

Application - ORIGINAL

2008-95

For

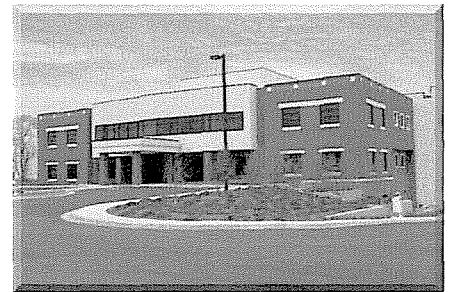
**Application for a Certificate of
Public Convenience & Necessity
for the
Renovation of the Pirtle Spring Water Treatment Plant**

Presented To:

Kentucky Public Service Commission

211 Sower Boulevard

Frankfort, KY 40602-0615



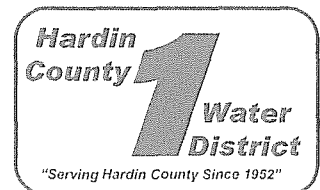
Filed By:

1400 Rogersville Road

Radcliff, KY. 40160

Phone: 270-351-3222

Mr. Jim Bruce, General Manager



March, 2008

Hardin County Water District No. 1

Serving Radcliff and Hardin County for Over 50 Years

1400 Rogersville Road
Radcliff, KY. 40160

2008-95

March 14, 2008

Ms. Beth O'Donnell
Executive Director - Kentucky Public Service Commission
211 Sower Blvd.
P.O. Box 615
Frankfort, KY 40620-0615

RECEIVED

MAR 17 2008

PUBLIC SERVICE
COMMISSION

**SUBJECT: Application Filing - Certificate of Public Convenience & Necessity
Pirtle Spring WTP - Renovation Project**

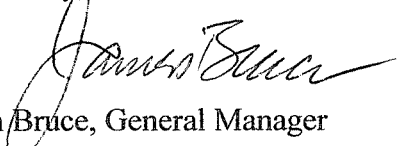
Dear Director O'Donnell,

Enclosed please find an original and four copies of the above referenced application. We have been planning, designing and securing funding for this project for about five years. (Our application requests a deviation to submit an original and four copies).

We have a design-build team and contractor now ready to begin construction. In order to avoid more construction cost increases, we would like to authorize them to proceed as soon as possible. Due to the length of the project, we also need to take advantage of warmer weather as soon as possible, as construction will take about a year.

We request an expedited review and issuance of a certificate, so we can proceed with the project construction. We appreciate your attention to see this application is reviewed and approved as soon as possible. If you have any questions, please do not hesitate to call me or our attorney, Mr. David Wilson II (Phone: 270-351-4404).

Sincerely,



Jim Bruce, General Manager

Cf; Mr. David Wilson II, HCWD1 Attorney

Encl.

BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY

IN THE MATTER OF:

APPLICATION OF THE
HARDIN COUNTY WATER DISTRICT No. 1
FOR A CERTIFICATE OF PUBLIC CONVENIENCE
AND NECESSITY TO RENOVATE THE PIRTLE SPRING
WATER TREATMENT PLANT

CASE NO. _____

APPLICATION

The Petition of the Hardin County Water District No.1, respectfully shows:

1. Applicant ("District") requests a deviation from **807 KAR 5:001 Section 8(2)** and submit one original and four (4) copies of the application for Commission purposes.
2. District is a duly organized and operating water district, established in 1952 under the laws of the Commonwealth of Kentucky (KRS 74 et. seq.) and is engaged in producing, selling and purchasing potable water, and also owns and operates the Ft. Knox sanitary and storm sewer utilities. The District operates and does business in a service area that includes the City of Radcliff ("City") and portions of Hardin, Meade and Breckinridge counties, and the Ft. Knox Army Base cantonment area.

The District also has wholesale water sales agreements with the City of Vine Grove, Meade County Water District, City of Hardinsburg and Hardin County Water District No. 2. The entire service area is within the boundaries of the Commonwealth of Kentucky. The District's address is 1400 Rogersville Road, Radcliff, Kentucky 40160. (807 KAR 5:001: Section 8(1)).

3. The District is proposing to renovate its only water treatment plant that was originally built in 1982. Although efforts have been made to maintain and care for the facilities, the water treatment facility is in disrepair as shown in the photographs in **Exhibit 1**. Many aspects of the facility do not currently meet *Recommended Standards for Water Works* ("10 State Standards") and presents numerous safety hazards, operational difficulties and aging facilities. Moreover, this renovation will provide for future growth within the District's service area and allow the District to continue to provide quality potable water to all customers. (807 KAR 5:001: Section 9(2)(a)).
4. The construction will re-use the existing site, sludge lagoons, concrete clearwell, concrete foundations and walls, two clarifiers (flocculation / sedimentation basins), chlorine feed building and raw water pumps and pump building. All other structures will be demolished and rebuilt. The new facility will be built on top of the concrete foundation and clearwell and will include the following: new control building; new chemical feed and storage; new filters and backwash system; new shop; two water quality laboratories; new restrooms and break

facilities and all new electric switchgear, pumps and motors. The new filters, chemical feed, pumps and motor control center and electrical switchgear will all be sized for 4.5 mg/d, which is a 50% increase over the current plant and equipment. The new filters will also allow backwashing of one unit, while two remain in service and providing 100% of current system demand, and also allow filter to waste (FTW) and individual filter monitoring, which the current filters do not. (1996 Safe Drinking Water Act Amendments, Filter Backwash Recycling Rule).

5. The District requests that it be issued a Certificate of Public Convenience and Necessity authorizing and approving the renovation of its Pirtle Spring Water Treatment Plant located at 1500 Shipley Road, Cecilia, Kentucky, in western Hardin County. Pirtle Spring Water Treatment Plant provides potable water to approximately 30,000 persons in Hardin, Meade and Breckinridge counties in Kentucky (including customers of wholesale accounts), and currently has 9,748 active retail accounts.
6. No franchises or permits are required with the exception of a permit from the Kentucky Cabinet for Natural Resources Department, Division of Water, which is enclosed in **Exhibit No. 2**
7. The District has entered into a design-build agreement with Judy Construction to design and build the renovations. Judy Construction and the District have agreed on a contract price of \$5,126,260. A competitive, publicly advertised process was used to select the design-build team. Additional costs that will be incurred directly by the District for construction, administration, SCADA (Supervisory Control and Data Acquisition) and other miscellaneous cost, such as furniture, cabinetry, etc. add \$309,000 to the construction cost, and purchased water due to construction adds \$200,700 for a total project cost of \$5,635,960. **See Exhibit No. 3.**
8. The District believes that the negotiated price is reasonable, and comparable to other water treatment facilities recently approved and constructed in the Commonwealth, when compared using cost per million gallons constructed. **Exhibit No. 4**
9. An area map is provided showing the geographical location of Pirtle Spring Water Treatment Plant. **Exhibit No. 5** (807 KAR 5:001 Section 9(2)(c) and Section 9(2)(d))
10. Board minutes recording the approval of the project and submitting an application to the Commission are identified in **Exhibit No. 6.** *(The Board's vote included a contract which assumed the District would hire HVAC contractor directly, which would not be part of the approved DB contract amount. This has since changed, and the HVAC work is now included in the DB contract, however the total project cost has not increased).*
11. Proposed renovation will be funded by \$4,000,000 in approved grants. The source of the funds are the Infrastructure for Economic Development Fund for Tobacco Producing Counties (HB267)(WX21093024) and (HB380)(WX21093024), with each grant being \$2,000,000. The District is currently seeking additional grant funding. Commitment letters for these grants are identified in **Exhibit No. 7.**

Should remaining grants not be received, the District's Board of Commissioners has approved requesting legislators to re-direct another approved \$1,000,000 grant, Infrastructure for Economic Development Fund for Tobacco Producing Counties (HB380) (WX21093020) that provides partial funding for a future system expansion project. All remaining costs will be funded from the District's reserves. Based on preliminary, unaudited 2007 year end balances, the District had \$1,242,567 of unrestricted funds available for this project. A summary of funding is listed in **Table 1** below

NOTE: The table assumes that the District will *NOT* receive any other grants besides the grants already received.

Table 1

Funding Source	Amount \$
Tobacco Settlement Grant (HB267)	\$2,000,000
Tobacco Settlement Grant (HB380)	\$2,000,000
TOTAL GRANTS FOR PROJECT >	\$4,000,000
Tobacco Settlement Grant (HB380) (For other County Expansion Project)	\$1,000,000
District Reserves (07 Year End, Unaudited)	\$1,242,567
TOTAL AVAILABLE >	\$6,242,567

807 KAR 5:001 Section 9(2)(e)

12. The District is not requesting a rate increase or adjustment for this project and is not proposing or requesting to issue any new debt, loans or mortgages to fund this project.
13. The estimated added cost of operation after the completion of the renovation project is \$183,551 of which 57% is for increased depreciation, which is a non-cash expense. Using the 2006 annual PSC report, this increase would be an equivalent to 5% of total actual 2006 operating expenses (\$3,683,196 includes depreciation, interest expense and amortized debt expense). This summary is included as **Exhibit 8**. (807 KAR 5:001 Section 9(2)(f)).
14. The District request deviation from 807 KAR 5:001 Section 8(2) and submit three (3) copies of the Engineering plans and specifications. Engineering plans and specifications for the plant renovation are identified in **Exhibit 9** (under separate cover). The engineering plans and specifications were prepared by HDR/Quest and have been signed, sealed and dated by an engineer registered in the Commonwealth of Kentucky. The engineering plans have been duly approved by the Department of Natural Resources, Division of Water and said approval is identified in **Exhibit 2**. (807 KAR 5:001 Section 8(2) and KAR 807 5:001 Section 9(2)(b) and KRS 322.340)
15. The District requests an expedited review and approval, in order to take advantage of the current price from the contractor, avoid future material and labor cost increases, and begin construction as soon as the weather provides, in the spring of 2008.

WHEREFORE, Hardin County Water District No.1 hereinafter referred to as District, request that the Public Service Commission of the Commonwealth of Kentucky issue a Certificate of Public Need and Necessity for the renovation of the Pirtle Spring Water Treatment Plant.

Dated at Radcliff, Kentucky, this 14 day of March 2008.

HARDIN COUNTY WATER DISTRICT No. 1

By: 

David T. Wilson II, Attorney at Law
Attorney for Hardin County Water District No.1
Skeeters, Bennett, Wilson and Pike, PLC
550 West Lincoln Trail Boulevard, PO Box 610
Radcliff, Kentucky 40160
Phone: (270) 351-4404
email: david.wilson@sbw-law.com

VERIFICATION

The undersigned, Mr. James S. Bruce, General Manager of the Hardin County Water District No.1, hereby verifies that he has personal knowledge of the matters set forth in the enclosed application requesting the Commission issue a Certificate of Public Need and Necessity for the renovation of the Pirtle Spring Water Treatment Plant, and that he is duly designated by the Board of Commissioners of the Hardin County Water District No. 1 to sign and submit this information its behalf.

HARDIN COUNTY WATER DISTRICT No. 1

By *James S. Bruce*
JAMES S. BRUCE, GENERAL MANAGER

CERTIFICATION OF SERVICE

The undersigned, Mr. David T. Wilson II, attorney for the Hardin County Water District No. 1, hereby verifies that the foregoing was served on Ms. Beth O'Donnell, Executive Director, Kentucky Public Service Commission, 211 Sower Boulevard, Frankfort, KY. 40601-8204 on this 14th Day of March, 2008

David T. Wilson II

Mr. David T. Wilson II, ESQ.
Attorney for Hardin County Water District No. 1

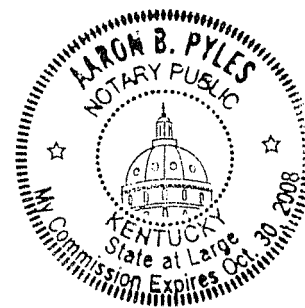
STATE OF KENTUCKY
COUNTY OF HARDIN

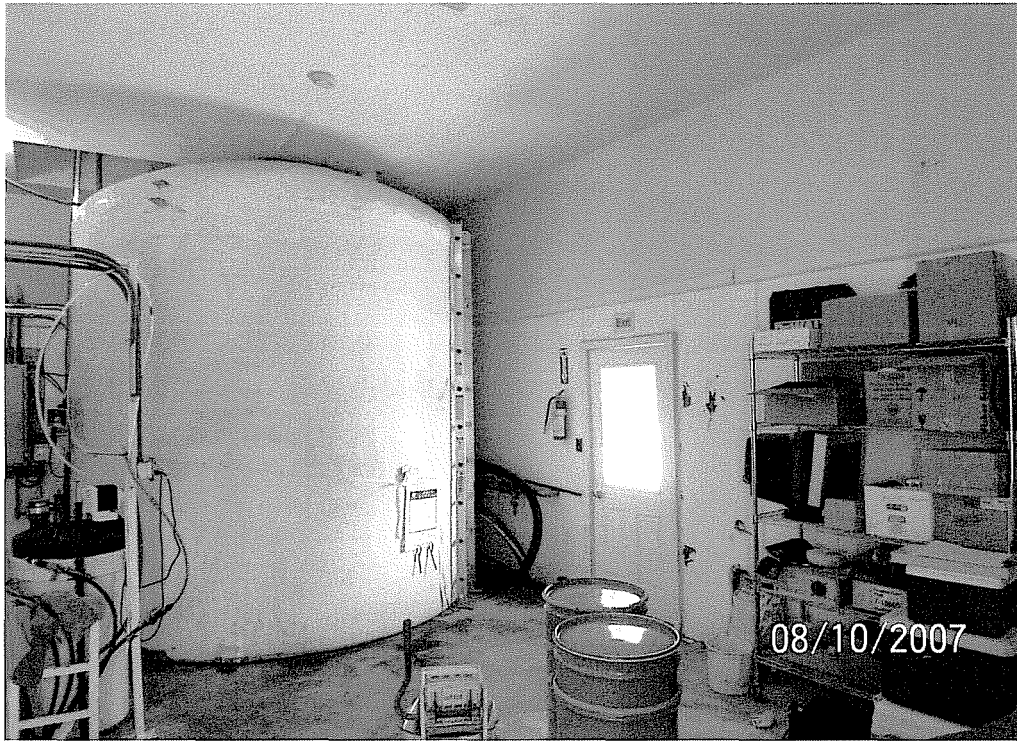
I, the undersigned, a Notary Public, do hereby certify that on this 14th day of March, 2008, personally appeared before me, James S. Bruce and David T. Wilson, II, who being by me first sworn, subscribed to and acknowledged that they both represent the Hardin County Water District No. 1, a Kentucky Corporation, that they have signed the foregoing document as General Manager and Attorney of the Corporation.

