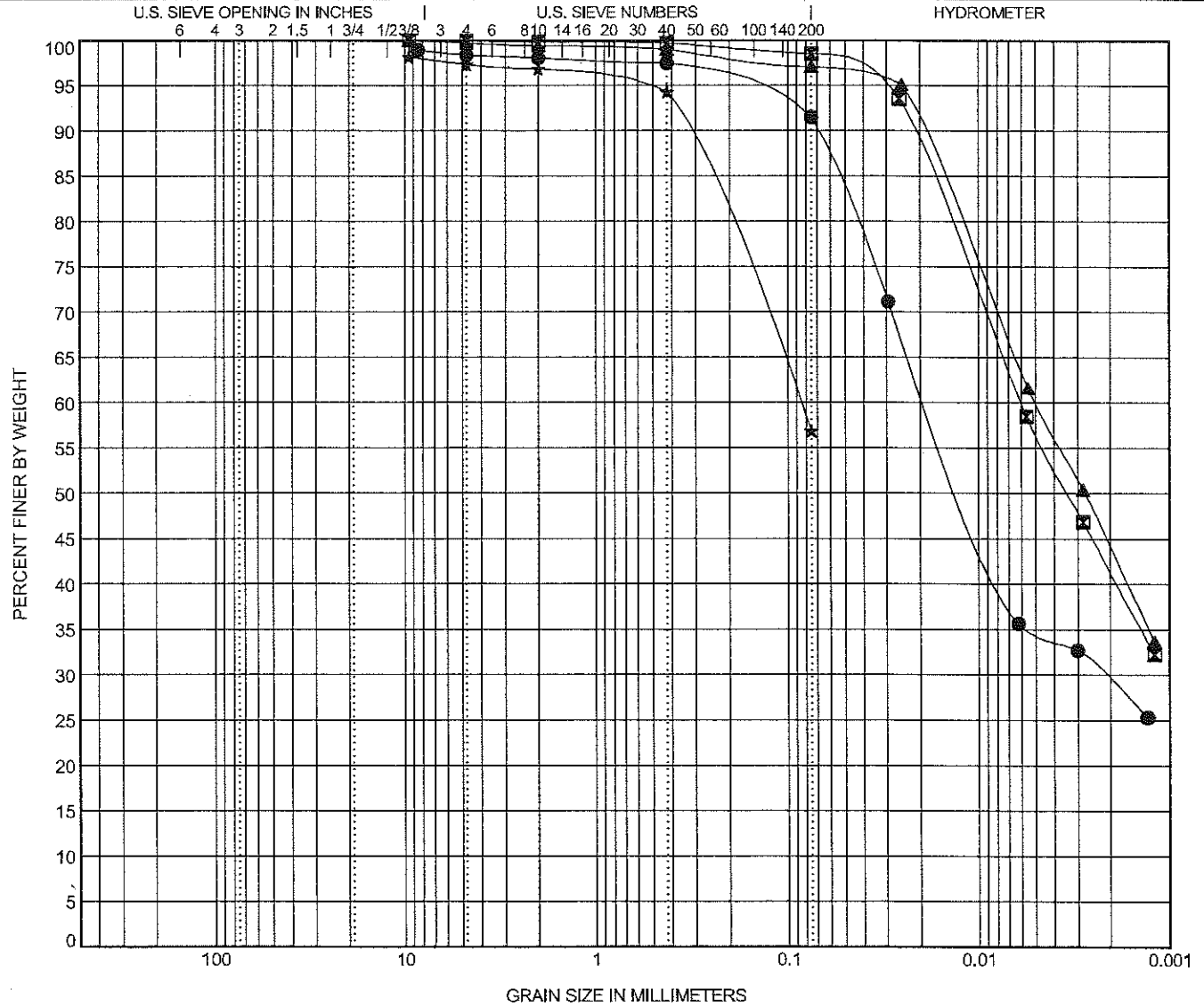
GRAIN SIZE DISTRIBUTION

CLIENT Kenvirons, Inc.

PROJECT NAME LWC Water Supply Transmission Line

PROJECT NUMBER 214-023

PROJECT LOCATION Hardin & Bullitt Counties, KY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-1	13.0	LEAN CLAY(CL)	31	18	13		
■ B-1	28.0	LEAN CLAY(CL)	35	20	15		
▲ B-1	38.0	LEAN CLAY(CL)	36	19	17		
★ B-1	58.0	SANDY SILT(ML)	NP	NP	NP		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-1	13.0	8.5	0.018	0.002		0.5	6.9	56.7	34.8
■ B-1	28.0	9.5	0.006			0.1	1.4	41.9	56.6
▲ B-1	38.0	9.5	0.005			0.3	2.6	37.0	60.0
★ B-1	58.0	9.5	0.087			0.8	40.4	56.9	

GRAIN SIZE - GINT STD US LAB.GDT - 4/7/14 15:32 - T:\14 PROJECTS\214-023 LWC WATER SUPPLY TRANSMISSION LINE\LAB TESTING\LWC TRANS LINE GEO TECH.GPJ

APPENDIX B

Boring Logs



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SECTION 15105

FIRE HYDRANTS

1.0 WORK INCLUDED

Under this Item, the CONTRACTOR shall provide all labor, tools, equipment and materials to furnish and install fire hydrants with gate valves as shown on the drawing and as directed by the ENGINEER.

2.0 MATERIALS

The hydrants shall be designated on the DRAWINGS as follows:

Type 1 one hose outlet

Type 2 two hose outlets

Type 3 two hose outlets and one steamer connection

All fire hydrants on lines 6-inch and larger shall have a six inch bell connection and four-inch bell connection on lines smaller than 6-inch. Hydrants shall be designed for 250 psi working pressure and seat tested at 500 psi and shall conform to the latest specifications of the AWWA. All working parts shall be bronze. The hose outlets and steamer nozzle shall be of such size and design that it will fit the present fire fighting equipment. Hydrants shall be designed so that no water will be lost when they are broken off and so they can be repaired with a repair kit. Design, materials, and workmanship shall be similar and equal to the latest stock pattern ordinarily produced by the manufacturer. Length of barrel shall be such to provide ample cover over the connecting line. Working drawings and full description of hydrants shall be submitted to the ENGINEER before ordering. All hydrants shall have a 4 1/4 or 5 1/4 inch valve opening against pressure. The hydrants shall be equal to Kennedy Model K81A or Mueller Model A-423. Four spanner wrenches for operation of the hydrants shall be furnished for the DISTRICT'S use.

3.0 PAINT

Hydrants shall be painted one coat of primer and two finish coats of approved paint of color **Natural Blue**. Painting shall conform to AWWA C902-85, Section 4.2 Painting.

4.0 INSTALLATION

Hydrants shall be set at such elevations that the connecting pipe will have the same depth of cover as the distribution main. The hydrant shall be set upon a

slab of stone or concrete not less than four inches thick and 15 inches square. The back of the hydrant opposite the pipe connection shall be firmly wedged against one and one-half square feet or enough of the vertical face of the trench with concrete to prevent the hydrants from blowing off the line. The entire fire hydrant piping assembly from the main line tee to the hydrant shall be joint restrained. The joint restraints shall be equal to Meg-a-Lug for mechanical joint pipe as manufactured by EBBA IRON and rated for 350 psi minimum.

Not less than seven cubic feet of No. 9 stone shall be placed around the base of the hydrant to insure drainage. Before the No. 9 stone is placed and before it is backfilled the drain hole shall be inspected and thoroughly cleaned if necessary. The backfill around the hydrant shall be thoroughly compacted to the grade line in a manner satisfactory to the ENGINEER. Hydrants shall have the interior cleaned of all foreign matter before installation.

All hydrants will be installed with the pumper connection facing the main access road or as directed by the ENGINEER.

Stuffing boxes shall be tightened and the hydrants shall be inspected in open and closed position to see that all parts are in working condition.

5.0 PAYMENT

The unit price bid shall constitute full compensation for furnishing and installing the fire hydrants and associated gate valve as specified.

SECTION 15220 DIRECTIONAL DRILLING

1. GENERAL

Directional drilling construction methods shall be used to cross streams as shown in the plans and as directed by the Engineer.

2. POLYETHYLENE PIPE

Polyethylene pipe shall conform with ASTM D-3350 "Polyethylene Plastic Pipe and Fitting Materials" for high density pressure pipe manufactured of grade P34 resin material with a hydrostatic-design basis (HDB) rating of 1,600 psi at 73.4 degrees F (23 degrees C).

High-density polyethylene pipe shall be manufactured and tested in conformance to the requirements of the latest revision of the American Society for Testing and Materials designation ASTM D-3350, "Polyethylene Plastic Pipe and Fitting Materials". High-density polyethylene pipe shall have a grade designation of PE 3408 and a cell classification designation of PE 345434C. No material shall be used in the pipe or fittings, which has been demonstrated to be detrimental to water quality.

High-density polyethylene pipe shall be joined by means of butt fusion as per the manufacturer's recommendations.

The high-density polyethylene pipe used as a carrier pipe shall be as specified on the Drawings. Polyethylene pipe used as a casing pipe shall be SDR-11. There shall be a minimum of 1/2" clearance in all directions between the outside diameter of the carrier pipe and inside diameter of the casing pipe. Polyethylene pipe shall be as manufactured by Phillips Driscopipe, Inc. or approved equal.

3. EXECUTION

The directional drilling shall use a bentonite type drilling fluid to act as a lubricant and to fill the void between the polyethylene casing pipe and the bore hole. The CONTRACTOR shall be careful in the depth and direction of the bore to not disturb the creek or river bottom or banks. Casing pipe will be required for all creek crossings. The casing pipe shall be pulled through the bore hole and the polyethylene carrier pipe will be pulled through the casing pipe.

4. PAYMENT

The unit price bid for directional drilling shall be full compensation for supplying the carrier pipe and casing pipe, and all material, labor, equipment, and tools for the construction of the water line by directional drilling. Payment will be made by the unit price bid for each Directional Bore Creek Crossing entered on the Bid Schedule.



SECTION 15221

RESTRAINED JOINTS FOR PUSH-ON AND MECHANICAL JOINT DUCTILE IRON PIPE, FITTINGS AND VALVES

1.0 GENERAL

This section specifies field installed restraints for ductile iron pipe, fittings and valves.

2.0 FIELD LOCK GASKET RESTRAINTS

Field Lock Gasket Restraints shall be a boltless, integral restraining system for ductile iron push-on joint pipe manufactured with stainless steel locking segments vulcanized into the gasket that grip the pipe to prevent joint separation. ANSI/AWWA C111/A21.11 Standard for Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings shall apply. The pressure rating shall be 350 psi for 4" – 24" pipe sizes with the stipulation that the pressure rating does not exceed the pressure rating of the pipe in which it is installed. The assembly of the gaskets shall be in strict accordance with the assembly instructions of the manufacturer/provider of the gaskets.

3.0 MECHANICAL JOINT RESTRAINT

Restraint devices for mechanical joint fittings and appurtenances conforming to either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53, shall conform to the following:

A. Design

Restraint devices for nominal pipe sizes 3 inch through 48 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.

The devices shall have a working pressure rating of 350 psi for 3-16 inch and 250 psi for 18-48 inch. Tandem devices shall be rated at two (2) times the pressure rating of the standard devices. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.

B. Material

Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.

For applications requiring restraint 30 inch and greater, an alternate grade of iron meeting the material requirements of ASTM A536 is acceptable, providing the device meets all end product performance requirements.

Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.

Three (3) test bars shall be incrementally poured per production shift as per Underwriter's Laboratory (U.L.) Specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.

Chemical and nodularity tests shall be performed as recommended by the Ductile Iron Society, on a per ladle basis.

C. Traceability

An identification number consisting of year, day, plant and shift (YYDDD) (plant designation) (Shift number), shall be cast into each gland body.

All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. These Material Traceability Records (MTR's) are to be made available, in hard copy, to the purchaser that requests such documentation and submits his gland body identification number.

Production pieces that are too small to accommodate individual numbering, such as fasteners and wedges, shall be controlled in segregate inventory until such time as all quality control tests are passed. These component parts may then be released to a general inventory for final assembly and packaging.

All components shall be manufactured and assembled in the United States. The purchaser shall, with reasonable notice, have the right to plant visitation at his/her expense.

D. Installation

Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly as well as allowing joint deflection after assembly. The installation shall strictly conform with the manufacturer's installation instructions.

Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.

E. Approvals

Restraint devices shall be Listed by Underwriters Laboratories (3" through 24" size) and Approved by Factory Mutual (3" through 12" size).

Mechanical joint restraint for ductile iron pipe shall be Megalug Series 1100 produced by EBAA Iron Inc. or approved equal.

F. Restraint Coating System

All wedge assemblies and related parts shall be processed through a phosphate wash, rinse and drying operation prior to coating application. The coating shall

consist of a minimum of two coats of liquid thermoset epoxy coating with heat cure to follow each coat.

All casting bodies shall be surface pretreated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance.

4.0 MEASUREMENT AND PAYMENT

Measurement and payment may be based on a unit price per item or considered incidental to other items of construction as described in the Drawings and/or Specifications.

SECTION 15222

V-BIO ENHANCED POLYETHYLENE ENCASUREMENT FOR DUCTILE IRON PIPE

1.0 GENERAL

Polyethylene encasement shall be installed on ductile iron pipe in area locations and to plan lengths as designated on the project drawings. Polyethylene encasement for use with ductile iron pipe shall meet all the requirements for ANSI/AWWA C105/A21.5, **Polyethylene Encasement for Ductile Iron Pipe Systems** which is included herewith by reference.

2.0 INSTALLATION

Ductile iron pipe and the polyethylene encasement used to protect it shall be installed in accordance with AWWA C600 and ANSI/AWWA C105/A21.5 and also in accordance with all recommendations and practices of the AWWA M41, Manual of Water Supply Practices – Ductile Iron Pipe and Fittings. Specifically, the wrap shall be overlapped one foot in each direction at joints and secured in place around the pipe and any wrap at tap locations shall be taped tightly prior to tapping and inspected for any needed repairs following the tap.

All installations shall be carried out by personnel trained and equipped to meet these various requirements.

The installing contractor shall submit an affidavit stating compliance with the requirements and practices of ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51, ANSI/AWWA C105/A21.5, AWWA C600 and M41.

3.0 MATERIALS

3.1 Linear Low Density Polyethylene Film

Linear low density polyethylene film shall be manufactured from virgin polyethylene material conforming to the following:

- 3.1.1 Raw material requirements, per ASTM D4976
 - Group: 2 (Linear)
 - Density: 0.910 to 0.935 g/cm³
 - Dielectric Strength: Volume resistivity, 10¹⁵ ohm-cm, minimum

3.1.2 Physical Properties of Finished Film

Tensile Strength: 3,600 psi (24.8 MPa), for an 8-mil (200- μ m) minimum thickness, minimum in machine and transverse direction (ASTM D882)

Elongation: 700 percent, minimum in machine and transverse direction (ASTM D882)

Dielectric Strength: 800 V/mil (31.8 V/ μ m) thickness, minimum (ASTM D149)

Impact Resistance: 600 g, minimum (ASTM D1709 Method B)

Propagation Tear Resistance: 2,550 gf (grams force), minimum in machine and transverse direction (ASTM D1922)

3.1.3 Polyethylene encasement for use with ductile iron pipe systems shall consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than 8 mils.

The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of anti-microbial biocide to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.

3.2 Tube Size or Sheet Width

Tube size or sheet width for each pipe diameter shall be as listed in Table 1 contained in ANSI/AWWA C105/A21.5, **Polyethylene Encasement for Ductile Iron Pipe Systems**.

3.3 Marking

3.3.1 Marking Requirements

The polyethylene film supplied shall be clearly marked, at a minimum of every 2 ft along its length, containing the following information:

- a. Manufacturer's name or trademark
- b. Year of Manufacture
- c. ANSI/AWWA C105/A21.5
- d. Minimum film thickness and material type
- e. Applicable range of nominal pipe diameter size(s)
- f. Warning – Corrosion Protection – Repair any damage

3.3.2 Marking Height

Letters and numerals used for marking items a through e in Sec 4.3.1 shall not be less than 1 in. in height. Item f in Sec 4.3.1 shall be not less than 1.5 in. in height.

APPENDIX NO. 1

REPORT OF GEOTECHNICAL INVESTIGATION

BATTLE TRAINING ROAD PUMP STATION SITE





Report of
***GEOTECHNICAL
EXPLORATION***

AMERICAN ENGINEERS, INC.

BATTLE TRAINING ROAD
PUMP STATION

HARDIN COUNTY WATER
DISTRICT NO. 2

HARDIN COUNTY, KY
OCTOBER 2013

DESIGNING YOUR FUTURE, TODAY.

AEI



AMERICAN ENGINEERS, INC.

PROFESSIONAL ENGINEERING

65 Aberdeen Drive
Glasgow, KY 42141
Office (270) 651- 7220
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October 4, 2013

Mr. Carlos F. Miller, PE
Kenvirons, Inc.
452 Versailles Road
Frankfort, Kentucky 40601

Re: Report of Geotechnical Exploration
Hardin County Water District No. 2
Battle Training Road Pump Station
Hardin County, Kentucky
AEI Project No. 213-193

Dear Mr. Miller:

American Engineers, Inc. Field Services Center is pleased to submit this geotechnical report that details the results of our geotechnical exploration performed at the above referenced site.

The attached report describes the site and subsurface conditions and also details our recommendations for the proposed project. The Appendices to the report contains a drawing with a boring layout, typed boring logs and the results of all laboratory testing.

We appreciate the opportunity to be of service to you on this project and hope to provide further support on this and other projects in the future. Please contact us if you have any questions regarding this report.

Respectfully,
AMERICAN ENGINEERS, INC.

A handwritten signature in black ink, appearing to read "Brad High".

Brad High, PG
Staff Geologist

A handwritten signature in black ink, appearing to read "Dusty Barrett".

Dusty Barrett, PE
Geotechnical Project Manager

**REPORT OF GEOTECHNICAL EXPLORATION
HARDIN COUNTY WATER DISTRICT NO. 2
BATTLE TRAINING ROAD PUMP STATION
HARDIN COUNTY, KENTUCKY**

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**REPORT OF GEOTECHNICAL EXPLORATION
HARDIN COUNTY WATER DISTRICT NO. 2
BATTLE TRAINING ROAD PUMP STATION
HARDIN COUNTY, KENTUCKY**

1 GENERAL SITE DESCRIPTION

The site of the proposed pump station site is located in Hardin County, Kentucky off KY Highway 434. Currently, construction of a 10 million gallon per day (MGD) pump station is scheduled at the site. At the time of the exploration, each site was covered in a growth of mixed grass. Topographic relief can generally be described as rolling to steep. Topographic relief in the vicinity of the approximate 65 foot by 50 foot building footprint is on the order of about ten feet based on available topographic mapping. It is our understanding that the finished floor elevation (FFE) of the building will lie at approximate Elevation 468 requiring up to about 8 feet of cut to achieve the proposed FFE.

Foundation loads were unknown at the time of this report but are not anticipated to result in significant concentrated loads. It is our understanding that the upper wall of the pump station will likely be designed as a retaining wall to resist earth pressures from the hillside above.

2 GENERAL SITE GEOLOGY

Available geologic mapping (*Geologic Map of the Colesburg Quadrangle, Hardin and Bullitt Counties, Kentucky, USGS, 1967 and the Kentucky Geologic Map Information Service*) shows the sites to be underlain by Lower Mississippian-aged deposits of the Borden Formation as well as Quaternary-aged alluvium and lacustrine deposits. Mapping indicates the lower part of the Borden Formation to consist of silty shale and clay shale. The silty shale is described as light olive gray to dark greenish gray in color, calcareous and clayey. The clay shale is described as greenish gray to olive gray in color and silty in part. The alluvium was described as a heterogeneous mixture of sand, silt, clay and gravel.

No geologic hazards were apparent at the site upon review of available mapping or during the investigation, however minor faulting was indicated about 2 miles to the south of the site on the 7.5-minute quadrangle map. It is impossible to investigate a site to such an extent to fully identify the possibility of future geologically related problems. It should be understood by the owner that there is some risk of future ground subsidence when building in areas where karst activity has been known to historically exist.

3 SCOPE OF WORK PERFORMED

The geotechnical exploration consisted of drilling four soil test borings, three with rock core and one rockline sounding. Borings were staked and elevated by AEI. A boring layout is included in Appendix A of this report.

The borings were drilled by an AEI drill crew using a truck-mounted drill rig equipped with continuous flight hollow-stem augers and an NQ2-size diamond coring bit. A Senior Soils Engineering Technician was on site throughout the fieldwork to log the soils and rock encountered during the drilling operation. The recovered soil samples and rock core were further classified in the lab by a Geologist and a Geotechnical Engineer.

4 RESULTS OF THE EXPLORATION

4.1 GENERAL

Information provided in the Appendices for this report includes boring locations, logs of the borings, and other relevant geotechnical information. A description of the subsurface soil, bedrock and groundwater conditions follows.

4.2 SUBSURFACE SOIL CONDITIONS

The generalized subsurface conditions encountered at the boring locations, including descriptions of the various strata and their depths and thicknesses are presented on the Boring Logs in Appendix B.

Eight to 16 inches of topsoil was encountered in each of the borings beneath the existing ground surface, however will likely vary between the borings. The borings typically encountered low to moderate plasticity clay soils beneath the topsoil. These soils can typically be classified as lean clay, CL, (Clay of Low plasticity), in accordance with the Unified Soil Classification System. The near-surface soils encountered typically contained trace to some fine to medium gravel and trace to some fine sand, brown to gray in color, moist to wet of presumed optimum moisture content for compaction, and medium stiff to stiff in soil strength consistency. Plasticity of the clays soils encountered during the investigation generally increases with depth.