Aaron B. Pyles
NOTARY PUBLIC, STATE OF KENTUCKY

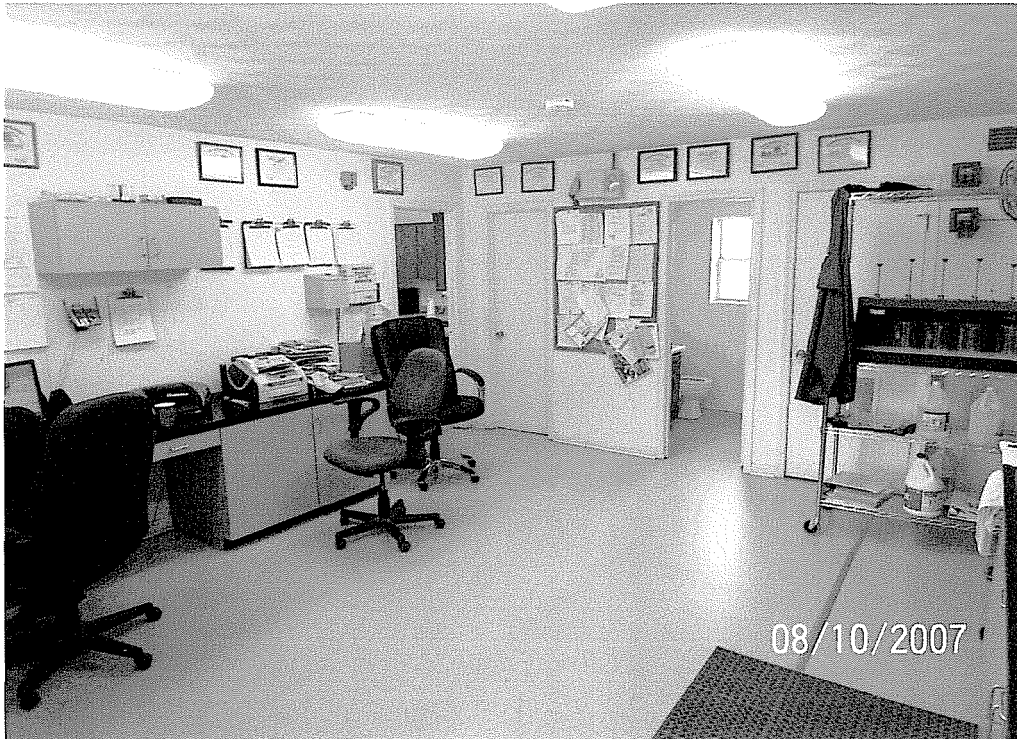
My Commission Expires;

October 30, 2008





This tank stores polymer coagulant. There were 2 tanks in this room, but the second tank cracked and began leaking. There is no containment method or system. The building was built around the tanks, so without extensive demolition of building, there is no way to put back the 2nd tank. Currently, we do not have redundant feed or back-up storage of this critical treatment chemical. The re-built plant will have redundant chemical feed and storage systems. This room doubles as storage, SCADA main panel, emergency eyewash and other chemical storage. *Section 5.1.7 a of the Ten States Standards (TSS) state "Chemical feed equipment shall be located in a separate room to reduce hazards and dust problems." As is evident in the picture above, the chemical feed equipment is next to the storage tank. Also, section 5.1.9 a 2 states "Space should be provided for convenient and efficient handling of chemicals."*



A single room must serve as laboratory, operators console, supervisors office, entrance to single bathroom (no men's and women's separation, do have a woman operator) entrance to kitchen/break room, and access to storage closet and furnace. *No adequate separation for these uses, nor large enough space as required in section 2.8.2 of the TSS.*



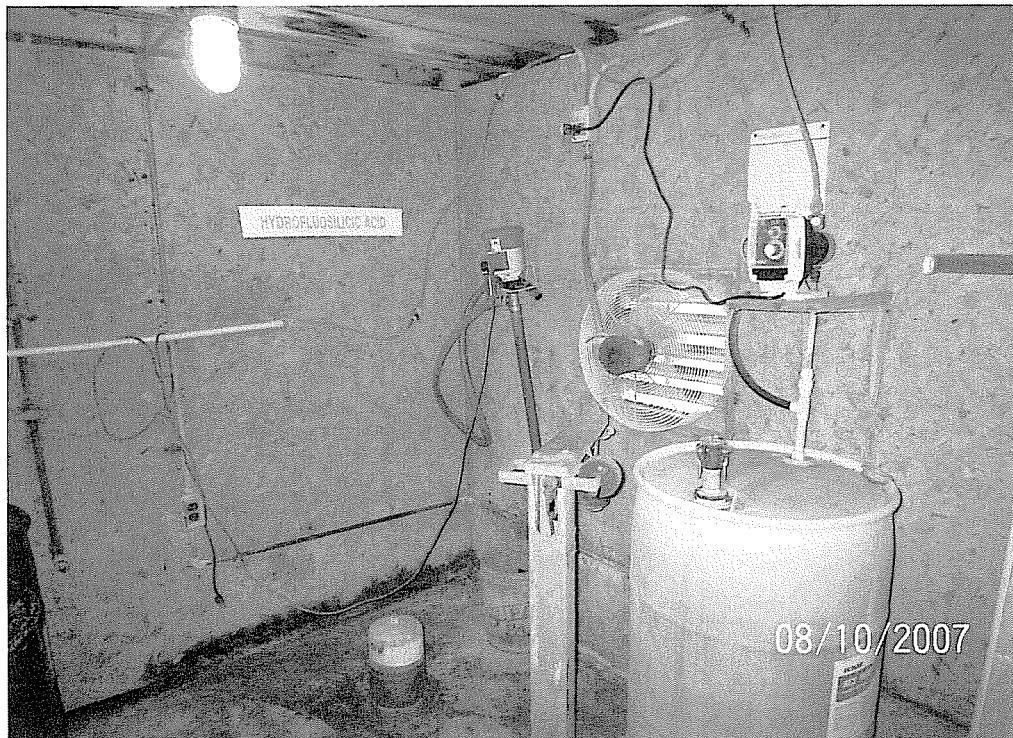
There is no dedicated shop to work on equipment. This room serves as parts storage, chemical storage, room for air compressor, raw water turbidimeter, attic access, trash storage and workbench. In summer, must move all this to other out-building so the lawn mower can be stored in this room. As stated in section 2.7 of the TSS "Shop Space and Storage - "Adequate facilities should be included for shop space and storage consistent with the designed facilities."



The main control building was built using residential construction methods with wood. There is extensive termite damage throughout the building. This room is also the coagulant storage room



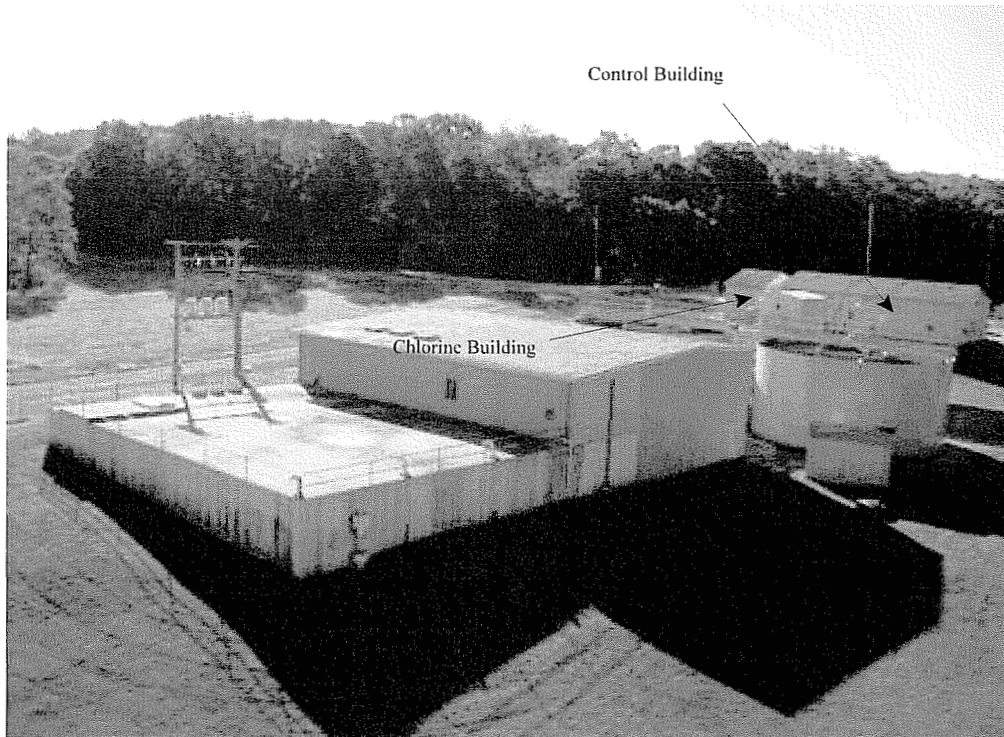
This is the dry alum coagulant room. It is located in the control building. There are no redundant storage or feed systems. The drywall is damaged from getting wet while cleaning the room. There is also termite damage and rot along the floor. The exhaust fan is not installed to code, and sits directly against wood studs.



The hydrofluorosilicic acid feed room does not have any redundant equipment. Walls are made of wood particle board and have moisture damage and mold. There is not an adequate measurement system, other than a scale on which barrels must be lifted up on to. Single pump and paint mixer must be used to mix the dosages. *Section 5.4.2 b. of the TSS states "Acids and caustics shall not be handled in open vessels, but should be pumped in undiluted form from original containers through suitable hose, to the point of treatment or to a covered day tank."* As you can see there is not enough space for a bulk tank. We must use 55 gallon drums.



The 8 steel filter vessels have extension corrosion. Tanks are in a closed in metal building, without adequate ventilation. Tanks have been sandblasted and painted several times, but high humidity, open water tanks and slight chlorine levels in are during backwash cause constant corrosion.



Main control building is located away from all treatment processes (furthest building in background). Operators have no way to view flocculation and sedimentation tanks (outdoors) or filter building except for standing in the bathroom or kitchen. All trips from control building to operations building and lab require walking between buildings, outdoors. Chlorine gas cylinders are in separate building, about 6 feet from main operations building. This building will be demolished and concrete pad used for parking area. The new building will have operators console/room with windows directly viewing filter basins, with windows also providing view of clarifiers and chlorine feed building.



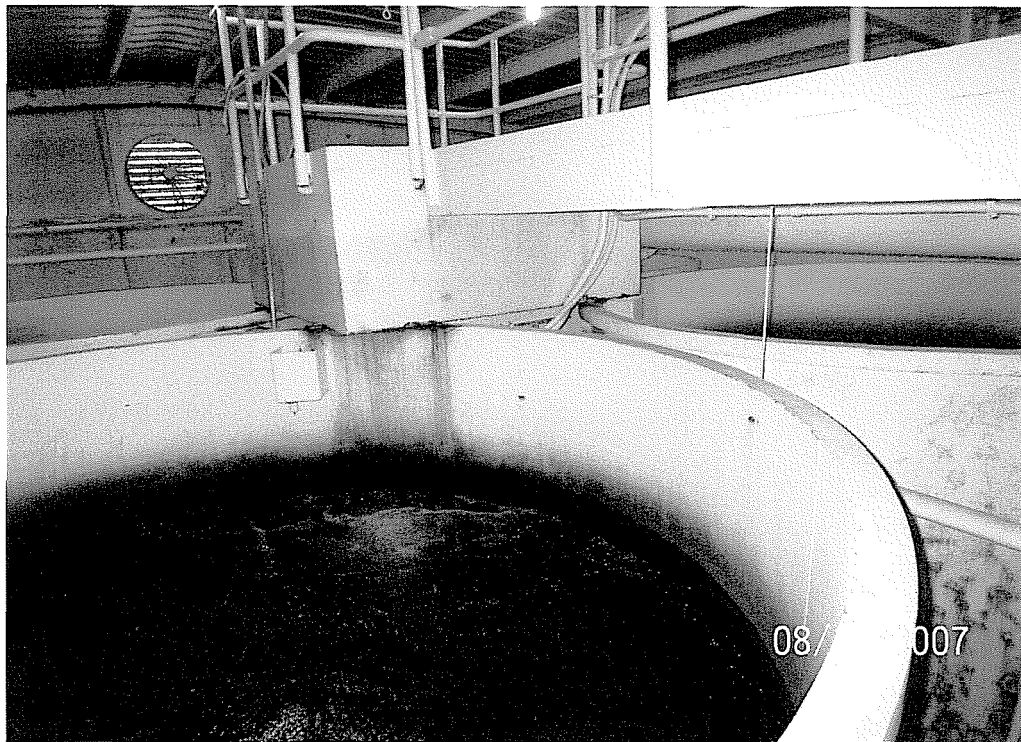
Filter building has very little insulation left on walls. When sandblasting filter tanks for painting, insulation blankets were damaged along walls and ceiling. Most of damaged insulation blankets have been removed. Floor in filter building constantly has standing water on them due to condensation and sweating on walls of steel filter tanks. This building will be removed and replaced with a masonry block building with metal roof.



Wood and vinyl trim throughout operations building have been damaged or are aged. Another example of residential construction methods used for an industrial treatment facility, and does not meet 10 states standards. Wood construction used throughout the building.



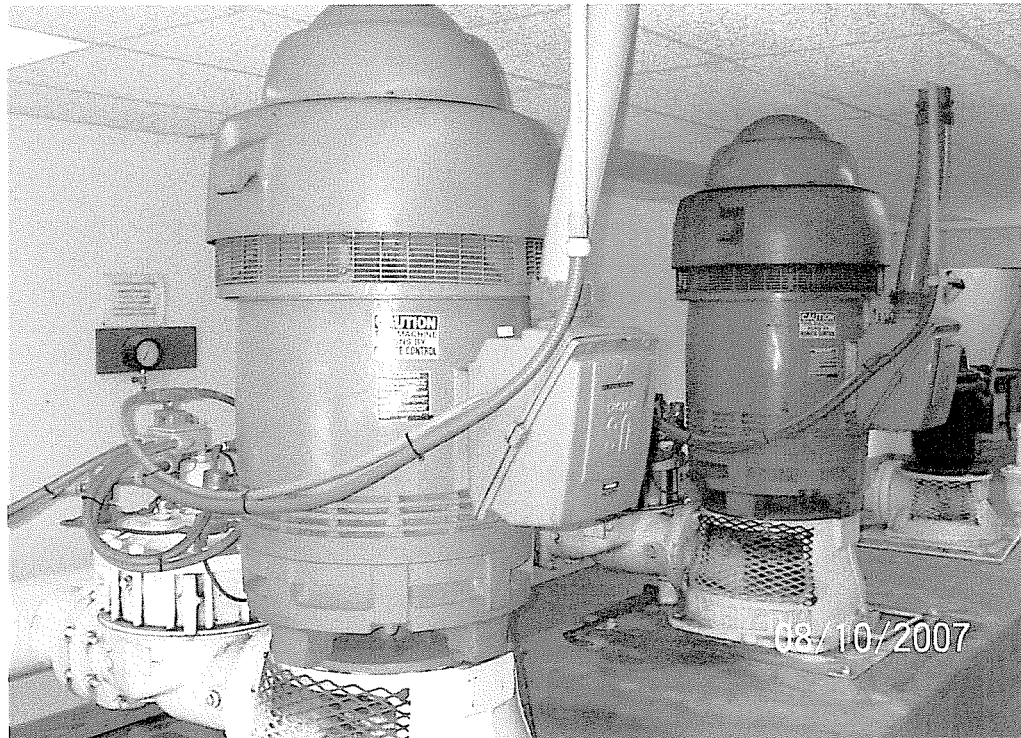
Blow off pumps for clarifier tanks located in small shed, away from other buildings. Extensive rust occurring on residential metal door. Pump and wet-well subject to freezing and corrosion.



There are 8 separate filter tanks, but operate as 2 units. Cannot measure turbidity from each filter, to isolate filter performance. The design also does not allow filter to waste, as new regulations require. Division of Water has provided a variance to treat as 2 filter vessels, however this is not best operations practice. New facility will provide for 3 initial filters, and space for future 4th filter basin, providing 100% treatment production during the back washing of 1 filter vessel.



This is catwalk over filter tanks. The building was built with too low a ceiling height . Operators cannot stand up while on catwalk, and must stoop or bend to avoid hitting head on beams and electrical conduit. Lighting over filters is inadequate.



Two high service pumps having been running almost continuously for 26 years. Pump control valves must be used to reduce flow at low demand times, creating inefficient energy use. Some of switchgear is dated in 1960's and is installed not to code and also requires frequent repairs and maintenance. New high service pumps will include Variable Frequency Drives, improving efficiency and lowering energy costs.



ENVIRONMENTAL AND PUBLIC PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

Ernie Fletcher
Governor

Division of Water
14 Reilly Road
Frankfort, Kentucky 40601-1190
www.kentucky.gov
November 9, 2007

Teresa J. Hill
Secretary

Jim Bruce, General Manager
Hardin County Water District No. 1
1400 Rogersville Road
Radcliff, KY 40160

RE: Hardin County Water District No. 1
AI # 1673, APE20070009
PWSID # 0470393-07-009
Pirtle WTP - Reconstruction
Hardin County, Kentucky

Dear Mr. Bruce:

We have reviewed the plans and specifications for the above referenced project. The plans include the reconstruction of Pirtle Water Treatment Plant. This will entail 4 rapid gravity sand filters, replacement of 2 high service pumps and 1 backwash pump, a chemical area with containment trench, associated equipment, housing and piping. This is to advise that plans and specifications covering the above referenced subject are APPROVED with respect to sanitary features of design as of this date with the following construction stipulations:

1. The fluoride feed room should be a separate room and have a power fan vented to the outside atmosphere. This vent fan should be located close to the ceiling.
2. Fluorosilicic acid metering pumps shall be sized to operate in the mid-range of their capacity and mounted not more than 4 feet above the solution tank.
3. The fluorosilicic acid day tank should be about a two day supply and should be mounted on scales to record the daily weight loss of hydrofluosilicic acid. The day tank should be vented to outside atmosphere. Lines connected to the day tank should be flexible enough to allow the scales to work properly.
4. All fittings for feed of fluorosilicic acid shall be compatible with the chemical.
5. A berm should be built around the fluorosilicic acid bulk tank that would contain 110% of the bulk tanks contents
6. Bulk and day tanks shall have an overflow that is turn down, is screened, has a free fall discharge, and is located where noticeable.

7. Combined filter effluent turbidimeter taps shall be provided.
8. When this project is completed, contact Bob Murphy at (502) 564-3246 ext 3778 for Oral Health Program start-up approval.
9. If sanitary features of the approved plans are to be changed during construction, the engineer shall submit the revision to the Division of Water for approval prior to implementation of the modification. Written approval from the Division of Water must be granted prior to on-site work dedicated to the adjustment.
10. When this project is completed, the owner shall submit a written certification to the Division of Water that the above referenced water facilities have been constructed and tested in accordance with the approved plans. Such certification shall be signed by a licensed professional engineer.
11. When this project is completed, the engineer shall submit as-built drawings to the Division of Water.

Unless construction of this project is begun within 1 year from the issuance date of this permit, the permit shall expire. If requested prior to the permit expiration, an official extension from the Division of Water may be granted. If this permit expires, the original plans and specifications may be resubmitted for a new comprehensive review.

Once the treatment plant is completed, the following operating stipulations will apply until future construction, modification, or correspondence from the Division of Water changes the applicability of the stipulations. Further, if a stipulation is changed or deemed to be no longer applicable, unaffected stipulations shall not be voided.

1. Replacement parts for all chemical feed pumps shall be kept on-site.
2. The rated potable water production of Hardin County Water District No. 1's potable water treatment plant following construction shall remain unchanged.
3. Hardin County Water District No. 1's potable water treatment plant is designated as Class IVA and shall remain designated as Class IVA following construction.
4. The maximum potable water production, calculated from daily gallons of water treated and daily hours of operation, of Hardin County Water District No. 1's potable water treatment plant shall not exceed 2,150 gpm (due to high service pump capacity).
5. Standards contained in 401 KAR Chapter 8 applicable to community water systems serving at least 3,300 people, utilizing direct filtration, and utilizing chemical disinfection of surface water shall apply.

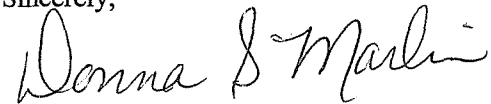
This approval has been issued under the provisions of KRS Chapter 224 and regulations promulgated pursuant thereto. Issuance of this approval does not relieve the applicant from the responsibility of obtaining any other approvals, permits or licenses required by this Cabinet and other

Pirtle WTP - Reconstruction
DW# 0470393-07-009, APE20070009
November 9, 2007
Page 3 of 3

state, federal and local agencies. Water withdrawal and KPDES permits are not included in this approval and are the responsibility of Hardin County Water District No. 1.

If you have any questions regarding this correspondence, please contact Terry Humphries at 502/564-8158, extension 518.

Sincerely,



Donna Marlin, Branch Manager
Drinking Water Branch
Division of Water

DM:TWH

C: HDR|Quest
Hardin County H.D.

Pirtle Spring Reconstruction Project

Master Project Cost Estimate

Revised after 8/07/07 Meeting

ITEM	27-Jul-07				Revised Total	COMMENT
	Source	DB	Revised			
1						
Site Work						
- Erosion Control (State Mandated)	HC-I	\$	0	\$	1,000	District do in-house labor + leased equipment
- Excavation-(Fill, Regrade, Drainage)	DB	\$	60,000	\$	60,000	By Judy - Revised since original
- Yard Piping Renovations (& Valves) (34 Tons of DIP+ PVC)	DB	\$	160,000	\$	160,000	By Judy - Revised since original
- New Septic System (Installed)	DB	\$	7,500	\$	7,500	No Change - Judy
- Paving	DB	\$	81,000	\$	81,000	No Change
- Landscaping Final Dress & Seeding	HC-I	\$	0	\$	20,000	District have landscape contractor do under exist contract
- Site Fencing / Gates / Openers	HC-O	\$	0	\$	32,000	District sub-contract directly
		\$	308,500	\$	361,500	
Sub total						
2						
Water Treatment Plant						
Operations Building						
- Structural Excavation/Cr. Stone/Backfill/Foundation Prep/Caissons	DB	\$	128,000	\$	128,000	By Judy - Revised since original
- Concrete (480 CY) 7-27-07 (368 CY)	DB	\$	180,000	\$	180,000	By Judy - Revised since original
- 7-27-07 CMU Block Bldg	DB	\$	672,000	\$	672,000	Using revised, CMU building option
- Masonry	DB	\$	151,000	\$	151,000	By Judy - Revised since original
- Custom Casework (kitchen, storage, control room)	HC-O	\$	0	\$	33,000	District sub-contract directly
- Miscellaneous Metals/Bar Joists/Metal Decking	DB	\$	363,000	\$	363,000	By Judy - Revised since original
- Drywall/Metal Studs/Carpet/Ceramic/Hardwood Floors	DB	\$	186,000	\$	186,000	By Judy - Revised since original
- Miscellaneous Architectural-(Lockers, Toilet Access,/Partitions, Etc.)	DB	\$	17,000	\$	17,000	By Judy - Revised since original
- Doors & Windows (Hardware) (Overhead, FRP, and H.M.)	DB	\$	58,000	\$	58,000	By Judy - Revised since original
- Glass & Glazing	DB	\$	18,000	\$	18,000	By Judy - Revised since original
- Interior Carpentry	DB	\$	4,000	\$	4,000	By Judy - Revised since original
- Painting / Caulking (District doing painting, sub caulking)	HC-I	\$	87,000	\$	10,000	District in-house, rent equipment
- HVAC/Mechanical (Geothermal)	DB	\$	258,000	\$	258,000	By Judy - Revised since original
- Mechanical (Plumbing, Small Control/Chemical Piping/Valves)	DB	\$	219,000	\$	219,000	By Judy - Higher than original
- Electrical	DB	\$	656,000	\$	656,000	By Judy - Revised since original
- Electrical - Site Work / Main Feed (Nolin)	HC-O	\$	35,000	\$	35,000	Direct District prmt to Nolin
		\$	2,997,000	\$	2,988,000	
						Operations Building Total
Filtration Equipment						
- Concrete Filter Vessels	DB	\$	116,000	\$	116,000	By Judy - Revised since original
- Electric Actuated Butterfly Valves	DB	\$	188,000	\$	188,000	By Judy - No change
- Filter Control Panels	HC-O	\$	0	\$	15,000	Using touch pad screens tied to SCADA (By District)
- SCADA (Re-wire existing, connect new instruments, filter controls)	HC-O	\$	0	\$	50,000	District sub-contract directly
- Filter Piping (Hangers & Accessories) (49 Tons)	DB	\$	204,000	\$	204,000	By Judy - Revised since original
- Filter Media (Underdrain, Troughs)	DB	\$	196,000	\$	196,000	By Judy - Revised since original
- Instrumentation Control, including 5 each ROH Controllers (Mat. Provide)	DB	\$	18,000	\$	18,000	Just what Judy provides - District providing other
		\$	722,000	\$	787,000	
						Filtration Equipment Total
Chemical Feed Equipment						
- Chemical Feed Equipment	DB	\$	146,000	\$	146,000	By Judy - Revised since original
		\$	146,000	\$	146,000	
						Chemical Feed Equipment Total
Replacement of Existing Pumps						
- Replacement of Backwash Pump (50 HP)	DB	\$	30,000	\$	30,000	By Judy - No change
- Replacement of High Service Pumps (300 HP)	DB	\$	102,000	\$	102,000	By Judy - Higher than original
- Pump Discharge Piping/Fittings	DB	\$	39,000	\$	39,000	By Judy - Higher than original
		\$	171,000	\$	171,000	
						Replacement of Existing Pumps Total
Water Treatment Plant Total						
		\$	4,344,500	\$	4,453,500	