SPT-N values in the residual clays ranged from seven to 37 blows per foot (bpf), with most between ten and 15 bpf. Corresponding estimated unconfined compressive strength (Q_p) values ranged from less than 0.25 to more than 4.5 tons per square foot (tsf) with most values between about 2.25 and 4.5 tsf. Together, the SPT-N and Q_p values are indicative of stiff soil strength consistencies with medium stiff and very stiff zones.

Atterberg limits testing, grain-size analyses and visual classification of recovered soil samples indicate that the near-surface clay soils classify as CL (Clay of Low plasticity), lean clay, in accordance with the USCS. Liquid limit test results ranged from 33 to 39

percent with corresponding plasticity indices ranging from 15 to 20 percent. Moisture contents of the residual clays range from about 16 to 28 percent with most between 18 and 23 percent. Results of Atterberg limits and moisture content testing indicate that the residual clays are typically near to about five percent wet of the plastic limit. Unconfined compressive strength testing was performed on selected relatively undisturbed soil samples and ranged from 2,277 to 13,279 pounds per square foot (psf). Selected laboratory testing results are noted on the Boring Logs in Appendix A and Laboratory Testing Results in Appendix C.

4.3 BEDROCK CONDITIONS

Refusal, as indicated by the driller on the field boring logs, indicates a depth where either essentially no downward progress can be made by the auger or where the N-value indicates essentially no penetration of the split-spoon sampler. It is normally indicative of a very hard or very dense material such as large boulders or the upper bedrock surface. Auger refusal was encountered in each of the soil test borings and the rockline sounding. Auger refusal depths ranged from about 25 to 32 feet beneath the existing ground surface. The recovered rock core was typically described as shale, silty to arenaceous, medium gray to bluish gray in color, soft to moderately hard, and laminated to thin bedded. Core recovery percentages were all 100 percent, with Rock Quality Designation (RQD) values of zero.

4.4 GROUNDWATER CONDITIONS

Groundwater was not encountered in any of the borings at the site during drilling operations. In cohesive soils such as those encountered at the site, a long time is required for the hydrostatic groundwater level to come to equilibrium in the borehole. The short-term groundwater levels reported by the drill crew are not generally indicative of the long-term groundwater level. To accurately determine the long-term groundwater level, as well as the seasonal and precipitation induced fluctuations of the groundwater level, it is necessary to install piezometers in the borings, and monitor them for an extended length of time. Frequently, groundwater conditions affecting construction in this region are caused by trapped or perched groundwater, which occurs within the soil materials or at the soil/rock interface in irregular, discontinuous locations. If these water bodies are encountered during excavation, they can produce seepage durations and rates that will vary depending on the recent rainfall activity and the hydraulic conductivity of the material.

4.5 SEISMIC CONDITIONS

According to the Kentucky Building Code, 2012 Edition, and the subsurface conditions encountered in the borings, Site Class D should be utilized for foundation design.

Soil liquefaction analysis was outside the scope of this investigation. Prior studies in this region on similar soil types indicate that the potential for liquefaction is low and is primarily dependent on the variability of site soils and earthquake severity.

Once the subgrade is judged to be relatively uniform and suitable for support of engineered fill, fill areas should be brought to design elevations with on site soil and/or suitable off-site borrow material placed and compacted as specified in Section 5.1.7 Fill Placement.

5.1.4 On-Site Soils

The near-surface soils on the sites are low to moderate plasticity clays that classify as CL in accordance with the USCS. Efforts should be made to schedule earthwork activities during the late spring to early fall months since these soils will pump, rut, and lose strength with moisture contents more than several points wet or dry of the optimum moisture content for compaction. These soils are judged suitable for use as fill material at the site provided provisions are made for wetting or drying the soils for compaction and are placed and compacted in accordance with Section 5.1.7.

5.1.5 General Fill Requirements

Any material, whether borrowed on-site or imported to the site, placed as engineered fill on the project site beneath the proposed building or other proposed on-grade structures such as pavement, parking lots, sidewalks, etc., should be an approved material, free of environmental contamination, vegetation, topsoil, organic material, wet soil, construction debris, and rock fragments greater than six inches in diameter. We recommend that any borrow material, if needed, consist of granular or lean clay materials or mixtures thereof with Unified Classifications of CL, SC, or GC. We further recommend high plasticity clays, known as fat clays (CH soils) not be *imported* to the sites due to their potential for volume changes with fluctuations in moisture content.

The preferred borrow material should have a Plasticity Index (PI) less than 20 and a standard Proctor maximum dry density of at least 95 pcf. Engineering classification and standard Proctor tests should be performed on all potential borrow soils, and the test results evaluated by an AEI Geotechnical Engineer to evaluate the suitability of the soil for use as engineered fill.

5.1.6 Off-Site Soils

If off-site material is needed it should meet the requirements specified in 5.1.5 above.

5.1.7 Fill Placement

Lean clay, CL, soil placed under building areas should be placed in maximum eight inch (loose thickness) horizontal lifts, with each lift being compacted to a minimum of 98 percent of the standard Proctor maximum dry density, at a moisture content from optimum to 2 percent wet of optimum. The compaction requirement may be reduced to 95 percent in proposed paved areas and to 92 percent in proposed landscape areas. Representative and adequate field density testing should be performed by AEI to verify that compaction requirements have been met.

5.1.8 Soil Movement

Site grading should be maintained during construction so that positive drainage is promoted at all times. Final site grading should be accomplished in such a manner as to divert surface runoff and roof drains away from the foundation elements and paved areas. Precipitation runoff should be collected in storm sewers as quickly as possible. Maintenance should be performed regularly on paved areas to seal pavement cracks and reduce surface water infiltration into the pavement subgrade.

5.2 STRUCTURE FOUNDATIONS

5.2.1 Recommended Bearing Pressure

For foundation elements bearing on residual clays or engineered fill, an allowable bearing capacity of 2,000 pounds per square foot may be utilized for design. However, based on SPT-N values obtained near the surface in the borings, the Contractor should anticipate that some undercutting of footings will likely be required. Footings which do not achieve the design bearing capacity should be undercut to suitable material and backfilled with lean clay fill as outlined in Section 5.1.7 or with KDOH No. 57 stone.

5.2.2 Acceptance of Foundation Bearing Surfaces

Prior to placement of reinforcing steel in spread footings, an AEI Engineer or Engineering Technician should review the bearing surface to verify that the design bearing capacity provided can be achieved. The spread footings should also be reviewed to verify that the bottom is level and free of mud, loose soil or other questionable material that might affect foundation support.

5.2.3 Groundwater

Any groundwater encountered in spread footing excavations should be removed prior to concrete placement. Some zones of seepage may be present at the soil/rock interface depending on the time of year construction takes place.

5.2.4 Potential Foundation Movement

A detailed settlement analysis was beyond the scope of this investigation. It is anticipated that less than 1 inch of total settlement will occur with soil bearing foundation systems with differential settlement anticipated to be in the range of $\frac{1}{2}$ to $\frac{3}{4}$ inch.

These estimates assume that the foundations are designed and constructed according to the recommendations in this report and in conjunction with sound foundation construction practice.

5.2.5 Below Grade Walls

Below grade walls should include sand or gravel backfill. The design should also include weepholes or other provisions to prevent hydrostatic pressures behind the wall. For retaining walls free to rotate without top fixity, an equivalent fluid pressure of 70 pcf should be used for design. For below grade walls with top fixity restrained from rotation

such as basement walls, an equivalent fluid pressure of 95 pcf should be used for design. If positive drainage cannot be achieved, then values of 105 pcf and 115 pcf, respectively should be utilized for design. These values account for a slope of 2H:1V above the wall.

Earth pressure on below grade walls will result in a lateral load on the foundations. A passive earth pressure coefficient of 2.45 should be used along with a safety factor of 2.0 for determining the allowable passive pressure in front of the wall. For a unit weight of 125 pcf, this results in an equivalent fluid pressure of 150 pcf. A coefficient of friction of 0.35 can also be used between the concrete foundation and soil bearing materials when calculating resisting forces.

5.2.6 Grade Supported Floor Slab Recommendations

We recommend on-grade supported floor slabs be isolated from the building foundations and allowed to float free and settle differentially with the building. We have estimated an Effective Modulus of Subgrade Reaction (K) of 100 pci for floor slab design.

The final floor slab design, including the amount of and type of steel reinforcement (welded wire mesh or bar reinforcing) will be dependent on the structural engineer's evaluation of the final grade slab thickness, concrete compressive strength, and actual slab loadings. Additional design and construction recommendations are provided as follows:

- Proofrolling of the cut subgrade and existing subgrade should be performed to identify soft or unstable soil prior to engineered fill placement. Soft soils should be removed to the extent determined in the field by the AEI Geotechnical Engineer or Technician. Proofrolling of the final floor slab subgrade should also be performed prior to floor slab construction and any defects appropriately repaired as recommended in the field by AEI.
- The floor slab should be supported on a minimum 4-inch compacted layer of free draining granular base material to distribute concentrated loads, improve drainage, and reduce the risk of deterioration of the prepared subgrade during construction. The stone should be kept moist not wet, immediately before placement of concrete to limit differential curing conditions at the top and bottom of the slab.
- A vapor barrier can be placed on the granular subbase to reduce migration of moisture through the slab. However, proper concrete mix designs, placement and curing methods must be used to reduce the potential for concrete shrinkage problems that are sometimes associated with the use of a vapor barrier. Reference to ACI 302.1 R 96, "Guide for Concrete Floor and Slab Construction",

should be utilized. Joints between slab sections should contain keys or dowels to permit slab rotation but to reduce extreme vertical differential displacements.

5.3 GENERAL CONSIDERATIONS

5.3.1 Construction Monitoring/Testing

All construction operations involving foundation construction should be performed in the presence of an experienced representative of AEI. The representative would operate under the direct supervision of an AEI Geotechnical Engineer.

Field observations should be performed prior to and during concrete placement operations.