Pirtle Spring Reconstruction Project

Master Project Cost Estimate

Revised after 8/07/07 Meeting

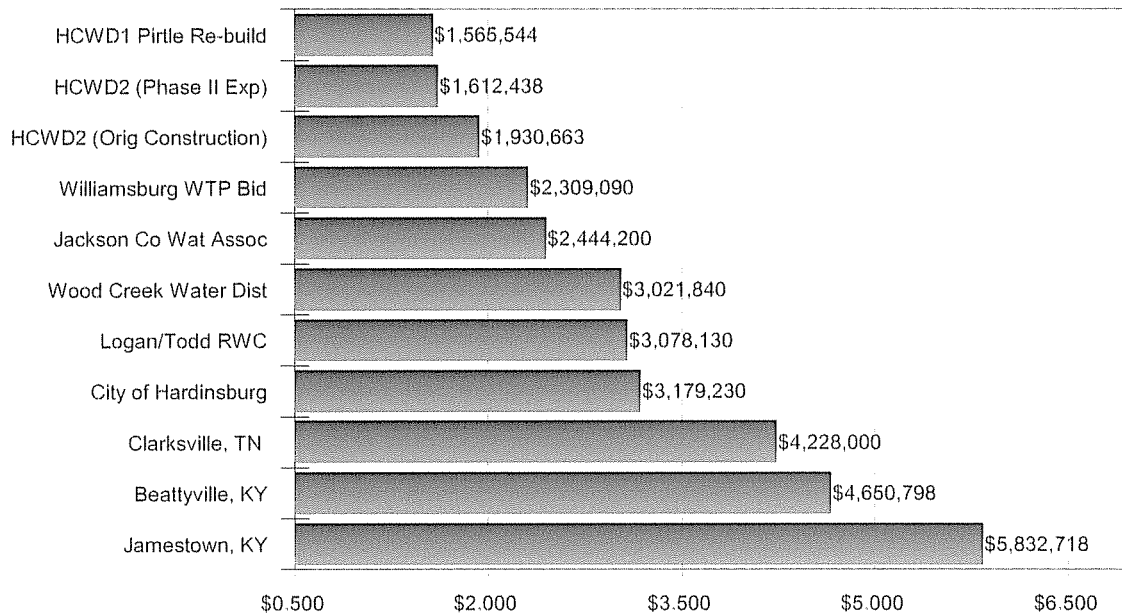
ITEM	Source	27-Jul-07		Revised Total	COMMENT
		DB	Revised		
3	Miscellaneous				
- Mobilization/Demobilization Bonds (@2%)	DB	\$ 81,000	\$	81,000	No Change
- General Conditions	DB	\$ 226,000	\$	226,000	By Judy - Revised since original
- Demolition of Existing Metal Building	DB	\$ 76,000	\$	76,000	No Change
- Balance of Demolition, Concrete Coring/Cutting/Disposal	DB	\$ 87,000	\$	87,000	By Judy - Revised since original
- Removal of Existing Equipment/Piping/Valves/Pumps	DB	\$ 105,000	\$	105,000	By Judy - Revised since original
- C12 Bldg Block Veneer, new doors windows, roof	HC-I	\$	\$	15,000	District - In-house
- Existing Cleanwell Leveling/Sealing (Allowance) (By District)	HC-O	\$ 0	\$	10,000	District sub-contract directly
			\$	600,000	
Miscellaneous Sub total			\$	5,053,500	
Hard Costs Total			\$	5,369,900	
Design Costs			\$	316,400	
Quest Engineers	DB	\$ 263,000	\$	263,000	By Judy - Revised since original
Berry Prindle Architects	DB	\$ 28,000	\$	28,000	No Change
Structural, HVAC, Plumbing, Geotech Engineering Subcontractors	DB	\$ 25,400	\$	25,400	No Change
Design Costs Total			\$	316,400	
TOTAL CONTRACTOR + DESIGN COST >			\$	5,369,900	
Items Purchased Direct / Provided by District (Non-Construction)			\$	288,700	
Office Furniture / Projection-Media Equipment	HC-D	\$	\$	30,500	District purchase direct
Purchased Water Costs (6 mos @ 50%)	HC-D	\$ 200,700	\$	200,700	Based on 18 weeks at 50% capacity
Shelving for Storage	HC-D	\$	\$	2,500	District purchase direct
Phone System (10 Extensions, commercially sold system)	HC-D	\$	\$	1,200	District purchase direct
Lab Equipment / Casework / Cabinets	HC-D	\$	\$	40,000	District purchase direct
Exterior Building Sign / Letters	HC-O	\$	\$	5,500	District purchase direct
Dry Erase Boards, Etc.	HC-D	\$	\$	1,000	District purchase direct
Interior Door Signs/Plaques	HC-D	\$	\$	800	District purchase direct
Flag Pole / Light	HC-D	\$	\$	3,500	District purchase direct
Fire Extinguishers, Cabinets	HC-D	\$	\$	3,000	District purchase direct
Sub-Total Items Purchased Direct >			\$	200,700	
Additives / Deducts Provided by Judy - 7/27/07			\$	0	Accept?
Colored Block / Mortar	DB	\$ 3,000	\$	0	No
Dry Block / Mortar	DB	\$ 2,300	\$	0	No
Use Square D - Not AB equipment	DB	\$ -3,520	\$	-3,520	Yes
Use alternate lighting package, other than LHI fixtures	DB	\$ -5,570	\$	-5,570	Yes
Deduct site lighting based on specified lighting	DB	\$ -18,500	\$	-18,500	Yes
Paint upper level interior areas (in lieu of District)	DB	\$ 31,625	\$	0	No
Seal exterior CMU	DB	\$ 8,300	\$	0	No
Change ext metal building color to standard Kynar color	DB	\$ -3,000	\$	0	No
Change roof panels to standard Kynar color	DB	\$ 4,950	\$	4,950	Yes
Change roof panels to MR24 (Butler)	DB	\$ -11,700	\$	0	No
Install new roof / wall covering CL2 building	DB	\$ 15,000	\$	0	No
Sub-Total Additives >			\$	-\$22,640	
TOTAL ALL-IN DB / HCWD1 COSTS >				\$5,635,960	

Pirtle Spring Reconstruction Project
 Master Project Cost Estimate
 Revised after 8/07/07 Meeting

ITEM

Source	27-Jul-07 DB Revised	Revised Total	<u>COMMENT</u>
Summary By Source of Cost:			
<u>Source</u>			
HC-I	\$ 46,000		HCWD1 Labor AND Materials
DB	\$ 5,126,260		Design-Build Team
HC-O	\$ 180,500		HCWD1 Hire Own Outside Contractor
HC-D	\$ 283,200		HCWD1 Buy materials directly
	\$ 5,635,960		New Total - All In Project Cost (w/o Contingency)

PWP Renovation Project Cost Comparison \$ per MG Constructed

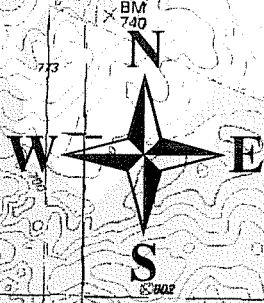


Comparable WTP Projects in Kentucky

<u>Location / Owner</u>	<u>Date of Bid</u>	<u>Const Cost</u>	<u>ENR Index</u>	<u>PV Cost</u>	<u>mg/d</u>	<u>\$ Const / mg/d</u>	<u>Comments</u>
Jamestown, KY	Jun-06	\$12,140,000	105.7	\$12,831,980	2.2	\$5,832,718	Membrane, re-build expansion
Beattyville, KY	Jun-06	\$8,850,000	107.5	\$9,301,597	2.0	\$4,650,798	Conv UV Dis, on-site generation, brand new
Clarksville, TN	Aug-06	\$32,000,000	105.7	\$33,824,000	8.0	\$4,228,000	New Intake and WTP Improvements
City of Hardinsburg	Oct-05	\$6,148,000	103.4	\$6,358,459	2.0	\$3,179,230	New WTP (chem feed, coag, filtration, clearwell) in greenfield
Logan/Todd RWC	Sep-04	\$22,900,000	107.5	\$24,625,037	8.0	\$3,078,130	New WTP (chem feed, coag, filtration, clearwell) in greenfield
Wood Creek Water Dist	Jun-05	\$13,990,000	108.0	\$15,109,200	5.0	\$3,021,840	Super Pulsator, UV, Re-Build, Expansion
Jackson Co Wat Assoc	Jun-02	\$5,050,000	121.0	\$6,110,500	2.5	\$2,444,200	Dissolved Air, New WTP
Williamsburg WTP Bid	Oct-06	\$6,442,000	107.5	\$6,927,270	3.0	\$2,309,090	New Intake, Chem Feed Bldg, Add 2 filters, tube settlers, sludge equip
HCWD2 (Orig Construction)	Sep-88	\$3,000,000	173.8	\$5,212,789	2.7	\$1,930,663	New WTP in greenfield
HCWD2 (Phase II Exp)	Sep-98	\$6,622,000	131.5	\$8,707,163	5.4	\$1,612,438	Expanded capacity, add 2 trains, new CW, HS pumps
HCWD1 Pirtle Re-build	Sep-07	\$5,635,960	100.0	\$5,635,960	3.6	\$1,565,544	Conventional gravity filtration, re-use clarification, clearwell

- NOTES: 1. Project costs should only include costs within WTP site / property
2. Where possible, new source development costs have been excluded
3. Construction cost is final, may not be same as bid amount
4. Construction cost is final, may not be same as bid amount
5. mg/d amount is what was added with project, or total with original WTP project
6. Cost excludes inspection, design, sub-consultant

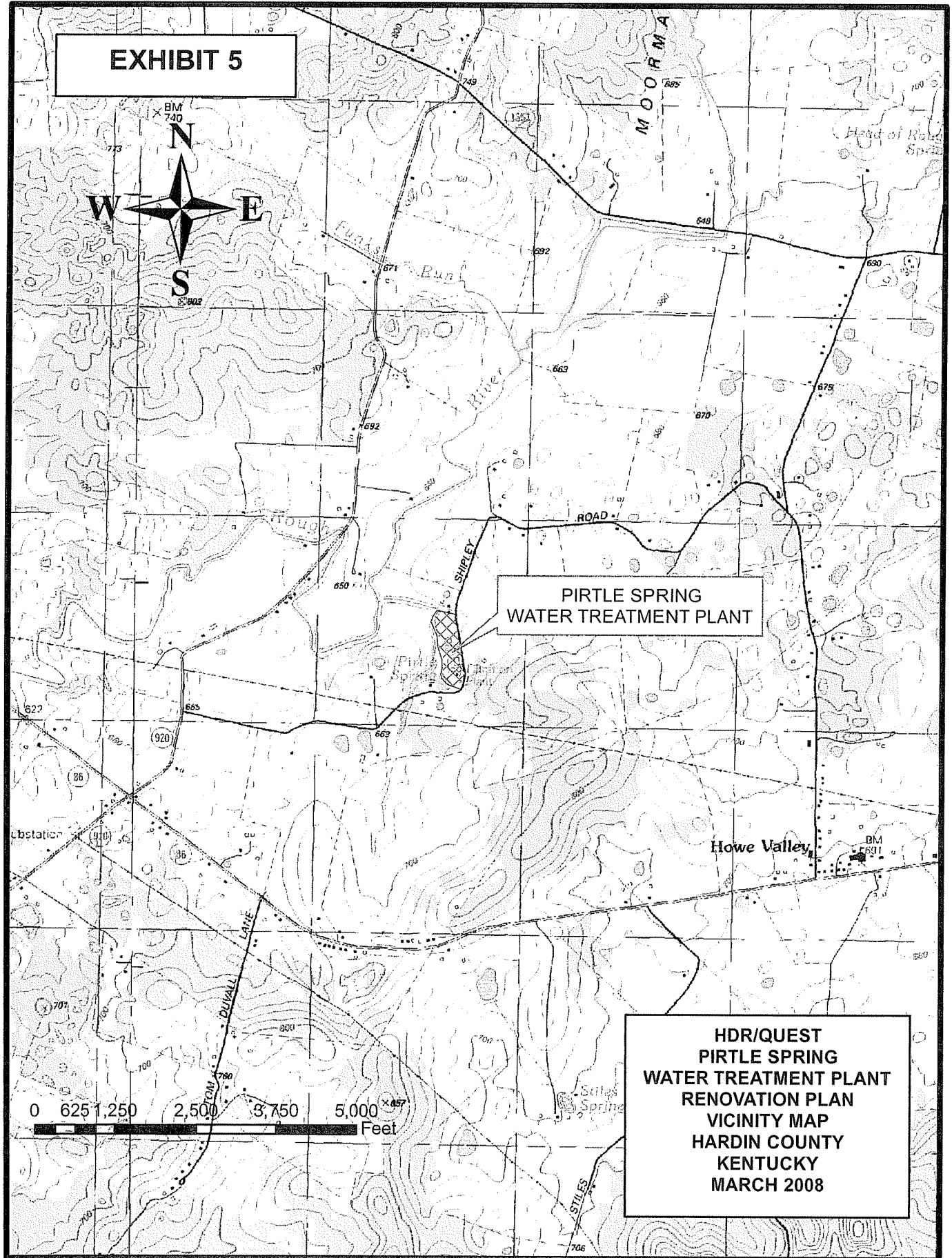
EXHIBIT 5



**PIRTLE SPRING
WATER TREATMENT PLANT**

0 625 1,250 2,500 3,750 5,000 Feet

**HDR/QUEST
PIRTLE SPRING
WATER TREATMENT PLANT
RENOVATION PLAN
VICINITY MAP
HARDIN COUNTY
KENTUCKY
MARCH 2008**



**Hardin County Water District No. 1
Minutes of Special Meeting
of the Board of Commissioners**

September 11, 2007

Chairman Bill Rissel called the meeting to order at 11:05 a.m. with Commissioners Ron Hockman, Les Powers, William Gossett and John Tindall attending. Staff present included Jim Bruce, General Manager; Brett Pyles, Operations Manager; Stephanie Brown, Administrative Assistant; Timmy Walker, Distribution System Operator; Charlene Easter, Customer Service Manager; and Susanna Wittstock, Customer Service Representative. Lunch was provided for the Board and staff.

Chairman Rissel opened the floor for public comment. There were no public comments offered and the floor was closed to public comment.

Mr. Bruce introduced Timmy Walker as a new Distribution System Operator. Ms. Easter introduced Susanna Wittstock as a new Customer Service Representative and gave a brief description of her work history. The Board and Chairman Rissel welcomed Mr. Walker and Ms. Wittstock to the District. Ms. Easter, Mr. Walker and Ms. Wittstock left the meeting at this time.

Pirtle WTP Reconstruction Project: Mr. Bruce presented the Board with a slide show presentation as well as several spreadsheets showing project costs, estimated effect on the financial statements, and design elements of the project. The presentation also included various photos of the current Water Treatment Plant at Pirtle Spring, additions to the water treatment plant with the new construction, the project cost breakdown, and financing options. Mr. Bruce reviewed interior and exterior drawings of the building and explained the various aspects of the building. The Board had numerous questions of Mr. Bruce, which were all answered during the presentation.

Chairman Rissel asked if there was a consensus from the Board to proceed with the project without delay. There was a consensus from the Board to go ahead with the project. There was then extensive discussion about the different financing options presented for the project. Commissioner Hockman suggested that the District contact the Governor's office, Ron Lewis' office, Senator Tori's office, and Representative Tim Moore in order to schedule a tour of the Pirtle Spring Water Treatment Plant in order to show the importance of this project and demonstrate the need for additional grant money to fund the project. There was also discussion about the possibility of requesting that another \$1 million grant for a county expansion project be re-directed toward the Pirtle project.

Secretary Tindall made a motion to authorize staff to execute a Phase II Design-Build agreement with the design-build team of Judy Construction/HDR-Quest Engineers/Jenkins-Essex Construction to accept their construction price of \$4,950,000, and to authorize staff, legal counsel and the design build team to complete and file any and all regulatory permits and documents to begin the construction of the project, and to issue a Notice to Proceed to the team once permits and approvals are received, and also authorize staff to proceed with the Option B, in order to fund the construction and project costs over the next eighteen (18) months from this date, as well as proceed with an initiative with both state and federal elected officials in an attempt to gain additional funding to avoid debt to finish the project, but also with the understanding that if additional funding could not be secured, that the Board would then consider re-directing the other \$1 million county expansion grant toward this project. The motion was seconded by Commissioner Hockman and passed unanimously. Chairman Rissel thanked the staff for the diligent efforts on this project over the past several years, and the thorough presentation provided to the Board.