5.3.2 Limitations

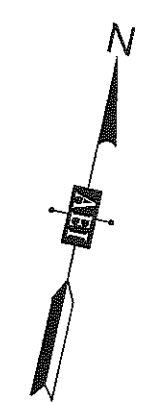
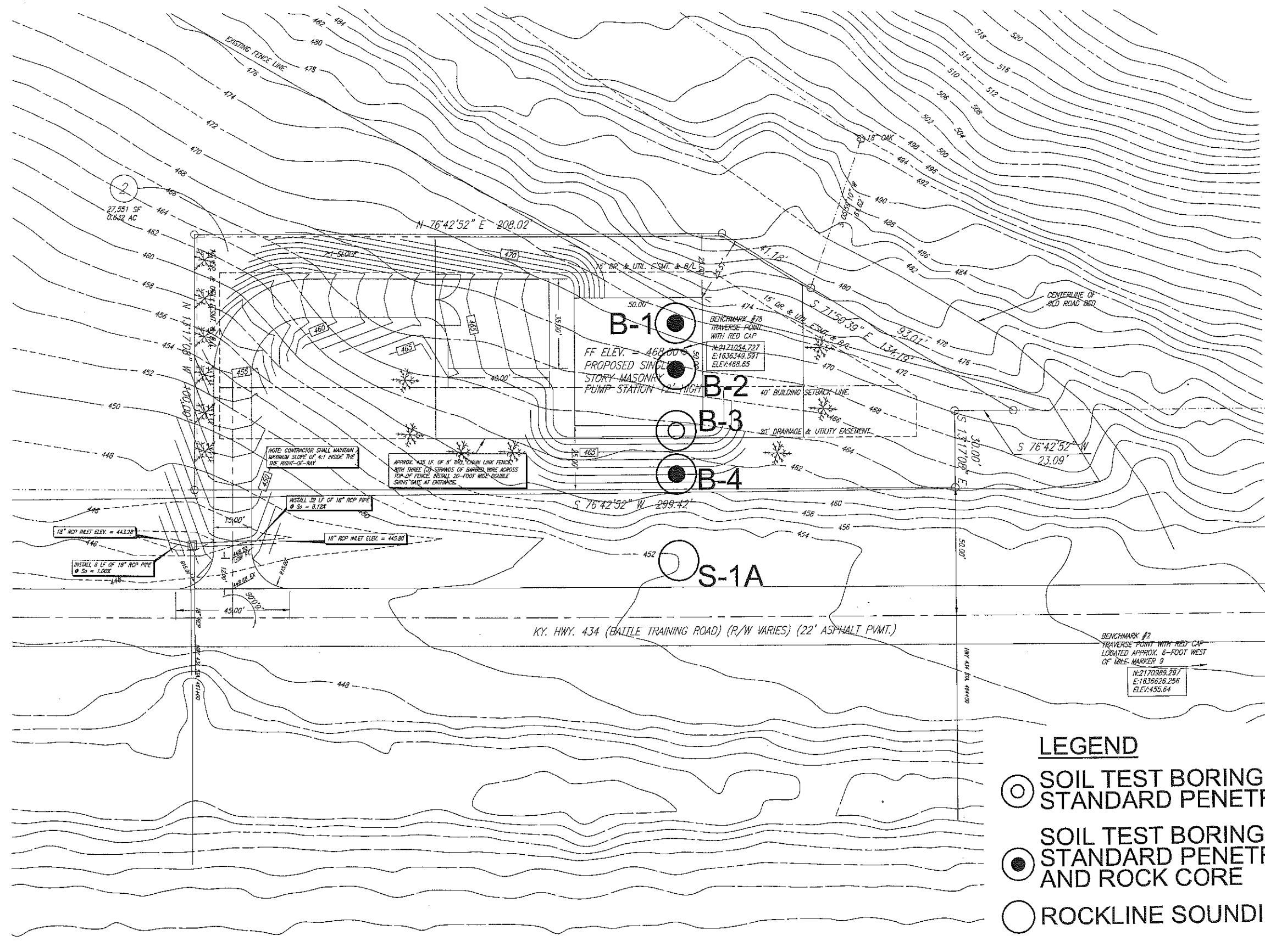
The conclusions and recommendations presented herein are based on information gathered from the borings advanced during this exploration using that degree of care and skill ordinarily exercised under similar circumstances by competent members of the engineering profession. No warranties can be made regarding the continuity of conditions between the borings.

We will retain samples acquired for this project for a period of 30 days subsequent to the submittal date printed on the cover of this report. After this period, the samples will be discarded unless otherwise requested.

APPENDIX A

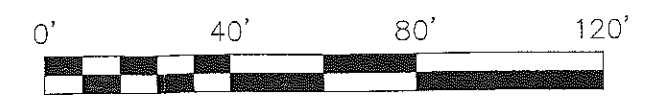
Boring Layout





LEGEND

- ⊙ SOIL TEST BORING WITH STANDARD PENETRATION TESTS
- SOIL TEST BORING WITH STANDARD PENETRATION TESTS AND ROCK CORE
- ROCKLINE SOUNDING



REVISIONS		
DATE	BY	
BORING LAYOUT		
KENVIRONS, INC.		
CLIENT:		
PROJECT:	PROPOSED PUMP STATION BATTLE TRAINING ROAD LEBANON JUNCTION, KY	
PLANS PREPARED AND SUBMITTED BY:	<small>AMERICAN ENGINEERS, INC. PROFESSIONAL ENGINEERING 111 LAWRENCE STREET LEBANON, KY 40035 (606) 338-2222 www.aei-inc.com</small>	
SCALE:	1"=40'	
DATE:	10-7-13	
DRAWN BY:	J. CHILDRESS	
CHECKED BY:	D. BARRETT	
FILE:	1213 Proj-2413-189 Battle Training Boring Layout 1.dgn	
SHEET:	B1	



AMERICAN ENGINEERS, INC.
 PROFESSIONAL ENGINEERING
 87 Aberdeen Drive
 Glasgow, KY 42141
 (270) 651-7228

KEY TO SYMBOLS

CLIENT Kenvirons, Inc.

PROJECT NAME LWC Water Supply Transmission Line

PROJECT NUMBER 214-023

PROJECT LOCATION Hardin & Bullitt Counties, KY

LITHOLOGIC SYMBOLS (Unified Soil Classification System)



CL: USCS Low Plasticity Clay



LIMESTONE: Limestone



SC-SM: USCS Clayey Sand



TOPSOIL: Topsoil

SAMPLER SYMBOLS



Rock Core



Split Spoon

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - LIQUID LIMIT (%)
 PI - PLASTIC INDEX (%)
 W - MOISTURE CONTENT (%)
 DD - DRY DENSITY (PCF)
 NP - NON PLASTIC
 -200 - PERCENT PASSING NO. 200 SIEVE
 PP - POCKET PENETROMETER (TSF)

TV - TORVANE
 PID - PHOTOIONIZATION DETECTOR
 UC - UNCONFINED COMPRESSION
 ppm - PARTS PER MILLION
 Water Level at Time Drilling, or as Shown
 Water Level at End of Drilling, or as Shown
 Water Level After 24 Hours, or as Shown

KEY TO SYMBOLS - GINT STD US LAB GDT - 4/7/14 15:33 - T114 PROJECTS\214-023 LWC WATER SUPPLY TRANSMISSION LINE\LAB TESTING\LWC TRANS LINE GEOTECH.GPJ

APPENDIX NO. 2

NATIONWIDE PERMIT NO. 12



STEVEN L. BESHEAR
GOVERNOR

LEONARD K. PETERS
SECRETARY

ENERGY AND ENVIRONMENT CABINET

DEPARTMENT FOR ENVIRONMENTAL PROTECTION

DIVISION OF WATER

200 FAIR OAKS LANE, 4TH FLOOR

FRANKFORT, KENTUCKY 40601

www.kentucky.gov

February 24, 2014

Hardin County Water District No. 2
P.O. Box 970
Elizabethtown, Kentucky 42701

Re: Nationwide Permit No. 12
24-Inch Transmission Pipeline, Louisville
Water Company Supplemental Water Supply
AI No.: 1674; Activity ID: APE20140002
USACE ID No.: LRL-2014-25-teh
Unnamed Tributaries to Cedar Creek, Patty
Branch, Brewer Hollow, Unnamed Tributary to
Mud Creek, Mud Creek
Hardin County, Kentucky

To Whom It May Concern:

This letter transmits to you a copy of our General Water Quality Certification for Nationwide Permit # 12 for Utility Line Backfill and Bedding for the proposed temporary impacts associated of 6 stream crossings for installation of pipeline associated with the Louisville Water Company Supply project. . An individual Water Quality Certification is not necessary for this activity provided that this project has received the appropriate Nationwide Permit from the U.S. Army Corps of Engineers and all conditions of the attached General Water Quality Certification are met. **In order to comply with the conditions of this general water quality certification, standardized stream crossing plans and specifications and erosion and sediment control best management practices shall be followed as mitigation for the temporary impacts.**

Although an Individual WQC is not needed, other permits from the Division of Water may be required. If this activity occurs within a floodplain, a Permit to Construct Across or Along a Stream may be required. Please contact Todd Powers (502-564-3410) for more information. If the project will disturb one acre or more of land, or is part of a larger common plan of development or sale that will ultimately disturb one acre or more of land, a Kentucky Pollution Discharge Elimination System (KPDES) stormwater permit shall be required from the Surface Water Permits Branch. This permit requires the development of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP must include erosion prevention and sediment control measures. Contact: Surface Water Permits Branch (SWPB) Support (502-564-3410 or SWPBsupport@ky.gov)

All future correspondence on this project must reference AI No. 1674. If you should have any questions concerning this letter, please contact me at Chloe.Brantley@ky.gov or (502) 564-3410 Extension 4863.

Sincerely,

A handwritten signature in cursive script that reads "Chloe Brantley".

Chloe Brantley, Project Manager
Water Quality Certification Section
Kentucky Division of Water

AJ:CB

Attachments

cc: Todd Hagman, USACE: Louisville District (via email: Todd.E.Hagman@usace.army.mil)
Carlos Miller, Kenvirons, Inc. (via email: CMILLER@kenvirons.com)
Hardin County Water District No. 2 (via email: hardincountywater2.com)



STEVEN L. BESHEAR
GOVERNOR

LEONARD K. PETERS
SECRETARY

ENERGY AND ENVIRONMENTAL PROTECTION CABINET

DEPARTMENT FOR ENVIRONMENTAL PROTECTION

DIVISION OF WATER

200 FAIR OAKS LANE

FRANKFORT, KENTUCKY 40601

www.kentucky.gov

General Certification--Nationwide Permit # 12 Utility Line Backfill and Bedding

This General Certification is issued March 19, 2012, in conformity with the requirements of Section 401 of the Clean Water Act of 1977, as amended (33 U.S.C. §1341), as well as Kentucky Statute KRS 224.16-050.

For this and all nationwide permits, the definition of surface water is as per 401 KAR 10:001 Chapter 10, Section 1(80): Surface Waters means those waters having well-defined banks and beds, either constantly or intermittently flowing; lakes and impounded waters; marshes and wetlands; and any subterranean waters flowing in well-defined channels and having a demonstrable hydrologic connection with the surface. Lagoons used for waste treatment and effluent ditches that are situated on property owned, leased, or under valid easement by a permitted discharger are not considered to be surface waters of the commonwealth.

Agricultural operations, as defined by KRS 224.71-100(1) conducting activities pursuant to KRS 224.71-100 (3), (4), (5), (6), or 10 are deemed to have certification if they are implementing an Agriculture Water Quality Plan pursuant to KRS 224.71-145.