**Hardin County Water District No. 1
Minutes of Special Meeting - HCWD1 Board of Commissioners
September 11, 2007**

Continued

Radcliff Sewer Acquisition Memorandum of Understanding (MOU) Review: Mr. Bruce informed the Board that the Radcliff City Council has had two working sessions in order to review the proposed Memorandum of Understanding for the acquisition of the Radcliff sanitary sewer utility. The City of Radcliff had since requested that Veolia and the District meet with the current sewer department employees in order to review the acquisition process and the impact on employees. This meeting was held on September 2.

The City Attorney had presented three proposed changes to the latest Memorandum of Understanding. Mr. Bruce reviewed the three changes with the Board. There was discussion about each of the requests, specifically about granting request #2, to transfer a real estate parcel the District currently leases to the County Clerk. Secretary Tindall then made a motion, seconded by Commissioner Powers, to proceed with accepting all three requests, with some modifications, and submit to the City. There was then further discussion as to whether each request should be voted on separately, or included in one motion. Chairman Rissel asked the Board if there was a consensus to split the motion into three votes. Secretary Tindall agreed to withdraw his motion, and Commissioner Powers his second, so the separate votes could be considered.

Secretary Tindall made a motion to accept change request #1, as proposed by the City Attorney, to add a condition to the City would be given a right of first refusal for ownership of the wastewater system, should the District ever in the future decide to privatize, sell or transfer said system, with the understanding that the Public Service Commission would be required for that kind of transaction, and that the City understands that PSC approval would be required. The motion was seconded by Commissioner Powers and passed.

Secretary Tindall made a motion to accept change request #2, as proposed by the City Attorney, which would transfer the ownership of the District's land parcel and building currently leased to the County Clerk, but add the stipulation that the District's lease would be assigned to the City, and the City would have to agree to leave the current lease terms unchanged until the lease expired. The motion was seconded by Commissioner Powers and passed.

In response to the City Attorney's request #3, Secretary Tindall made a motion that the District intends to complete sewer projects currently underway which improve or provide sewer service to the Highway 313/South Wilson Road corridor, targeting the southern end of Radcliff, and to complete the various phases as planned, with the understanding that the City has set aside funds for these projects, having already made commitments to developers, and that those earmarked funds will have already been paid to complete the projects, or be paid in advance or will be transferred to the District as part of the proposed wastewater system transfer to the District, and that the District further recognizes that while design is expected to be completed soon, construction may not be completed until after a transfer of the sewer utility to the District, and further to require that before a turnover of the system to the District, the City would agree to provide complete and detailed summaries of all required financial commitments and expenditures, as well as the physical boundaries of all parcels benefitting from these projects, the time-frames anticipated for completion, but with an added stipulation that if the projects were not completed after the transfer of the system to the District, that if the District found other methods, design or efficiencies to provide the same capacity and sewer availability to the same parcels, that the District

Hardin County Water District No. 1
Minutes of Special Meeting - HCWD1 Board of Commissioners
September 11, 2007

Continued

would be allowed to use those alternative methods to conserve funds so additional improvements and projects could be made to the Radcliff sewer system. The motion was seconded by Treasurer Gossett and passed.

Private Road - Water Main Locations: Mr. Bruce informed the Board that there have been an increasing number of developments in Radcliff proposing private roads. Mr. Bruce reviewed the District's current policies and presented a new resolution regarding water main locations on private roads for the Board to consider.

After discussion about the contents of the resolution, Commissioner Hockman made a motion to approve and adopt resolution 01-2007, which sets forth policies for the installation of public water mains and assets within private roads within the District's service area and to authorize staff and legal counsel to proceed with all changes, documents and actions as required by the resolution which would become effective immediately, but making the modifications of deleting items six and seven, and also adding Commissioner Power's suggestion that item 1 also require acceptance only after inspection of mains by the District. The motion was seconded by Treasurer Gossett and passed.

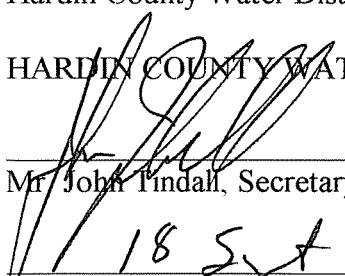
Adjourn: Being no further business before the Board, Treasurer Gossett made a motion to adjourn at 1:32 p.m and it was seconded by Secretary Tindall and passed.

(Minutes submitted by Ms. Stephanie Brown)

APPROVAL OF MINUTES

I hereby certify that the foregoing minutes were duly approved by the Board of Commissioners of the Hardin County Water District No. 1 at a meeting held on the date shown below:

HARDIN COUNTY WATER DISTRICT No. 1



Mr. John Tindall, Secretary



Date Approved



KENTUCKY INFRASTRUCTURE AUTHORITY

Ernie Fletcher
Governor

1024 Capital Center Drive, Suite 340
Frankfort, Kentucky 40601
Phone (502) 573-0260
Fax (502) 573-0157
<http://kia.ky.gov>

Jody E. Hughes
Executive Director

March 13, 2007

Mr. Charles Miller
Hardin County Water District No. 1
1400 Rogersville Road
Radcliff, Kentucky 40160

RE: Infrastructure for Economic Development Fund for Tobacco Producing Counties HB267
Hardin County Water District No. 1 – WX21093024 - \$2,000,000 – Pirtle Springs

Infrastructure for Economic Development Fund for Non-coal Producing Counties HB380
Hardin County Water District No. 1 – WX21093024 - \$2,000,000 – Pirtle Springs

Infrastructure for Economic Development Fund for Non-coal Producing Counties HB380
Hardin County Water District No. 1 – WX21093020 - \$1,000,000 – Constantine Road

Dear Mr. Miller:

Enclosed please find copies of the fully executed Grant Assistance Agreements for the above referenced grants.

I have also attached a checklist indicating the status of documents submitted to date. As indicated, the following items remain outstanding for Step 2 for all three grants:

- As-bid Budget
- Other Funding Commitment
- Clearinghouse Comments

Please note, Step 3, Project Closeout items also remain outstanding. Thank you for your cooperation.

Sincerely,

Debby L. Milton
Kentucky Infrastructure Authority

C: Bryan Kirby, CEDA (w/attachments)

EXHIBIT 8

Hardin County Water District No.1

Pirtle Spring Water Treatment Plant Renovation Project

Detailed Estimates to USoA Account Changes (Listing impacted accounts only)

Pro Forma Income Statement

Prepared by Jim Bruce, General Manager

Acct. (a)	Account Name (b)	Actual 06 Operations (c)	Pro Forma Adjustments (d)	Adj. Ref. (e)	Pro Forma Operations (f)	% Chng
403.0	Depreciation Expenses	\$682,258	\$194,343	1	\$876,601	22.2% 06 Total
601.0	Salaries & Wages - Employees	\$247,897	-\$1,465	2	\$246,432	-0.6% 06 Treatment Expense Only
604.0	Employee Pension and Benefits	\$90,363	\$527	3	\$90,890	0.6% 06 Treatment+Maint Expense Only
615.0	Purchased Power	\$247,116	-\$30,380	4	\$216,736	-14.0% 06 Total
620.0	Materials & Supplies	\$10,104	\$2,526	5	\$12,630	20.0% 06 Treatment Expense Only
659.0	Insurance - Other	\$75,791	\$18,000	6	\$93,791	19.2% 06 Total
	Total Operations & Maintenance Impact to Net Income	\$1,353,529	\$183,551		\$1,537,080	11.9%

Column (e) Adjusting Reference Notes

1	Project cost of \$5,635,960 divided by average depreciation years of all assets for 29 years Assumes all existing facilities have been scrapped and no longer depreciated.
2	Assumes Maintenance Specialist will spend 25% less time performing maintenance on new facilities
3	Based on decrease of Treatment + Treatment Maint Spec payroll
4	Assumes an increase in energy consumption for heating/cooling, lights, etc. based on cost per sq/ft Assumes a 20% decrease in energy cost for gained efficiencies for pumps/motors by switching to Variable Frequency Drives
5	Assumes 25% increase in materials and supplies
6	Square foot cost of existing facilities x square foot cost of proposed facilities

EXHIBIT 9

PLANS & SPECIFICATIONS

BY HDR/Quest

UNDER SEPARATE COVER

Specifications

for

**Pirtle Springs Water
Treatment Plant Renovation
Hardin County Water District No. 1**

October 2007

Prepared by:

HDR|Quest Engineers
2517 Sir Barton Way
Lexington, Kentucky 40509
(859) 223-3755



HDR|Quest

RECEIVED

MAR 17 2008

PUBLIC SERVICE
COMMISSION

Specifications

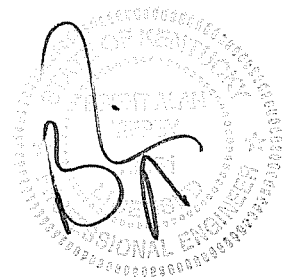
for

Pirtle Springs Water Treatment Plant Renovation Hardin County Water District No. 1

October 2007

Prepared by:

**HDR|Quest Engineers
2517 Sir Barton Way
Lexington, Kentucky 40509
(859) 223-3755**



HDR|Quest

**PIRTLE SPRINGS WATER TREATMENT PLANT RENOVATION
HARDIN COUNTY WATER DISTRICT NO. 1**

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**PIRTLE SPRINGS WATER TREATMENT PLANT RENOVATION
HARDIN COUNTY WATER DISTRICT NO. 1**

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**PIRTLE SPRINGS WATER TREATMENT PLANT RENOVATION
HARDIN COUNTY WATER DISTRICT NO. 1**

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END OF TABLE OF CONTENTS

**Bidding Requirements, Contract Forms
and Conditions of the Contract**

Division 1 - General Requirements

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Rehabilitation of the Pirtle Spring WTP in Hardin County, Kentucky
- B. The Contractor shall provide all materials, labor and equipment necessary for completion of the Project. The Contract Documents are intended to provide the basis for proper completion of the work suitable for the intended use of the Owner. Anything not expressly set forth but which is reasonably implied or necessary for proper performance of the Project shall be included.
- C. Continuous Operations: The existing system must be maintained in continuous operation in such a manner that it meets all local, state, and federal requirements. The Contractor is responsible not to deactivate, demolish, or interfere with any system component required for the continuous operation until a new or temporary permanent-like system has been installed and is operational. The Contractor is responsible for payment of all fines resulting from any action or inaction on his part or the part of his subcontractors during performance of the Work that causes the facility/facilities to operate in an illegal manner or fail to operate in a legal manner.
- D. The following major Work items are included in the Contract:
 - 1. Demolition of existing treatment building.
 - 2. Demolition of existing filters.
 - 3. Replacement of high service pumps.
 - 4. Construction of new treatment building.
 - 5. Construction of new filters.
 - 6. Construction of new chemical feed and storage facilities.

1.02 PERMITS

The Contractor shall obtain any permits related to or required by, the Work in this Contract.

1.03 CODES

Comply with applicable codes and regulations of authorities having jurisdiction. Submit copies of inspection reports, notices, citations and similar communications, to the Owner.

1.04 EXISTING CONDITIONS AND DIMENSIONS

- A. The Work in this Contract will primarily be performed in or around existing facilities of which a portion must remain functional. The Contractor must maintain the required items and/or systems functional without additional effort by the Owner's personnel and at no extra costs to the Owner.

- B. The Contractor is responsible for verifying all existing conditions, elevations, dimensions, etc., and providing his finished work to facilitate existing conditions.

END OF SECTION 01010

SECTION 01015 - WORK SEQUENCE

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall conform to all miscellaneous requirements as contained in the Contract.
- B. The Contractor shall perform all Work included in the Contract Documents
- C. The Contractor shall perform all the Work incidental to the items shown in the Contract Documents even though it may not be specifically enumerated.
- D. The Contractor will have to perform the work in a sequence acceptable to the Owner, and in some instances the Work will have to be performed in a sequence directed by the Owner.
- E. Further, the Contractor shall have to perform all the Work included in this project in a sequence that does not impair the treatment capabilities of the water plant nor cause undue hardships on day-to-day operating personnel.

1.02 RELATED REQUIREMENTS

- A. Section 00710 - General Conditions.
- B. Section 01010 - Summary of Work.
- C. Section 01040 - Coordination.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 SCHEDULING THE SEQUENCE OF CONSTRUCTION OPERATIONS

The Contractor shall submit to the Engineer, for review and approval, a complete schedule (progress chart) of his proposed sequence of construction operations prior to commencement of the work.

The Engineer will neither consider nor approve a construction schedule that fails to utilize the entire time allocated by the Contract for the construction of the Project.

The Contractor shall schedule the various construction activities to complete the Project throughout the entire Contract time period. This schedule requirement shall not prevent the Contractor from completing the Project in a shorter time frame than illustrated in the schedule. The construction schedule along with a cost breakdown schedule shall be reviewed and approved by the Owner prior to the submission of the first partial payment request in accordance with the General Conditions.

A copy of the construction schedule shall be submitted to the Owner with each pay request, appropriately marked to indicate the actual progress of the work compared to the planned schedule. This revised schedule must be approved by the Owner prior to payment.

END OF SECTION 01015

SECTION 01025 - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, services and other necessary supplies and perform all work shown on the Drawings and/or described in the Specifications and Contract Documents at the lump sum bid price.

1.02 PERIODIC ESTIMATE FORMS

- A. Within fifteen (15) days following the Pre-Construction Conference, the Contractor shall prepare and submit a periodic estimate on the form provided by the Engineer. The estimate form will depict the Contractor's cost for completing the Contract requirements and show by major unit of the project work the Contractor's dollar value for the material and the labor (two separate amounts) to be used as a basis for the periodic payments. The Contractor's periodic estimate breakdown must be approved by the Engineer before any payments will be made on this Contract.