For all other operations, the Commonwealth of Kentucky hereby certifies under Section 401 of the Clean Water Act (CWA) that it has reasonable assurances that applicable water quality standards under Kentucky Administrative Regulations Title 401, Chapter 10, established pursuant to Sections 301, 302, 304, 306 and 307 of the CWA, will not be violated for the activity covered under NATIONWIDE PERMIT 12, namely Utility Line Backfill and Bedding, provided that the following conditions are met:

1. The activity will not occur within surface waters of the Commonwealth identified by the Kentucky Division of Water as Outstanding State or National Resource Water, Cold Water Aquatic Habitat, or Exceptional Waters.
2. The activity will not occur within surface waters of the Commonwealth identified as perpetually-protected (e.g. deed restriction, conservation easement) mitigation sites.
3. This general water quality certification is limited to the crossing of surface waters by utility lines. This document does not authorize the installation of utility lines in a linear manner within the stream channel or below the top of the stream bank.

General Certification--Nationwide Permit # 12
Utility Line Backfill and Bedding
Page 2

4. For a single crossing, impacts from the construction and maintenance corridor in surface waters shall not exceed 50 feet of bank disturbance.
5. This general certification shall not apply to nationwide permits issued for individual crossings which are part of a larger utility line project where the total cumulative impacts from a single and complete linear project exceed ½ acre of wetlands or 300 linear feet of surface waters. Cumulative impacts include utility line crossings, permanent or temporary access roads, headwalls, associated bank stabilization areas, substations, pole or tower foundations, maintenance corridor, and staging areas.
6. Stream impacts under Conditions 4 and 5 of this certification are defined as the length of bank disturbed. For the utility line crossing and roads, only one bank length is used in calculation of the totals.
7. Stream impacts covered under this General Water Quality Certification and undertaken by those persons defined as an agricultural operation under the Agricultural Water Quality Act must be completed in compliance with the Kentucky Agricultural Water Quality Plan (KWQP).
8. The Kentucky Division of Water may require submission of a formal application for an individual certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.
9. Activities that do not meet the conditions of this General Water Quality Certification require an Individual Section 401 Water Quality Certification.
10. Blasting of stream channels, even under dry conditions, is not allowed under this general water quality certification.
11. Utility lines placed parallel to the stream shall be located at least 50 feet from an intermittent or perennial stream, measured from the top of the stream bank. The cabinet may allow construction within the 50 foot buffer if avoidance and minimization efforts are shown and adequate methods are utilized to prevent soil from entering the stream.
12. Utility line stream crossings shall be constructed by methods that maintain flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the excavation shall not be allowed to enter the flowing portion of the stream.

General Certification--Nationwide Permit # 12
Utility Line Backfill and Bedding
Page 3

13. The activities shall not result in any permanent changes in pre-construction elevation contours in surface waters or wetlands or stream dimension, pattern or profile.
14. Utility line activities which impact wetlands shall not result in conversion of the area to non-wetland status. Mechanized land clearing of forested wetlands for the installation or maintenance of utility lines is not authorized under this certification.
15. Activities qualifying for coverage under this General Water Quality Certification are subject to the following conditions:
 - Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur.
 - Sediment and erosion control measures, such as check-dams constructed of any material, silt fencing, hay bales, etc., shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, design and placement of temporary erosion control measures shall not be conducted in such a manner that may result in instability of streams that are adjacent to, upstream, or downstream of the structures. All sediment and erosion control devices shall be removed and the natural grade restored within the completion timeline of the activities.
 - Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
 - Removal of riparian vegetation shall be limited to that necessary for equipment access.
 - To the maximum extent practicable, all in-stream work under this certification shall be performed under low-flow conditions.
 - Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances in which such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.

General Certification--Nationwide Permit # 12
Utility Line Backfill and Bedding
Page 4

- Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If rip-rap is utilized, it should be of such weight and size that bank stress or slump conditions will not be created because of its placement.
- If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when such work will be done.
- Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling (800) 928-2380.

Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.



STEVEN L. BESHEAR
GOVERNOR

LEONARD K. PETERS
SECRETARY

ENERGY AND ENVIRONMENT CABINET

DEPARTMENT FOR ENVIRONMENTAL PROTECTION

DIVISION OF WATER

200 FAIR CREEK LANE, 4TH FLOOR

FRANKFORT, KENTUCKY 40601

www.kentucky.gov

ATTENTION APPLICANT

If your project involves one or more of the following activities, you may need more than one permit from the Kentucky Division of Water.

***building in a floodplain *road culvert in a stream**

***streambank stabilization *stream cleanout**

***utility line crossing a stream**

***construction sites greater than 1 acre**

- Construction sites greater than 1 acre will require the filing of a Notice of Intent to be covered under the KPDES General Stormwater Permit. This permit requires the creation of an erosion control plan.
Contact: Surface Water Permits Branch (SWPB) Support at (502) 564-3410 or SWPBsupport@ky.gov
- Projects that involve filling in the floodplain will require a floodplain construction permit from the Water Resources Branch.
Contact: Todd Powers
- Projects that involve work IN a stream, such as bank stabilization, road culverts, utility line crossings, and stream alteration will require a floodplain permit and a Water Quality Certification from the Division of Water.
Contact: Adam Jackson

All three contacts listed above can be reached at (502) 564-3410. A complete listing of environmental programs administered by the Kentucky Department for Environmental Protection is available from Pete Goodmann by calling (502) 564-3410.

GENERAL CONDITIONS FOR WATER QUALITY CERTIFICATION

1. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
2. All dredged material shall be removed to an upland location and/or graded on adjacent areas (so long as such areas are not regulated wetlands), to obtain original streamside elevations, i.e. overbank flooding shall not be artificially obstructed.
3. In areas not riprapped or other wise stabilized, revegetation of stream banks and riparian zones shall occur concurrently with project progression. At a minimum, revegetation will approximate pre-disturbance conditions.
4. To the maximum extent practicable, all instream work under this certification shall be performed during low flow.
5. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances where such instream work is unavoidable, then it shall be performed in such a manner and duration as to minimize resuspension of sediments and disturbance to substrates and bank or riparian vegetation.
6. Any fill or riprap including refuse fill, shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If riprap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created because of its placement.
7. If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when work will be done.
8. Removal of existing riparian vegetation should be restricted to the minimum necessary for project construction.
9. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling 800/564-2380.

APPENDIX No. 3

SPECIFIC CONDITIONS FOR PIPELINE INSTALLATIONS

**Alan E. Hack and Rebecca S. Hack Property
Ronald C. Hack and Jeanette Hack Property**

ALAN E. HACK AND REBECCA S. HACK PROPERTY

MEMORANDUM OF AGREEMENT

This Memorandum of Agreement (the "MOA"), having an effective date of March 2, 2015, is made and entered into by and between the **HARDIN COUNTY WATER DISTRICT No. 2**, PO Box 970, Elizabethtown, Kentucky 42702, hereinafter referred to as "Water District"; and **ALAN E. HACK** and **REBECCA S. HACK**, husband and wife, 4584 Shepherdsville Road, Elizabethtown, Kentucky 42701, hereinafter referred to as "Hack";

WITNESSETH

WHEREAS, the Water District is a water district organized under the provisions of KRS Chapter 74;

WHEREAS, the Water District currently owns and operates water supply, treatment, and distribution facilities;

WHEREAS, the Water District has made plans to construct a 24-inch diameter ductile iron water transmission main (the "Water Line") from Shepherdsville Road (Kentucky Highway 251) to the Point of Delivery from the Louisville Water Company near the Hardin-Bullitt County Line south of the Rolling Fork River for the purpose of obtaining a supplemental supply of potable water;

WHEREAS, a portion of the proposed route of the Water Line parallels the existing Mid-Valley petroleum pipeline (the "Mid-Valley Pipeline");

WHEREAS, the proposed route of the Water Line crosses under Shepherdsville Road (Kentucky Highway 251) and onto the Hack property, then proceeds north to the Mid-Valley Pipeline Easement, and then proceeds in a northeasterly direction across real property owned by Hack;

WHEREAS, the Water District seeks to obtain both temporary construction and permanent easement rights, as set forth in the attached Utility Right-of-Way Easement (the "Water Line Easement") from Hack;

WHEREAS, Hack's property is strategically located because it will provide an ideal access point to the Water Line Easement both during construction and thereafter for inspecting, maintaining, and repairing the Water Line Easement and the Water Line.

WHEREAS, the Water District and Hack have engaged in good-faith negotiations and have reached an agreement whereby Hack will grant the easement rights sought by the Water District, subject to certain terms and conditions; and

WHEREAS, the Parties desire to memorialize these terms and conditions.

NOW, THEREFORE, FOR AND IN CONSIDERATION of the mutual promises, covenants and conditions contained herein, it is agreed by and between the Parties as follows:

1. **Compensation.** The Water District shall pay Hack the agreed upon sum upon the simultaneous execution of the Water Line Easement and this MOA.

2. **Easement Location.** The Water District's permanent easement and temporary construction easement shall be located as depicted on **Exhibits A, B, and C**, which are attached to the Water Line Easement document being simultaneously executed by Hack.

3. **Water Line Location.** The Mid-Valley Pipeline Easement has a nominal width of 50 feet. The portion of the Water District's Water Line Easement which follows the route of the Mid-Valley Pipeline consists of a 30 feet wide permanent easement and an adjacent 20 feet wide temporary construction easement. This portion of the Water District's Water Line shall be located entirely within the confines of the Mid-Valley Pipeline Easement.

4. **Pipe Storage Area.** A portion of the compensation being paid by the District to Hack is for the purpose of temporarily leasing an area located at the rear of Hack's barn. The leased area will be utilized as a Pipe Storage Area during construction of the Water Line. The Pipe Storage Area is shown in blue on **Exhibit 1**, which is attached hereto and incorporated herein by reference. It is

Exhibit 1, which is attached hereto and incorporated herein by reference. It is approximately 120 feet by 90 feet. The Water District's contractor (the "Contractor") and delivery trucks shall access the Pipe Storage Area by utilizing the main entrance to the H & D Auction House and the roads highlighted in yellow on **Exhibit 1**. The Contractor shall utilize the area shown in red on **Exhibit 1** to access the Mid-Valley Pipeline Easement and the Water Line Easement during construction of the Water Line.

5. **Overhanging Limbs.** To minimize the damage to Hack's walnut trees from the large delivery trucks which will be hauling pipe to the Pipe Storage Area, Hack shall cut or trim any and all low, overhanging limbs which might otherwise be damaged by the trucks and other construction equipment.

6. **Limited Use of Pipe Storage Area.** The Pipe Storage Area shall be used solely for the purposes of receiving, unloading, storing, and re-loading the pipe, fittings, appurtenances, construction supplies, and other materials which will be used for the installation of the Water Line. No equipment, except for the equipment necessary to unload and re-load the pipe, shall be stored on the Pipe Storage Area. The Contractor shall **not** use the Pipe Storage Area for its Field Office. The Contractor shall give Hack as much advance notice as possible, but at least seven (7) days' notice before it commences use of the Pipe Storage Area.