The following items will be included in the breakdown for all lump sum projects:

1. Mobilization: Payment for the Contractor's mobilization shall include all costs incurred for moving equipment onto the project area and any pertinent costs related thereto.
2. Bonds and Insurance: Payment for bonds and insurance shall include the costs of the Performance and Payment Bonds provided under the Contract, and the premiums for insurance required under the Contract.
3. General Requirements: Payment for General Conditions will be distributed over the initial term of the Contract and shall include field supervision and support staff, office supervision and support staff, costs associated with maintaining the field operation, and other items required by the general requirements and conditions of the Contract.
4. Demobilization: Payment for the Contractor's demobilization upon completion of the Project shall include all costs incurred for removing equipment and materials from the Project area and any pertinent costs related thereto.

END OF SECTION 01025

SECTION 01040 - COORDINATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall coordinate the Work of all crafts, trades and subcontractors engaged on the Work, and he shall have final responsibility in regards to the schedule, workmanship and completeness of each and all parts of the Work.
- B. The Contractor shall be prepared to guarantee to each of his subcontractors the dimensions which they may require for the fitting of their work to the surrounding work.
- C. All crafts, trades and subcontractors shall be made to cooperate with each other and with others as they may be involved in the installation of work which adjoins, incorporates, precedes or follows the work of another. It shall be the Contractor's responsibility to point out areas of cooperation prior to execution of subcontract agreements and the assignment of the parts of the Work. Each craft, trade and subcontractor shall be made responsible to the Contractor, for furnishing embedded items, giving directions for doing all cutting and fitting, making all provisions for accommodating the Work, and for protecting, patching, repairing and cleaning as required to satisfactorily perform the Work.
- D. The Contractor shall be responsible for all cutting, digging and other actions of his subcontractors and workmen. Where such action impairs the safety or function of any structure or component of the Project, the Contractor shall make such repairs, alterations and additions as will, in the opinion of the Engineer, bring said structure or component back to its original design condition at no additional cost to the Owner.
- E. Each subcontractor is expected to be familiar with the General Requirements and all Sections of the Detailed Specifications for all other trades and to study all Drawings applicable to his work to the end that complete coordination between the trades will be affected. Each subcontractor shall consult with the Contractor, who shall advise the Engineer if conflicts exist on the Drawings.
- F. No extra compensation will be allowed to cover the cost of removing piping, conduits, etc., or equipment found encroaching on space required by others.

END OF SECTION 01040

SECTION 01120 - ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.01 SCOPE

For the purpose of this Specification, environmental protection is defined as the retention of the environment in Project construction and to enhance the natural appearance in its final condition. Environmental protection requires consideration of air and land and involves noise as well as other pollutants. In order to prevent, and to provide for abatement and control of, any environmental pollution arising from the construction activities in the performance of this Contract, the Contractor and his subcontractors shall comply with all applicable federal, state and local laws and regulations concerning environmental pollution control and abatement. This Section covers the furnishings of all labor, materials, equipment and performing all work required for the protection of the environment during construction operations except for those measures set forth in other Sections of these specifications.

1.02 PROTECTION OF LAND RESOURCES

The land resources within the Project boundaries and outside the limits of work performed under this Contract shall be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project.

1.03 RECORDING AND PRESERVING HISTORICAL AND ARCHAEOLOGICAL FINDS

In the event archaeological materials (arrowheads, stone tools, stone axes, prehistoric and historic pottery, bottles, foundations, Civil War artifacts, and other types of artifacts) are uncovered during the construction of this project, work is to immediately cease at the location and the Kentucky Heritage Council shall be contacted. The telephone number is (502) 564-7005. Construction shall not commence at this location until a written release is received from the Kentucky Heritage Council. Failure to report a find could result in legal action.

1.04 PROTECTION OF LAND AREAS

Except for any work on storage areas and access routes specifically assigned for the use of the Contractor under this Contract, the land areas outside the limits of permanent work performed under this Contract shall be preserved in their present condition. Contractor shall confine his construction activities to areas

defined for work on the plans or specifically assigned for his use. No other areas shall be used by the Contractor without written consent of the Owner.

1.05 PROTECTION OF TREES AND SHRUBS

Reasonable care shall be taken during construction to avoid damage to vegetation.

The Contractor shall not deface, injure or destroy trees or shrubs, nor remove or cut them without prior approval from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage.

1.06 TREE PROTECTIVE STRUCTURES

Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured or otherwise damaged by the Contractor's equipment or by his other operations, he may direct the Contractor to provide temporary protection of such trees by placing boards, plans, or poles around them. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage.

1.07 RESTORATION OF DAMAGED TREES

Any tree scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. All scars made on trees shall be coated as soon as possible with an approved tree wound dressing.

Trees that are to remain, either within or outside established clearing limits, that are damaged by the Contractor so as to be beyond saving in the opinion of the Engineer, shall be immediately removed, if so directed, and replaced with a nursery-grown tree of the same species and size.

1.08 PROTECTION OF WATER RESOURCES

The Contractor shall control the disposal of fuels, oils, bitumens, calcium chloride, acids, or harmful materials, and shall comply with applicable Federal, State, County and Municipal laws concerning pollution of rivers and streams while performing work under this Contract. Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, herbicides and insecticides from entering public waters. Water used in on-site material processing, concrete curing, foundation and concrete cleanup, and other waste waters shall not be allowed to reenter a stream if an increase in the turbidity of the stream could result therefrom.

1.09 BURNING

Air pollution restrictions applicable to this project are as follows: Materials shall not be burned on the premises. If the Contractor elects to dispose of waste materials off the premises, by burning, he shall make his own arrangements for such burning area and shall, as specified in the General Conditions, conform to all applicable regulations.

1.10 DUST CONTROL

The Contractor shall maintain all excavations, stockpiles, access roads, waste areas, and all other work free from excess dust to such reasonable degree as to avoid causing a hazard or nuisance to others. Approved temporary methods consisting of sprinkling, chemical treatment, or similar methods will be permitted to control dust. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

1.11 EROSION CONTROL

Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall be graded to control erosion within acceptable limits. Temporary control measures shall be provided and maintained until permanent drainage facilities are completed and operative. The area of bare soil exposed at any one time by construction operations, should be held to a minimum.

1.12 CORRECTIVE ACTION

The Contractor shall, upon receipt of a notice in writing of any noncompliance with the foregoing provisions, take immediate corrective action. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs of damages by the Contractor unless it was later determined that the Contractor was in compliance.

1.13 POST-CONSTRUCTION CLEANUP OR OBLITERATION

The Contractor shall, unless other wise instructed in writing by the Engineer, obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed areas shall be graded and filled and the entire area seeded.

END OF SECTION 01120

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 WORK INCLUDED

Shop drawings, descriptive literature, project data and samples (when samples are specifically requested) for all manufactured or fabricated items shall be submitted by the Contractor to the Engineer for examination and review in the form and in the manner required by the Engineer. All submittals shall be furnished in at least three (3) copies to be retained by the Engineer and shall be checked and reviewed by the Contractor before submission to the Engineer. The review of the submittal by the Engineer shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is satisfactory. Review of such submittal will not relieve the Contractor of the responsibility for any errors which may exist as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work.

1.02 RELATED REQUIREMENTS

- A. Section 00710 - General Conditions.
- B. Section 01720 - Project Record Documents

1.03 DEFINITIONS

The term "submittals" shall mean shop drawings, manufacturer's drawings, catalog sheets, brochures, descriptive literature, diagrams, schedules, calculations, material lists, performance charts, test reports, office and field samples, and items of similar nature which are normally submitted for the Engineer's review for conformance with the design concept and compliance with the Contract Documents.

1.04 CONTRACTOR'S ULTIMATE RESPONSIBILITY

Review by the Engineer of shop drawings or submittals of material and equipment shall not relieve the Contractor from the responsibilities of furnishing same of proper dimension, size, quantity, materials and all performance characteristics to efficiently perform the requirements and intent of the Contract Documents. Review shall not relieve the Contractor from responsibility for errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. Review of

shop drawings shall not be construed as releasing the Contractor from the responsibility of complying with the Specifications.

1.05 GENERAL REQUIREMENTS FOR SUBMITTALS

- A. Shop drawings shall be prepared by a qualified detailer. Details shall be identified by reference to sheet and detail numbers shown on Contract Documents. Where applicable, show fabrication, layout, setting and erection details. Shop drawings are defined as original drawings prepared by the Contractor, subcontractors, suppliers, or distributors performing work under this Contract. Shop drawings illustrate some portion of the work and show fabrication, layout, setting or erection details of equipment, materials and components. The Contractor shall, except as otherwise noted, have prepared the number of reviewed copies required for his distribution plus three (3) which will be retained by the Engineer and Owner. Shop drawings shall be folded to an approximate size of 8-1/2 inch x 11 inch and in such manner that the title block will be located in the lower righthand corner of the exposed surface.
- B. Project data shall include manufacturer's standard schematic drawings modified to delete information which is not applicable to the Project, and shall be supplemented to provide additional information applicable to the Project. Each copy of descriptive literature shall be clearly marked to identify pertinent information as it applies to the Project.
- C. Where samples are required, they shall be adequate to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged. Provide sufficient size and quantity to clearly illustrate functional characteristics of product and material, with integrally related parts and attachment devices, along with a full range of color samples.
- D. All submittals shall be referenced to the applicable item, section and division of the Specifications, and to the applicable Drawing(s) or Drawing schedule(s) and shall be accompanied by transmittal forms in the format provided by the Engineer.
- E. The Contractor shall review and check submittals, and indicate his review by initials and date.
- F. If the submittals deviate from the Contract Drawings and/or Specifications, the Contractor shall advise the Engineer, in letter of transmittal of the deviation and the reasons therefor. All changes shall be clearly marked on the submittal with a bold mark other than red. Any additional costs for modifications shall be borne by the Contractor.

- G. In the event the Engineer does not specifically reject the use of material or equipment at variance to that which is shown on the Drawings or specified, the Contractor shall, at no additional expense to the Owner, and using methods reviewed by the Engineer, make any changes to structures, piping, controls, electrical work, mechanical work, etc., that may be necessary to accommodate this equipment or material. Should equipment other than that on which design drawings are based be accepted by the Engineer, shop drawings shall be submitted detailing all modification work and equipment changes made necessary by the substituted item.
- H. Additional information on particular items, such as special drawings, schedules, calculations, performance curves, and material details, shall be provided when specifically requested in the technical Specifications.
- I. Submittals for all electrically operated items (including instrumentation and controls) shall include complete wiring diagrams showing lead, runs, number of wires, wire size, color coding, all terminations and connections, and coordination with related equipment.
- J. Equipment shop drawings shall indicate all factory or shop paint coatings applied by suppliers, manufacturers and fabricators; the Contractor shall be responsible for insuring the compatibility of such coatings with the field-applied paint products and systems.
- K. Fastener specifications of manufacturer shall be indicated on equipment shop drawings.
- L. Where manufacturer's brand names are given in the Specifications for building and construction materials and products, such as grout, bonding compounds, curing compounds, masonry cleaners, waterproofing solutions and similar products, the Contractor shall submit names and descriptive literature of such materials and products he proposes to use in this Contract.
- M. No material shall be fabricated or shipped unless the applicable drawings or submittals have been reviewed by the Engineer and returned to the Contractor.
- N. All bulletins, brochures, instructions, parts lists, and warranties packaged with and accompanying materials and products delivered to and installed in the Project shall be saved and transmitted to the Owner through the Engineer.

1.06 CONTRACTOR RESPONSIBILITIES

- A. Verify field measurements, field construction criteria, catalog numbers and similar data.

- B. Coordinate each submittal with requirements of Work and Contract Documents.
- C. Notify Engineer, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.
- D. Begin no work, and have no material or products fabricated or shipped which required submittals until return of submittals with Engineer's stamp and initials or signature indicating review.

END OF SECTION 01300

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Work of all crafts and trades shall be laid out to lines and elevations as established by the Contractor from the Drawings or from instructions by the Engineer.
- B. Unless otherwise shown, all work shall be plumb and level, in straight lines and true planes, parallel or square to the established lines and levels. **The Work shall be accurately measured and fitted to tolerance as established by the best practices of the crafts and trades involved, and shall be as required to fit all parts of the Work carefully and neatly together.**
- C. All equipment, materials and articles incorporated into the Work shall be new and of comparable quality to that specified. All workmanship shall be first-class and shall be performed by mechanics skilled at, and regularly employed in, their respective trades.
- D. The Contractor shall determine that the equipment he proposes to furnish can be brought into the facility and installed in the space available. Equipment shall be installed so that all parts are readily accessible for inspection and maintenance.

1.02 WORKMANSHIP

Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

1.03 MANUFACTURERS' INSTRUCTIONS

Comply with manufacturers' instructions in full detail as to shipping, handling, storing, installing, start-up and operation.

1.04 MANUFACTURERS' FIELD SERVICES

- A. The Contractor shall arrange for the services of qualified service representatives from the companies manufacturing or supplying each type of equipment required in the Specification sections and/or in Section 01450.

- B. The manufacturer or supplier shall provide sufficient engineering and technician manhours to satisfactorily complete Supervision of Installation, Equipment Check-out, Field Acceptance Tests, Pre-startup Operator Training, and Post-startup Services (see Section 01450).

1.05 TESTING SERVICES

- A. Tests, inspections and certifications of materials, of equipment, of subcontractors' work, or of completed work shall be provided by the Contractor, as required by the various sections of the Specifications, and all costs for such tests, inspections and certifications shall be included in the Contract Price.
- B. The Contractor shall submit the name of testing laboratory proposed for use on the Project to the Owner, for approval.
- C. The Contractor shall deliver written notice to the Engineer at least two (2) work days in advance of any inspections or tests to be made at the Project site. All inspections or tests to be conducted in the field shall be done in the presence of the Owner or his representative.
- D. Certifications by independent testing laboratories may be by properly attested copies of the data including scientific procedures and results of tests.
- E. Contractor shall schedule and provide site visit services by the same firm which provided geotechnical investigations utilized in the structural design of the foundations for the project. Said visits shall be for the sole purpose of confirming that the conditions described in the geotechnical report are present over the foundation areas extending beyond the investigational borings. The actual costs of providing the described services is included in the bid as a "cash allowance". The Engineer or his representative may waive site visits which are intended to evaluate sub-grade conditions which, in the Engineer's opinion, are substantially identical to adjacent conditions which have been exposed and evaluated.