7. **Gravel for Pipe Storage Area.** The Contractor shall spread No. 3 gravel, topped with smaller gravel or dense grade, along portions of the roads highlighted in yellow on **Exhibit 1** and across that portion of the Pipe Storage Area which will be used as a road. After completion of the Water Line installation, this gravel shall stay in place and will not need to be removed.

8. **Duration.** The Contractor shall have the right to use the Pipe Storage Area during construction of the Water Line or for a period of six (6) months, whichever is shorter. The time commences when the first load of pipe is unloaded on the Pipe Storage Area.

9. **Restoration of Pipe Storage Area.** Immediately following the termination of the use of the Pipe Storage Area, the Contractor shall remove all remaining pipe, fittings, construction materials and supplies, trash, and all other items from this area. The Contractor shall then restore the Pipe Storage Area and the roads and areas highlighted in yellow to their prior condition, or better. This includes the need to fill all ruts and holes, disc, and drag the area so the surface is smooth and ready to be re-seeded. As soon as soil and weather conditions permit, the Contractor shall then apply fertilizer, re-seed, and straw the Pipe Storage Area.

10. **Use of Main Entrance.** During construction, the Water District, Contractor, and delivery trucks shall use the main entrance to the H & D Auction House as the means to exit and enter Shepherdsville Road (Kentucky Highway

251). Following construction, the Water District, shall have the permanent right to use the main entrance as the means of ingress / egress to and from the Water Line Easement.

11. **Ingress / Egress During Construction.** The Water District and the Contractor shall utilize the route depicted in yellow and the area shown in red to access the Mid-Valley Pipeline Easement and the Water Line Easement during construction of the Water Line.

12. **Maintenance of Parking Lots During Construction.** The Contractor's right to use Hack's main entrance, parking lots, and the roads depicted in yellow on **Exhibit 1** during construction is conditioned upon the Contractor maintaining the roads and parking lots in their current condition, or better, during construction. The Contractor shall use its best efforts to remove excess dirt and mud from the parking lots during construction.

13. **Auctions.** The Water District acknowledges that H & D Auction Service conducts a regularly scheduled auction on the first and third Friday night of each month. From time to time, it also conducts Special Auctions at the H & D Auction House. As Hack schedules these Special Auctions, he shall notify the Water District and the Contractor. The Water District shall prevent the Contractor from engaging in any construction activities near the H & D Auction House or which would prevent easy access to all three (3) of the Hack's parking lots during

these regular or Special Auctions.

14. **Road Bore.** The road bore under Shepherdsville Road (Kentucky Highway 251) will require a large pit to be excavated on Hack's property near the parking lot where the dumpster is located. The road boring activities will also block a portion and, perhaps, all of the road leading to Hack's parking lots. Therefore, the Water District shall ensure that the Contractor closely coordinates the scheduling of the road bore with Hack. Since the road boring activities could realistically extend beyond five (5) working days, the Contractor shall schedule the excavation of the pit to commence on the Monday or Tuesday immediately following one of H & D Auction Service's regular Friday night auctions. This will give the Contractor nearly two (2) full weeks to complete the road bore, cover the pit, remove the dirt and mud from the parking lots and road, restore all disturbed areas, and take other necessary actions to ensure that the road, parking lots, and entire area are safe and in a suitable condition no later than 1:00 pm on the Friday of the next auction.

15. **Electric Fence.** Prior to commencing installation of the Water Line, the Water District shall, at its own expense, install a temporary electric fence along the southeast edge of the Mid-Valley Pipeline Easement for a distance of approximately 1,000 feet to keep Hack's cattle away from the Water Line construction area. Hack shall provide the electric fence charger or other means of

electrifying the fence. The Water District shall have no obligation to remove the temporary electric fence following installation of the Water Line.

16. **Culvert.** The Parties acknowledge the existence of a natural drainage ditch which crosses the path of the proposed Water Line near the northern boundary of Hack's property. Following installation of the Water Line, the District shall install, at its own expense, a 15- inch diameter culvert approximately 16 feet in length to prevent erosion and to facilitate driving over the drainage ditch.

17. **Farm Gates.** Following installation of the Water Line, the Water District shall install, at its own expense, a 16 feet wide farm gate along the joint property line of Hack and Green. This will facilitate future access to the Water Line Easement for inspection, operation, and maintenance of the Easement and Water Line. In addition, the Water District shall install, at its own expense, another 16 feet wide farm gate in Hack's existing fence line (or a new fence to be constructed by Hack following the installation of the Water Line) just north of Hack's barn. Hack shall notify the Water District when he is ready for this gate to be installed. This gate shall be the Water District's primary means of gaining access to the Water Line Easement.

18. **Gravel Parking Lots.** Following installation of the Water Line, the Water District shall restore all three (3) of Hack's gravel parking lots and the roads highlighted in yellow on **Exhibit 1** to their current condition, or better. The Water

District shall resurface, at its own expense, as directed by Hack, all parking lots and roads with No. 57 gravel. The maximum amount of gravel provided by the Water District shall not exceed 170 tons. Neither the initial gravel provided by the Contractor before commencing use of the Pipe Storage Area nor the gravel provided by the Contractor to maintain the roads and parking lots during construction shall count toward this 170 ton maximum limit.

~~N.A. 19. Cedar Creek. The Water District shall cause the Contractor to Directionally Bore underneath Cedar Creek rather than using an open cut excavation construction method to cross Cedar Creek.~~

20. **Best Practices.** The Water District shall cause the contractor to use Construction Industry Best Practices, as specified by the Construction Industry Institute, during installation of the Water Line.

21. **Land Restoration.** As soon as practical following construction of the Water Line, the Water District shall cause the Contractor to restore, as nearly as practical, the land affected by the Water Line construction to its original condition. This includes, but is not limited to, the following: (a) removing excess rock, dirt, construction supplies and materials, trash, and other construction debris from the property; (b) leveling the disturbed areas; (c) filling all holes and ruts; (d) preparing the soil for re-seeding; (e) applying adequate fertilizer; and (f) re-seeding all disturbed areas. Thereafter, the Water District shall be responsible for

maintaining the Water Line Easement.

22. **Tree Damage.** In the event the Contractor damages any marketable timber or any walnut tree having a diameter of six (6) inches or larger at a point four (4) feet from the ground elevation, the Contractor shall fairly compensate Hack. If the Contractor fails to do so in a timely manner, then the Water District shall fairly compensate Hack. Following construction, if the Water District, its employees, contractors, or agents damage any marketable timber or any walnut tree having a diameter of six (6) inches or larger at a point four (4) feet from the ground elevation, the Water District shall fairly compensate Hack for the damages.

23. **Other Damages.** The Contractor shall be responsible for any damage incurred by Hack, or alteration or loss of use of anything owned by Hack, including, but not limited to, fence, soil, rock, electric, water, cows, other livestock, and grass, as a result of the delivery and storage of the pipe and construction materials, the construction and installation of the Water Line, and the restoration of the Water Line Easement by the Contractor, its employees, sub-contractors, or agents. The Contractor shall promptly repair or replace such damaged property to a minimum of its previous state or condition or fairly compensate Hack for the damage or loss of use in a timely manner. In the event the Contractor fails to do so in a timely manner, then the Water District Shall be obligated to do so.

Following construction of the Water Line, the Water District shall be responsible for any damage incurred by Hack, or alteration or loss of use of anything owned by Hack, including, but not limited to, fence, soil, rock, electric, water, cows, other livestock, and grass, as a result of the inspection, operation, repair, and maintenance of the Water Line Easement and the Water Line by the Water District, its employees, contractors, or agents. The Water District shall promptly repair or replace such damaged property to a minimum of its previous state or condition or fairly compensate Hack for the damage or loss of use in a timely manner.

24. **Bush Hogging Water Line Easement.** Since the Water Line will be located entirely within the Mid-Valley Pipeline Easement, the Water District will rely upon Mid-Valley to keep the Water Line Easement bush hogged on an annual basis. Nevertheless, should the Water Line Easement fail to be bush hogged by October 15 of each calendar year, the Water District shall bush hog its 30 feet wide permanent Water Line Easement.

25. **Permanent Ingress / Egress.** A portion of the compensation being paid by the District to Hack is for the purpose of obtaining a permanent access point to the Water Line Easement. Therefore, Hack hereby grants the Water District the permanent right to utilize the Hack property to access the Water Line Easement for periodic inspection, operation, and maintenance of the Easement and

Water Line. The Water District shall use the main entrance to the H & D Auction House, the existing road that runs along the west and northwest sides of the barn, and the area shown in red to access the Water Line Easement.

26. **Advance Notice.** The Water District shall notify Hack at least 48 hours before it enters Hack's property or the Water Line Easement for the purpose of performing routine or scheduled inspection, maintenance, or bush hogging of the Water Line Easement. In the event of a Water Line leak or other emergency, no advance notice shall be required, but the Water District shall make a good faith effort to contact Hack before it enters Hack's property.

27. **Indemnification.** The Water District hereby agrees to indemnify Hack for, and hold Hack harmless from, any and all losses, liabilities, costs and expenses (including, but not limited to, reasonable attorneys' fees) incurred by Hack as a result of any accident, negligence, or willful misconduct by the Water District, its employees, contractors, or agents, arising from the Water District's construction, inspection, operation, repair, and maintenance of the Water Line. To that end, immediately upon notification by Hack, the Water District shall assume, at its own cost, the defense of any such action or suit which may be brought against Hack because of the Water District's construction, inspection, operation, repair, or maintenance of the Water Line.



Exhibit "1"
Hack, Alan E. & Rebecca S.

Property information was acquired from the Hardin County PVA.
 Drawn for illustration purposes only; has not been surveyed.

January 23, 2015

IN TESTIMONY WHEREOF, this Memorandum of Agreement has been executed in multiple counterparts, each of which is deemed to be an original, by Hack and the duly authorized General Manager of the Water District.

HARDIN COUNTY WATER DISTRICT No. 2

BY: James R. Jeffries
James R. Jeffries, General Manager

DATE: 3-2-15

ALAN E. HACK
BY: Alan E. Hack
Alan E. Hack

REBECCA S. HACK
BY: Rebecca S. Hack
Rebecca S. Hack

DATE: 3.2.15

Contact Information:
Alan E. Hack
4584 Shepherdsville Road
Elizabethtown, KY 42701
Email: ahack62@hotmail.com
Phone: 270-737-7822 or
270-268-4466





Exhibit "A" Easement
Hack, Alan E. & Rebecca S. | Parcel No. 218-00-00-076

Property information was acquired from the Hardin County PVA.
Drawn for illustration purposes only; has not been surveyed.

February 24, 2015



ALAN & BECKY HACK
D.B. 1166, PG. 599

Exhibit "B" Easement
Hack, Alan & Becky | Parcel No. 218-00-00-077

Property information was acquired from the Hardin County PVA.
 Drawn for illustration purposes only; has not been surveyed.