END OF SECTION 01400

SECTION 01450 - SERVICES OF MANUFACTURER'S REPRESENTATIVE

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. General: The Contractor shall provide a qualified service representative from each company manufacturing or supplying certain equipment to perform the duties herein described and as required by the various sections of the Specifications. All costs shall be included in the Contract price.
 - 1. The service representative shall notify the Engineer each time he intends to be at the project site, and define the purpose of this visit. There will be no acknowledgment by the Owner of on-site visits by service representatives unless such visits are properly logged by the Engineer.
- B. Supervision of Installation: Where indicated in the Specifications, the manufacturer's representative shall provide supervision of the workers and advice to the Owner to insure that proper procedures are followed during equipment installation.
- C. Equipment Check-out:
 - 1. After installation of the listed equipment has been completed and the equipment is presumably ready for operation but before it is operated by others, the representative shall inspect, operate, test and adjust the equipment. The inspection shall include but shall not be limited to, the following points as applicable:
 - a. Soundness (without cracked or otherwise damaged parts).
 - b. Completeness in all details as specified.
 - c. Correctness of setting, alignment and relative arrangement of various parts.
 - d. Adequacy and correctness of packing, sealing and lubricants.
 - 2. The operation, testing and adjustment shall be as required to prove that the equipment has been installed properly and is capable of satisfactory operation under the conditions specified. On completion of his work, the manufacturer's or supplier's representative shall submit in triplicate to the Engineer a complete signed report of the result of his inspection, operation, adjustments and tests. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained, if such are specified, and suggestions for precautions to be taken to ensure proper maintenance. The report also shall include a certificate that the equipment conforms to the

requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

- D. **Field Acceptance Tests:** After the Engineer has reviewed the reports from the manufacturer's representatives, the Contractor shall make arrangements to have the manufacturer's representatives present when the field acceptance tests are made.
- E. **Pre-startup Operator Training:** Provision of classroom and hands-on training to maintenance personnel in the operation and maintenance of the equipment prior to placing the equipment in full operation.
- F. **Post-startup Services:** Provision of assistance to the Owner in the calibration, tuning and troubleshooting, plus any additional training which may be required during the year after the equipment is accepted by the Owner.
- G. The estimated number of on-site manhours required for pre-startup operator training and for post-startup services are listed in Table A.

Table A

SPECIFICATION SECTION	TASKS AND MANHOURS	
	PRE-STARTUP OPERATOR TRAINING	POST-STARTUP SERVICES
Vertical Turbine Pumps	8	4
Filter System Manufacturer		4

END OF SECTION 01450

SECTION 01510 - TEMPORARY UTILITIES

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall maintain strict supervision of use of temporary utility services:
 - 1. Enforce compliance with applicable standards.
 - 2. Enforce safety practices.
 - 3. Prevent abuse of services.

1.02 RELATED REQUIREMENTS

Section 01590 - Field Offices.

1.03 REQUIREMENTS OF REGULATORY AGENCIES

- A. Obtain and pay for all permits as required by governing authorities.
- B. Obtain and pay for temporary easements required across property other than that of Owner.
- C. Comply with applicable codes.

1.04 REMOVAL

- A. Completely remove temporary materials, equipment, and miscellaneous items upon completion of construction and approval of the Engineer.
- B. Repair damage caused by installation and restore to specified or original condition.

1.05 TEMPORARY ELECTRICITY

Electrical services for construction needs and for lighting and heating the work area will be provided by the Contractor.

1.06 TEMPORARY LIGHTING

- A. Furnish and install temporary lighting required for:
 - 1. Construction needs.
 - 2. Safe and adequate working conditions.

3. Public Safety
4. Security lighting.
5. Temporary office and storage area lighting.

B. Service periods:

1. Security lighting: All hours of darkness.
2. Safety lighting:
 - a. Within construction area: All times that authorized personnel are present.
 - b. Public areas: At all times.

C. **Costs of Installation and Preparation: Contractor shall pay all installation, maintenance and removal costs of temporary lighting.**

D. Maintenance of temporary lighting service (replacement of bulbs, etc.) shall be the sole responsibility of the Contractor.

1.07 **TEMPORARY TELEPHONE SERVICE (Contractor and Engineer's Resident Representative if required).**

- A. Furnish and install temporary telephone services for construction needs throughout construction periods.
- B. Pay costs for temporary telephone services, including installation, maintenance and removal.
- C. Pay costs for all local telephone services.
- D. Pay costs of toll charges related to construction of the Project for the Contractor's office and the Engineer's office.
- E. The Contractor and the Engineer shall have different phone numbers and instruments.

1.08 **TEMPORARY WATER**

Water necessary for construction, testing and disinfection shall be provided at the Contractor's expense.

END OF SECTION 01510

SECTION 01535 - PROTECTION OF INSTALLED WORK

PART 1 - GENERAL

1.01 WORK INCLUDED

Protection for products, including Owner-provided products, after installation.

1.02 RELATED REQUIREMENTS

Division 1 - General Requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PROTECTION AFTER INSTALLATION

- A. Protect installed products and control traffic in immediate area to prevent damage from subsequent operations.
- B. Restrict traffic of any kind across planted lawn and landscape areas.

END OF SECTION 01535

SECTION 01540 - SECURITY

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The Project area has to remain safely accessible to Owner's personnel; however, the Contractor will provide any non-interfering security he deems necessary to protect his work, equipment, etc.
- B. Provide an adequate system to secure the Project area at all times, especially during non-construction periods; the Contractor shall be solely responsible for **taking proper security measures.**
- C. For both security and safety purposes, cranes, vehicles and other equipment left on-site by the Contractor shall be locked at the end of each working day.

1.02 COSTS

Contractor shall pay for all costs for protection and security systems.

END OF SECTION 01540

SECTION 01550 - ACCESS ROADS AND PARKING AREAS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Access roads.
- B. Temporary parking.
- C. Existing pavements and parking areas.
- D. Permanent pavements and parking areas.
- E. Maintenance.
- F. Removal and repair.

1.02 RELATED REQUIREMENTS

- A. Section 01045 - Cutting and Patching.
- B. Section 01510 - Temporary Utilities.

PART 2 - PRODUCTS

2.01 MATERIALS

For temporary construction: Contractor's option but must be approved by the Owner.

PART 3 - EXECUTION

3.01 PREPARATION

Clear areas, provide proper surface and storm drainage of premises and adjacent areas. Install erosion protection.

3.02 ACCESS ROADS

- A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load-bearing capacity to provide unimpeded traffic for construction purposes.

- B. Construct temporary bridges and/or culverts to span low areas and allow unimpeded drainage.
- C. Extend and relocate as work progress requires, and provide detours as necessary for unimpeded traffic flow.
- D. Locate temporary access roads as approved by the Owner and/or the Engineer.
- E. Provide and maintain access to all Owner facilities.

3.03 TEMPORARY PARKING

Construct temporary parking areas to accommodate use of construction personnel in an area acceptable to the Owner and/or the Engineer. The Contractor shall enforce the requirement that all Project employees and subcontractors park only in the designated areas. Pay all costs relating to temporary parking.

3.04 MAINTENANCE

- A. Maintain traffic and parking areas in a sound condition, free of excavated material, construction equipment, products, mud, snow and ice. Use whatever dust control measures required to prevent airborne particles.
- B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water and other deficiencies to maintain paving and drainage in original and/or specified condition.

3.05 REMOVAL AND REPAIR

- A. Remove temporary materials and construction when permanent facilities are usable as directed by the Engineer.
- B. Remove underground work and compacted materials to a depth of two (2) feet; fill and grade site as specified.
- C. Repair existing permanent facilities damaged by usage to original and/or specified condition.

END OF SECTION 01550

SECTION 01560 - TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Dust control.
- B. Erosion and sediment control.

1.02 RELATED REQUIREMENTS

- A. Section 01510 - Temporary Utilities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 DUST CONTROL

- A. Execute work by methods to minimize raising dust from construction operations.
- B. Provide positive means to minimize construction or traffic generated dust from dispersing into atmosphere.
- C. Provide spraying of construction traffic areas with water to hold dust leaving the construction site to the minimum amounts allowed by regulations.

3.02 EROSION AND SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize amount of bare soil exposed at one time.
- C. Provide temporary measures such as berms, dikes, drains, hay bales, gabions, etc., as directed by the Engineer so as to minimize siltation due to runoff.
- D. Construct fill and waste areas by selective placement to avoid erosive exposed surface of silts or clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

END OF SECTION 01560

SECTION 01565 - EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall do all Work and take all measures necessary to control soil erosion resulting from construction operations, shall prevent the flow of sediment from the construction site, and shall contain construction materials (including excavation and backfill) within his protected working area so as to prevent damage to the adjacent wetlands or water courses.
- B. **The Contractor shall not employ any construction method that violates a rule, regulation, guideline or procedure established by Federal, State or local agencies having jurisdiction over the environmental effects of construction.**
- C. Pollutants such as chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste shall not be discharged into or alongside of any body of water or into natural or man-made channels leading thereto.

PART 2 - PRODUCTS

2.01 MATERIALS

Silt checks shall be constructed of No. 1 coarse aggregate as defined by the Kentucky Transportation Cabinet. Filter fabric for sediment traps shall be of suitable materials acceptable to the Engineer. Bales may be hay or straw, and shall be reasonably clean and free of noxious weeds and deleterious materials.

PART 3 - EXECUTION

3.01 METHODS OF CONSTRUCTION

- A. The Contractor shall use any of the acceptable methods necessary to control soil erosion and prevent the flow of sediment to the maximum extent possible. These methods shall include, but not be limited to, the use of silt fences, hay bales, water diversion structures, temporary revegetation, diversion ditches and settling basins.
- B. **Construction operations shall be restricted to the areas of work indicated on the Drawings and to the area which must be entered for the construction of temporary or permanent facilities. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing,**

excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of the wetlands and adjacent watercourses. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.

- C. Excavated soil material shall not be placed adjacent to the wetlands or watercourses in a manner that will cause it to be washed away by high water or runoff. Earth berms or diversions shall be constructed to intercept and divert runoff water away from critical areas. Diversion outlets shall be stable or shall be stabilized by means acceptable to the Engineer. If for any reason construction materials are washed away during the course of construction, the Contractor shall remove those materials from the fouled areas as directed by the Engineer.
- D. For Work within easements or rights-of-way, all materials used in construction such as excavation, backfill, roadway, and pipe bedding and equipment shall be kept within the limits of these easements or rights-of-way.
- E. The Contractor shall not pump silt-laden water from trenches or other excavation into the wetlands, or adjacent watercourses. Instead, silt-laden water from his excavations shall be discharged within areas surrounded by baled hay or into sediment traps or ensure that only sediment-free water is returned to the watercourses. Damage to vegetation by excessive watering or silt accumulation in the discharge area shall be avoided.
- F. Prohibited construction procedures include, but are not limited to the following:
 - 1. Dumping of spoil material into any streams, wetlands, surface waters, or unspecified locations.
 - 2. Indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface waters.
 - 3. Pumping of silt-laden water from trenches or excavations into surface waters, or wetlands.
 - 4. Damaging vegetation adjacent to or outside of the construction area limits.
 - 5. Disposal of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in wetlands, surface waters, or unspecified locations.
 - 6. Permanent or unauthorized alteration of the flow line of any stream.
 - 7. Open burning of debris from the construction work.

- G. Any temporary working roadways required shall be clean fill approved by the Engineer. In the event fill is used, the Contractor shall take every precaution to prevent the fill from mixing with native materials of the site. All such foreign fill materials shall be removed from the site following construction.

3.02 EROSION CHECKS

- A. The Contractor shall furnish and install baled hay or straw erosion checks surrounding the base of all deposits of stored excavated material outside of the disturbed area, and where indicated by the Engineer. Checks located surrounding stored material shall be located approximately 6 feet from that material. Bales shall be held in place with two 2 inch by 2 inch by 3 feet wooden stakes. Each bale shall be butted tightly against the adjoining bale to preclude short circuiting of the erosion check.
- B. The Contractor shall remove silt and sediment from the site as it accumulates at erosion checks and repair damaged checks during construction.

- 3.03 The Contractor shall remove all erosion control materials from the site as soon as potential for erosion has been eliminated and when approved by the Engineer. Reseed area where hay bales or silt has been removed.

END OF SECTION 01565

SECTION 01600 - MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 STORAGE OF MATERIALS AND EQUIPMENT

All excavated spoil, all materials and all equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the Work. Materials and equipment shall be kept neatly piled and compactly stored in such locations as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.

1.02 HANDLING AND DISTRIBUTION

- A. The Contractor shall handle, haul, and distribute all materials and all surplus materials on the different portions of the Work, as necessary or required; shall provide suitable and adequate storage room for materials and equipment during the progress of the Work, and be responsible for the protection, loss of, or damage to materials and equipment furnished by him, until final completion and acceptance of the Work.
- B. Storage and demurrage charges by transportation companies and vendors shall be borne by the Contractor.

1.03 MATERIALS, SAMPLES, INSPECTION

- A. Unless otherwise expressly provided on the Drawings or in any of the other Contract Documents, only new materials and equipment shall be incorporated in the Work. All materials and equipment furnished by the Contractor to be incorporated in the Work shall be subject to the inspection of the Engineer. No material shall be processed or fabricated for the Work or delivered to the Work site without prior concurrence of the Engineer.
- B. Facilities and labor for the storage, handling, and inspection of all materials and equipment shall be furnished by the Contractor. Defective materials and equipment shall be removed immediately from the site of the Work.
- C. If the Engineer so requires, either prior to or after commencement of the Work, the Contractor shall submit samples of materials for such special tests as the Engineer deems necessary to demonstrate that they conform to the Specifications. Such samples, including concrete test cylinders, shall be furnished, taken, stored, packed, and shipped by the Contractor as directed. The Contractor shall furnish suitable molds for and make the concrete test cylinders. Except as otherwise expressly specified, the Contractor shall make arrangements for, and pay for, the tests.