January 5, 2015



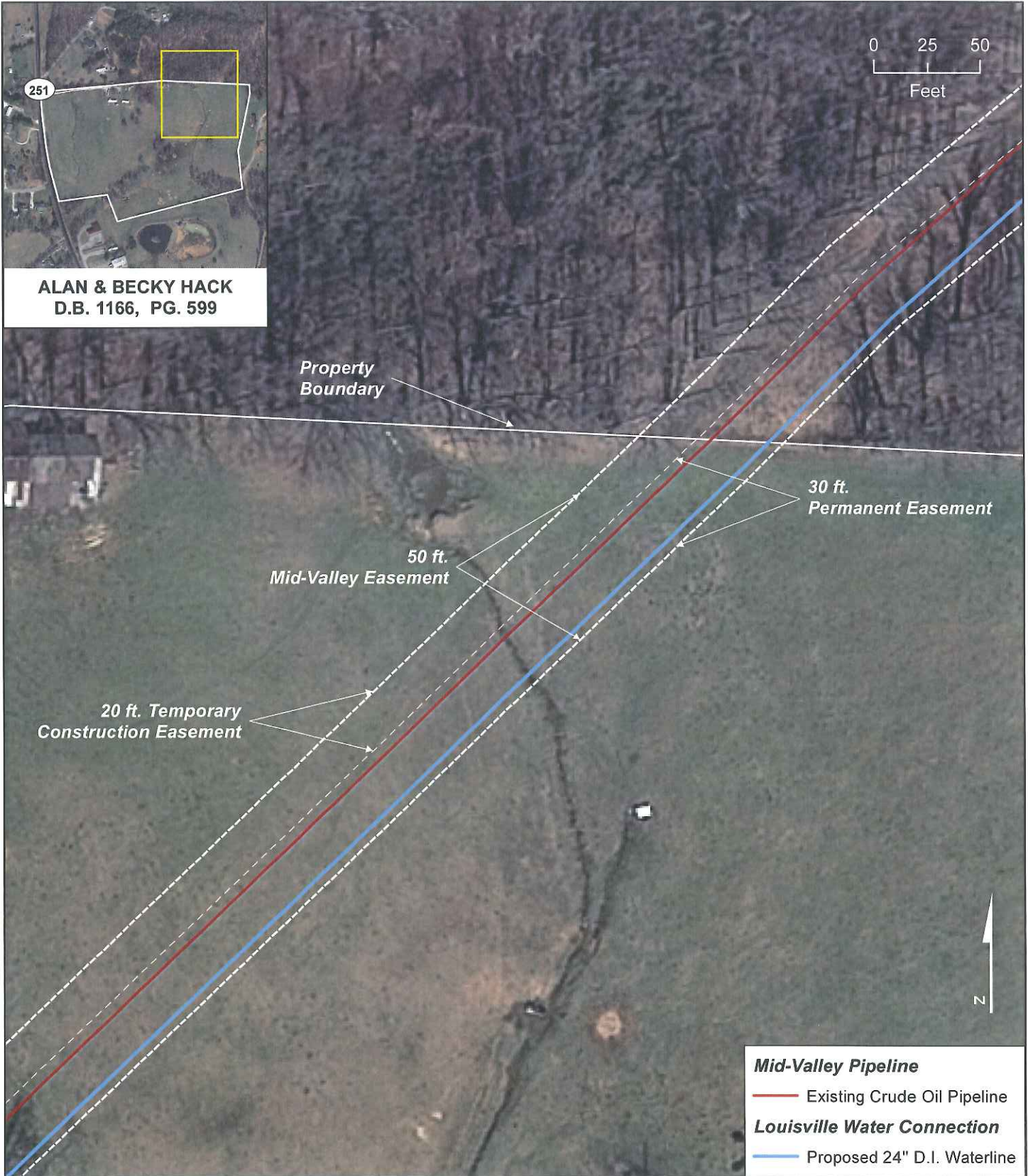


Exhibit "C" Easement
Hack, Alan & Becky | Parcel No. 218-00-00-077

Property information was acquired from the Hardin County PVA.
Drawn for illustration purposes only; has not been surveyed.

January 5, 2015

RONALD C. HACK AND JEANETTE HACK PROPERTY

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration **Ronald C. Hack** and **Jeanette Hack**, husband and wife, 1485 Woolridge Ferry Road, Elizabethtown, Kentucky 42701 (the "**Grantors**"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky 42702 (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a water line over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 229-00-00-006

The perpetual easement shall be 20 feet in width across the property of Grantors as depicted on **Exhibit A** (3 pages), which is attached hereto and incorporated herein by reference. The temporary construction easement shall be 30 feet in width and located as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction, except for property restoration and repairs.

Being a part of the property conveyed to the Grantors by the Deed recorded in Deed Book 587, Page 145 in the Hardin County Clerk's Office.

Additional Information: See separate Memorandum of Agreement for additional terms and conditions.

The District shall have the right to remove trees, brush, and other obstructions or obstacles located on the perpetual or temporary easement which might interfere with the District's water line or with the full exercise of its rights herein granted, but only when necessary for construction, repair, maintenance, or replacement of the water line.

The Grantors shall continue to own, use, occupy, and enjoy their property, including the area affected by the perpetual easement herein described; **provided, however,** the Grantors are specifically restricted from building or causing or permitting to be built any building or other structure upon the perpetual easement herein described.

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation or repair and maintenance of the water line and shall restore, as nearly as practical, the land to its original condition.

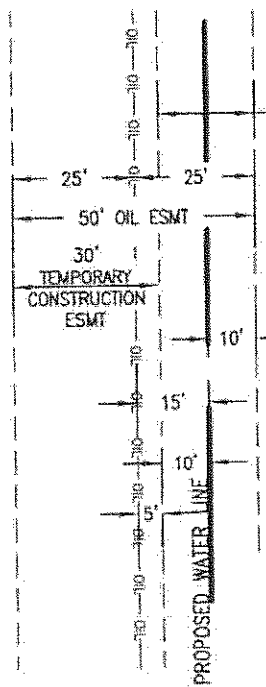
This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 3rd day of December, 2015.

Ronald C. Hack
Ronald C. Hack, Grantor

Jeanette Hack
Jeanette Hack, Grantor

TYP EASEMENT



20' PERMANENT WATER ESMT

CEDAR CREEK

EXISTING IRON PIPE AT A SUGAR TREE

EXISTING IRON PIPE AT AN OAK TREE

VICTOR & JENNIFER HACK PROPERTY
 (D.B. 1371 PG. 552)
 PVA#229-00-00-006.01

RONALD & JEANETTE HACK PROPERTY
 (D.B. 587 PG. 145)
 PVA#229-00-00-006

CENTER LINE OF 60-FOOT WIDE ACCESS/EGRESS EASEMENT

MINIARD PROPERTY
 (D.B. 721 PG. 598)
 PARCEL III
 PVA#229-00-01-008

BEAMER PROPERTY
 (D.B. 1379 PG. 547)
 PVA#229-00-01-009

SIMPSON PROPERTY
 (D.B. 1355 PG. 571)
 PVA#229-00-01-014

HELENA DRUIN, TRUSTEE PROPERTY
 (D.B. 1201 PG. 190)
 PVA#217-00-00-030

VICKI CAROL HUFF PROPERTY
 (D.B. 1079 PG. 28)
 PVA#217-00-00-028
 LOT 1
 WENDOVER HILLS
 (P.C. 1 SHI, 3360)

16" OAK TREE WITH 3 HACKS ON EAST SIDE +/- 6" ABOVE BASE

ROBERT GREEN PROPERTY
 (D.B. 1335 PG. 362)
 PVA#218-00-00-074

RONALD & JEANETTE HACK PROPERTY
 (D.B. 587 PG. 145)
 PVA#229-00-00-006

LEGEND

- × WIRE FLAG LOCATED BY ASHLAND OIL COMPANY
- ⊙ ASHLAND PVC INDICATOR POST
- EXISTING 1/2" DIA IRON PIN
- TREE
- △ EXISTING 1/2" DIA IRON PIN WITH YELLOW CAP STAMPED "LEIGH 1776"



SCALE: 1" = 600'

EXHIBIT A

THIS IS NOT A BOUNDARY SURVEY AND IS NOT TO BE USED FOR LAND TRANSFER

SHEET 1 OF 3

PROPERTY OWNER:
 RONALD & JEANETTE HACK
 1485 WOOLDRIDGE FERRY RD
 ELIZABETHTOWN KY 42701

ENGINEERING DESIGN GROUP, INC.
 315 S. MULBERRY STREET
 P.O. BOX 2484
 ELIZABETHTOWN, KY. 42702-2484
 (270) 769-1436

UTILITY EASEMENT SURVEY
 FOR
HARDIN COUNTY WATER DISTRICT #2
 OF
RONALD & JEANETTE HACK
PROPERTY

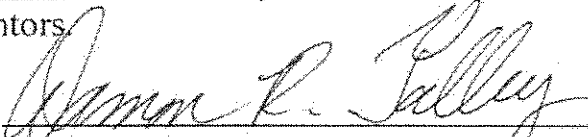


DATE: MAY 29, 2015

Z:\PROJECTS\MISC-SB\HACK\HACK-BASE-HCW22.DWG

STATE OF KENTUCKY
COUNTY OF HARDIN

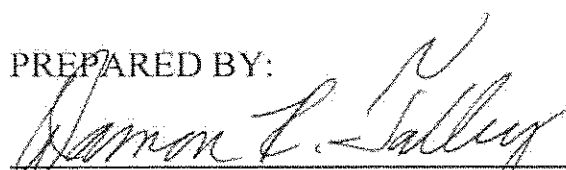
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 3rd day of December, 2015 by Ronald C. Hack and Jeanette Hack, husband and wife, Grantors.


NOTARY PUBLIC, State at Large

Notary ID: 534422

My Commission Expires: 6-9-2019

PREPARED BY:


Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

15/HCWD 2/ Easement - LWC - Hack, Ronald

MEMORANDUM OF AGREEMENT

This Memorandum of Agreement (the "MOA"), having an effective date of December 3, 2015, is made and entered into by and between the **HARDIN COUNTY WATER DISTRICT No. 2**, PO Box 970, Elizabethtown, Kentucky 42702, hereinafter referred to as "Water District"; and **RONALD C. HACK** and **JEANETTE HACK**, husband and wife, 1485 Wooldridge Ferry Road Elizabethtown, Kentucky 42701, hereinafter referred to as "Hack";

WITNESSETH

WHEREAS, the Water District is a water district organized under the provisions of KRS Chapter 74;

WHEREAS, the Water District currently owns and operates water supply, treatment, and distribution facilities;

WHEREAS, the Water District has made plans to construct a 24-inch diameter ductile iron water transmission main (the "Water Line") from Shepherdsville Road (Kentucky Highway 251) to the Point of Delivery from the Louisville Water Company near the Hardin-Bullitt County Line south of the Rolling Fork River for the purpose of obtaining a supplemental supply of potable water;

WHEREAS, the proposed route of the Water Line crosses real property owned by Hack;

WHEREAS, a portion of the proposed route of the Water Line parallels the existing Mid-Valley petroleum pipeline (the "Mid-Valley Pipeline");

WHEREAS, the Water District seeks to obtain both temporary construction and permanent easement rights, as set forth in the attached Utility Right-of-Way Easement (the "Water Line Easement") from Hack;

WHEREAS, the Water District and Hack have engaged in good-faith negotiations and have reached an agreement whereby Hack will grant the easement rights sought by the Water District, subject to certain terms and conditions; and

WHEREAS, the Parties desire to memorialize these terms and conditions.

NOW, THEREFORE, FOR AND IN CONSIDERATION of the mutual promises, covenants and conditions contained herein, it is agreed by and between the Parties as follows:

1. **Compensation.** The Water District shall pay Hack the agreed upon sum upon the simultaneous execution of the Water Line Easement and this MOA.
2. **Easement Location.** The Water District's permanent easement and temporary construction easement shall be located as depicted on **Exhibit A** (3 pages), which is attached to the Water Line Easement document being simultaneously executed by Hack.

3. **Water Line Location.** The Mid-Valley Pipeline Easement has a nominal width of 50 feet (25 feet on each side of the centerline of the oil pipeline). The Water Line Easement follows the route of the Mid-Valley Pipeline and consists of a 20 feet wide permanent easement and an adjacent 30 feet wide temporary construction easement. The route and location of the Water Line are depicted on **Exhibit A** of the Water Line Easement. As depicted on **Exhibit A**, the centerline of the Water Line shall be located 15 feet from the centerline of the Mid-Valley Pipeline and 10 feet from the edge of the permanent easement. This portion of the Water District's Water Line, which will be located on Hack's property, shall be located entirely within the confines of the Mid-Valley Pipeline Easement.

4. **Marking Easement Boundaries.** Prior to the commencement of construction, the Water District shall cause its surveyor to erect a sufficient number of temporary wooden stakes, flags, or markers so that the boundaries of the Mid-Valley Pipeline Easement will be clearly visible to the Water District's Contractor (the "Contractor") and its subcontractors during the construction of the Water Line.

5. **Ingress / Egress During Construction.** The Water District has made arrangements with Alan E. Hack for the Contractor to utilize Alan E. Hack's property to access the Mid-Valley Pipeline Easement and the Water Line Easement during construction of the Water Line. In addition, the Water District and the Contractor shall also utilize Woods Lane, and Woods Lane extended, to access the

Mid-Valley Pipeline Easement and the Water Line Easement during construction of the Water Line.

6. **Permanent Ingress / Egress.** A portion of the compensation being paid by the District to Alan E. Hack is for the purpose of obtaining a permanent access point to the Water Line Easement. Therefore, the Water District will utilize the Alan E. Hack property to access the southwestern portion of the Water Line Easement for periodic inspection, operation, and maintenance of the Easement and Water Line. In addition, the Water District shall use Woods Lane, and Woods Lane extended, to access the Water Line Easement for periodic inspection, operation, and maintenance of the Easement and Water Line. The Water District shall **not** use Hack's private road for means of ingress and egress to the Water Line and the Water Line Easement.

7. **No Blasting.** The Water Line construction and installation shall be accomplished **without** blasting or the use of any explosive devices. It is contemplated that the Contractor or subcontractors shall use a hydraulic ram (sometimes referred to as a "hoe ram") or rock saw to break or cut the rock that must be removed during the excavation of the trench for the Water Line.

8. **Best Practices.** The Water District shall cause the Contractor to use Construction Industry Best Practices, as specified by the Construction Industry Institute, during installation of the Water Line.

9. **Open Cut Stream Crossing.** Subject to the additional requirements set forth in paragraphs 10 and 11 of this MOA, the portion of the Water Line which crosses Cedar Creek (location described in paragraph 10) and the Feeder Stream (location described in paragraph 11) shall be installed by utilizing an "Open Cut Stream Crossing In Solid Rock" method or technique as more particularly described in the Standard Specifications prepared by Kenvirons, Inc. In addition, all Blue Line Stream Crossings must comply with Nationwide Permit #12 issued by the U. S. Army Corps of Engineers and the General Water Quality Certification for Nationwide Permit #12 issued by the Kentucky Division of Water, Department for Environmental Protection, Energy and Environment Cabinet.

10. **Cedar Creek.** The Blue Line Stream known as Cedar Creek is depicted on the Plan Sheets prepared by Kenvirons, Inc. dated March 2014 (see Sheet No. 4) and crosses the Water Line route at approximately Station 28+75. In addition to the requirements set forth in Paragraph 9 of this MOA, the Contractor shall install a concrete cut-off wall on the upstream side of the Water Line. The cut-off wall shall rest on solid, undisturbed bedrock and extend to the bottom of the concrete cap. The concrete cap that will be installed over the top of the Water Line

and trench shall extend approximately five (5) feet beyond either side of the trench (upstream and downstream). To contain Cedar Creek from veering from its natural course, it may be necessary to leave a swell or small berm at the top of both banks.

11. **Feeder Stream.** Also located on the Hack property is a small stream which feeds into Cedar Creek. This small stream shall be defined as the "Feeder Stream." The Feeder Stream flows into Cedar Creek approximately ¼ mile downstream from the Water Line. The Feeder Stream is depicted on the Plan Sheets prepared by Kenvirons, Inc. dated March 2014 (see Sheet No. 5) and crosses the Water Line route at approximately Station 45+00. (The Feeder Stream is shown near the Match Line for Sheet No. 4 and Sheet No. 5.) In addition to the requirements set forth in Paragraph 9 of this MOA, the Contractor shall install a concrete cut-off wall on the upstream side of the Water Line. The cut-off wall shall rest on solid, undisturbed bedrock and extend to the bottom of the concrete cap. The concrete cap that will be installed over the top of the Water Line and trench shall extend approximately five (5) feet beyond either side of the trench (upstream and downstream).

The Feeder Stream enters the Water Line Easement at a diagonal and then runs parallel with, and on top of, the proposed Water Line for approximately 50 feet. The Feeder Stream has a relatively smooth and flat rock creek bed. This permits a person to drive a golf cart or utility vehicle across and along the Feeder

Stream to access the portion of the Hack property located on the Northwest side of the Mid-Valley Pipeline Easement. During construction, the Contractor shall replace the portion of the rock creek bed that is removed with a smooth concrete cap, without jagged edges and approximately 12 inches deep. The concrete cap or road shall run along and over the Water Line for approximately 50 feet and extend beyond the sides of the trench as required by the Standard Specifications prepared by Kenvirons, Inc. The concrete cap shall be installed in such a manner that a person will be able to drive a golf cart or utility vehicle across and along the Feeder Stream to access the portion of the Hack property located on the Northwest side of the Mid-Valley Pipeline Easement without any more difficulty than prior to the construction.

12. **Timber Damage.** Currently, there are no trees located on the Mid-Valley Pipeline Easement. There are several trees, however, located on the Hack property near, but outside, the boundaries of the Mid-Valley Pipeline Easement. The roots of some of these trees extend underground and into areas that will be disturbed by the Water Line construction. In the event the Contractor damages any trees, the Contractor shall fairly compensate Hack. If the Contractor fails to do so in a timely manner, then the Water District shall fairly compensate Hack. Following construction, if the Water District, its employees, contractors, or agents damage any trees, the Water District shall fairly compensate Hack for the damages.

13. **Top Soil.** During construction of the Water Line, the Water District shall require the Contractor to separate and set aside the top six (6) inches of all good quality top soil along the route of the Water Line and not comingle the top soil with the other soil that is excavated. The top soil shall then be placed back on top of the other soil that is back-filled into the trench.

14. **Removal of Rocks, Boulders, and Excess Materials.** During construction and restoration of the Water Line, the Water District shall cause the Contractor to remove all rocks, boulders, roots, debris, other excess materials, surplus construction supplies and materials, trash, and rubbish from the Water Line Easement. None of the items described in the preceding sentence shall be dumped or left on the Water Line Easement, the Mid-Valley Pipeline Easement, or on any other portion of the Hack property.

15. **Land Restoration.** As soon as practical following construction of the Water Line, the Water District shall cause the Contractor to restore, as nearly as practical, the land affected by the Water Line construction to its original condition, or better. All disturbed areas shall be level graded without potholes or bumps. The property shall be restored in such a manner that it can be mowed with a finish mower once grass has been re-established. Thereafter, the Water District shall be responsible for maintaining the Water Line Easement.

16. **Seeding and Mulching.** Following final clean-up, the Water District shall cause the Contractor to apply fertilizer, prepare a seedbed, seed, and mulch all disturbed areas in accordance with the Standard Specifications prepared by Kenvirons, Inc. The seed variety and application rate shall meet or exceed the recommendations of the Hardin County Extension Office. The Contractor shall utilize whatever means is necessary (straw mulch, netting, sod, etc.) to establish, in all disturbed areas, a healthy, vigorous, thick stand of grass free of bare spots, ditches, ruts, and eroded areas. In the event the Contractor fails to do so in a timely matter, then the Water District shall be obligated to do so.

17. **Bush Hogging Water Line Easement.** Since the Water Line will be located entirely within the Mid-Valley Pipeline Easement, the Water District will rely upon Mid-Valley to keep the Water Line Easement bush hogged on an annual basis. Nevertheless, should the Water Line Easement fail to be bush hogged by October 15 of each calendar year, the Water District shall bush hog its 20 foot wide permanent Water Line Easement.

18. **Indemnification.** The Water District hereby agrees to indemnify Hack for, and hold Hack harmless from, any and all losses, liabilities, costs and expenses (including, but not limited to, reasonable attorneys' fees) incurred by Hack as a result of any accident, negligence, or willful misconduct by the Water District, its employees, contractors, or agents, arising from the Water District's

construction, inspection, operation, repair, and maintenance of the Water Line. To that end, immediately upon notification by Hack, the Water District shall assume, at its own cost, the defense of any such action or suit which may be brought against Hack because of the Water District's construction, inspection, operation, repair, or maintenance of the Water Line.

[Remainder of Page Intentionally Left Blank]

IN TESTIMONY WHEREOF, this Memorandum of Agreement has been executed in multiple counterparts, each of which is deemed to be an original, by Hack and the duly authorized General Manager of the Water District.

HARDIN COUNTY WATER DISTRICT No. 2

BY: James R. Jeffries
James R. Jeffries, General Manager

DATE: 12-3-15

RONALD C. HACK

BY: Ronald C. Hack
Ronald C. Hack

DATE: Dec. 3, 2015

JEANETTE HACK

BY: Jeanette Hack
Jeanette Hack

DATE: 3 December 2015

Contact Information:

Ronald C. Hack

Email: rhackfam@aol.com

Phone: 270-401-6868