- D. All samples shall be packed so as to reach their destination in good condition, and shall be labeled to indicate the material represented, the name of the building or work and location for which the material is intended, and the name of the Contractor submitting the sample. To ensure consideration of samples, the Contractor shall notify the Engineer by letter that the samples have been shipped and shall properly describe the samples in the letter. The letter of notification shall be sent separate from and should not be enclosed with the samples.
- E. The Contractor shall submit data and samples, or place his orders, sufficiently early to permit consideration, inspection and testing before the materials and equipment are needed for incorporation in the Work. The consequences of his failure to do so shall be the Contractor's sole responsibility.
- F. In order to demonstrate the proficiency of workmen, or to facilitate the choice among several textures, types, finishes, surfaces, etc., the Contractor shall provide such samples of workmanship of wall, floor, finish, etc., as may be required.
- G. When required, the Contractor shall furnish to the Engineer triplicate sworn copies of manufacturer's shop or mill tests (or reports from independent testing laboratories) relative to materials, equipment performance ratings, and concrete data.
- H. After review of the samples, data, etc., the materials and equipment used on the Work shall in all respects conform therewith.

END OF SECTION 01600

SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 00710 - General Conditions.
- B. Section 01710 - Cleaning.
- C. Section 01720 - Project Record Documents.

1.02 SUBSTANTIAL COMPLETION

- A. Contractor:
 - 1. Submit written certification to Engineer that project is substantially complete.
 - 2. Submit list of major items to be completed or corrected.
- B. Engineer will make an inspection within seven days after receipt of certification, together with the Owner's representative.
- C. Should Engineer consider that work is substantially complete:
 - 1. Contractor shall prepare, and submit to Engineer, a list of the items to be completed or corrected, as determined by on-site observation.
 - 2. Engineer will prepare and issue a Certificate of Substantial Completion, containing:
 - a. Date of Substantial Completion.
 - b. Contractor's list of items to be completed or corrected, verified and amended by Engineer.
 - c. The time within which Contractor shall complete or correct work of listed items.
 - d. Time and date Owner will assume possession of work or designated portion thereof.
 - e. Responsibilities of Owner and Contractor for:
 - (1) Insurance.
 - (2) Utilities.
 - (3) Operation of mechanical, electrical and other systems.
 - (4) Maintenance and cleaning.
 - (5) Security.

f. Signatures of:

- (1) Engineer.
- (2) Contractor.
- (3) Owner.

3. Contractor: Complete work listed for completion or correction, within designated time.

D. Should Engineer consider that work is not substantially complete:

1. He shall immediately notify Contractor, in writing, stating reasons.
2. Contractor: Complete work, and send second written notice to Engineer, certifying that Project, or designated portion of project is substantially complete.
3. Engineer will re-review work.

1.03 FINAL INSPECTION

A. Contractor shall submit written certification that:

1. Contract Documents have been reviewed.
2. Project has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in presence of Owner's representative and are operational.
5. Project is completed and ready for final inspection.

B. Engineer will make final on-site observation/review within seven (7) days after receipt of certification.

C. Should Engineer consider that work is finally complete in accordance with requirements of Contract Documents, he shall request Contractor to make Project Closeout submittals.

D. Should Engineer consider that work is not finally complete:

1. He shall notify Contractor, in writing, stating reasons.
2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to Engineer certifying that work is complete.
3. Engineer will re-review the work.

1.04 FINAL CLEANING UP

The work will not be considered as completed and final payment made until all final cleaning up has been done by the Contractor in a manner satisfactory to the Engineer. See Section 01710 for detailed requirements.

1.05 CLOSEOUT SUBMITTALS

- A. Project Record Documents: to requirements of Section 01720.
- B. Operation and Maintenance Data: to requirements of particular technical specifications and Section 01730.
- C. Warranties and Bonds: to requirements of particular technical specifications and Section 01740.

1.06 INSTRUCTION

Instruct Owner's personnel in operation of all systems, mechanical, electrical and other equipment.

1.07 FINAL APPLICATION FOR PAYMENT

Contractor shall submit final applications in accordance with requirements of General Conditions.

1.08 FINAL CERTIFICATE FOR PAYMENT

- A. Engineer will issue final certificate in accordance with provisions of General Conditions.
- B. Should final completion be materially delayed through no fault of Contractor, Engineer may issue a Semi-final Certificate for payment.

END OF SECTION 01700

SECTION 01710 - CLEANING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. On a continuous basis, maintain premises free from accumulations of waste, debris, and rubbish, caused by operations.
- B. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave Project clean and ready for occupancy.

1.02 RELATED REQUIREMENTS

- A. Section 01045 - Cutting and Patching.
- B. Section 01700 - Project Closeout.
- C. Cleaning for Specific Products or Work: Specification Section for that work.

1.03 SAFETY REQUIREMENTS

- A. Hazards control:
 - 1. Store volatile wastes in covered metal containers, and remove from premises daily.
 - 2. Prevent accumulation of wastes which create hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile or noxious substances.
- B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 - 1. Do not burn or bury rubbish and waste materials on Project site without written permission from the Owner.
 - 2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
 - 3. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute cleaning to ensure that building, grounds and public properties are maintained free from accumulations of waste materials, trash, and rubbish.
- B. Wet down dry materials and rubbish to allay dust and prevent blowing dust.
- C. At reasonable intervals during progress of Work, clean site and public properties. Provide on-site containers for collection of waste materials, debris, trash, and rubbish.
- D. Remove waste materials, debris, trash, and rubbish from site when containers are full, or when directed by the Engineer or Owner's representative, but not less often than once weekly. Legally dispose of all waste materials, debris, trash, and rubbish at dumping areas off of Project site.
- E. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
- F. The Contractor shall thoroughly clean all materials and equipment installed.

3.02 FINAL CLEANING

- A. Employ experienced workmen, or professional cleaners, for final cleaning.
- B. In preparation for substantial completion, conduct final inspection of sight-exposed interior and exterior surface, and of concealed spaces.
- C. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
- D. Broom clean paved surfaces; rake clean other surfaces of grounds.
- E. Maintain cleaning until Project, or portion thereof, is occupied by Owner.
- F. The Contractor shall restore or replace existing property or structures as promptly and practicable as work progresses.

END OF SECTION 01710

SECTION 01720 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 00710 - General Conditions.
- B. Section 01300 - Submittals.

1.02 MAINTENANCE OF DOCUMENTS

- A. Maintain at job site, one copy of:
 - 1. Contract Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Reviewed Shop Drawings.
 - 5. Change Orders.
 - 6. Other Modifications to Contract.
- B. Store documents in approved location, apart from documents used for construction.
- C. Provide files and racks for storage of documents.
- D. Maintain documents in clean, dry legible condition.
- E. Do not use record documents for construction purposes.
- F. Make documents available at all times for inspection by Engineer and Owner.

1.03 MARKING DEVICES

Provide colored pencil or felt-tip marking pen for all marking.

1.04 RECORDING

- A. Label each document "RECORD DRAWING" in 2-inch high printed letters.
- B. Keep record documents current.
- C. Do not permanently conceal any work until required information has been recorded.

- D. Contract Drawings: Legibly mark to record actual construction:
1. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 3. Field changes of dimension and detail.
 4. Changes made by Change Order or Field Order.
 5. Details not on original Contract Drawings.
- E. Specifications and Addenda: Legibly mark up each Section to record:
1. Manufacturer, trade name, catalog number, and Supplier of each product **and item of equipment actually installed.**
 2. Changes made by Change Order or Field Order.
 3. Other matters not originally specified.
- F. Shop Drawings: Maintain as record documents; legibly annotate Shop Drawings to record changes made after review.

1.05 SUBMITTAL

- A. At completion of project, deliver record documents to Engineer.
- B. Accompany submittal with transmittal letter, in duplicate, containing:
1. Date.
 2. Project title and number.
 3. Contractor's name and address.
 4. Title and number of each record document.
 5. Certification that each document as submitted is complete and accurate.
 6. Signature of Contractor or his authorized representative.

END OF SECTION 01720

SECTION 01730 - OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Compile product data and related information appropriate for Owner's maintenance and operation of equipment furnished under the contract. Prepare operating and maintenance data as specified.
- B. Instruct Owner's personnel in the maintenance and operation of equipment and systems as outlined herein.
- C. In addition to maintenance and operations data, the manufacturer's printed recommended installation practice shall also be included. If not part of the operations and maintenance manual, separate written installation instructions shall be provided, serving to assist the Contractor in equipment installation.

1.02 RELATED REQUIREMENTS

- A. Section 00710 - General Conditions.
- B. Section 01300 - Submittals.
- C. Section 01720 - Project Record Documents.
- D. Section 01740 - Warranties and Bonds.

1.03 MAINTENANCE AND OPERATIONS MANUAL

- A. Every piece of equipment furnished and installed shall be provided with the following maintenance and operations manuals:
 - 1. One (1) copy in electronic format, on compact disk, furnished for the Engineer's review as to adequacy and completeness. Preferred electronic format is .pdf file. Following review, the Contractor shall cause any changes required to be made, and shall store all manuals until the completion of the project or until requested by the Engineer. The manuals will be stored and delivered to the Engineer, organized as described in this specification.
 - 2. Two (2) final copies, with all required changes, in print format, furnished to the Owner.
 - 3. Four (4) final copies, with all required changes, on compact disk. Two (2) copies furnished to Owner, two (2) copies furnished to Engineer. Format shall be .pdf file.

The final form of the manuals shall be utilized in instructions of the Owner's personnel.

1.04 FORM OF SUBMITTALS

A. Prepare data in the form of an instructional manual for use by Owner's personnel.

B. Format for hard copies:

1. Size: 8-1/2 x 11 in.
2. Paper: 20 pound minimum, white, for typed pages.
3. Text: Manufacturer's printed data, or neatly typewritten.
4. Drawings:
 - a. Provide reinforced punched binder tab, bind with text.
 - b. Fold large drawings to the size of the text pages where feasible.
 - c. For all drawings included within manuals, furnish a 8 mil mylar copy in standard size drawings 36" x 24", 8" x 16" or 8-1/2" x 11".
 - d. For flow or piping diagrams that cannot be detailed on the standard size drawings, a larger, appropriate size drawing may be submitted.
5. Provide fly-leaf for each separate product, or each piece of operating equipment.
 - a. Provide typed description of product, and major component parts of equipment.
 - b. Provide indexed tabs.
6. Cover: Identify each volume with types or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
 - a. Title of Project.
 - b. Identity of separate structure as applicable.
 - c. Identity of general subject matter covered in the manual.

C. Binders:

1. Commercial quality, durable and cleanable, 3-hole, 3" or 4" post type binders, with oil and moisture resistant hard covers.
2. When multiple binders are used, correlate the data into related consistent grouping.
3. Labeled on the front cover and side of each binder shall be the name of the Contract, the Contract Number and Volume Number.

1.05 CONTENT OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in systematic order.

1. Contractor, name of responsible principal, address and telephone number.
2. A list of each product required to be included, indexed to the content of the volume.
3. List, with each product, the name, address and telephone number of:
 - a. Subcontractor or installer.
 - b. Maintenance contractor, as appropriate.
 - c. **Identify the area of responsibility of each.**
 - d. Local source of supply for parts and replacement.
4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product Data:

1. Include only those sheets which are pertinent to the specific product. References to other sizes and types or models of similar equipment shall be deleted or lined out.
2. Annotate each sheet to:
 - a. Clearly identify the specific product or part installed.
 - b. Clearly identify the data applicable to the installation.
 - c. Provide a parts list for all new equipment items, with catalog numbers and other data necessary for ordering replacement parts.
 - d. Delete references to inapplicable information.
3. Clear and concise instructions for the operation, adjustment, lubrication, and other maintenance of the equipment including a lubrication chart.

C. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate:
 - a. Relations of component parts of equipment and systems.
 - b. Control and flow diagrams.
2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
3. Do not use Project Record Documents as maintenance drawings.

- D. Written text, as required to supplement product data for the particular installation:
 - 1. Organize in a consistent format under separate headings for different procedures.
 - 2. Provide a logical sequence of instructions for each procedure.

- E. Copy of each warranty, bond and service contract issued: Provide information sheet for Owner's personnel.
 - 1. Proper procedures in the event of failure.
 - 2. Instances which might affect the validity of warranties or bonds.

- F. **The electronic copies of the manuals shall be submitted to the Engineer for review at the same time that the equipment to which it pertains is delivered at the site. The manuals must be approved by the Engineer before final payment on the equipment is made.**

END OF SECTION 01730

SECTION 01740 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittals when required.
- D. Review submittals to verify compliance with Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Performance and Payment Bonds.
- B. Guaranty.
- C. General Warranty of Construction.
- D. Warranties and Bonds required for specific products: As listed in other Specification sections.

1.03 WARRANTY BONDS OR CORPORATE GUARANTEES IN LIEU OF EXPERIENCE RECORD

- A. When specifically requested in the products and installation general provisions of a Specification section for a particular piece of equipment or product, a record of five (5) years of successful full-scale operation shall be required from the equipment manufacturer. This record of full-scale operation shall be from existing facilities utilizing the equipment or product specified, in an application similar to the application intended for this Project.
- B. The manufacturer shall certify in writing to the Contractor that it has the required record of successful full-scale operation. This certification shall be submitted by the Contractor with his construction materials and/or equipment data list. In the event the manufacturer cannot provide the five (5) year certification of experience to the Contractor, the Contractor shall furnish within thirty (30) days after the Notice of Award, a Warranty Bond or Corporation Guarantee from the equipment manufacturer written in the name of the Contractor and acceptable to the Owner. The Warranty Bond or Corporate Guarantee shall be kept in force for five (5) years from the Date of Substantial Completion of the Contract less the number of years of experience

the manufacturer may be able to certify to the Engineer. As a minimum, the Bond or Guarantee shall be in force for one (1) year after the Date of Substantial Completion of the Contract. The Warranty Bond shall be written in an amount equivalent to the manufacturer's quotation, the Contractor's installation cost plus 100 percent (100%). The Warranty Bond or Corporate Guarantee will assure the Owner that, if in the judgement of the Engineer, the equipment does not perform its specified function, the Contractor shall remove the equipment and install equipment that will perform the specified function and the work by the Contractor shall be paid for by the Warranty Bond or Corporate Guarantee.

1.04 SUBMITTALS REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.
- B. Furnish two (2) original signed copies.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - 1. Product, equipment or work item.
 - 2. Firm name, address and telephone number.
 - 3. Scope.
 - 4. Date of beginning of warranty, bond or service and maintenance contract.
 - 5. Duration of warranty, bond or service and maintenance contract.
 - 6. Provide information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
 - 7. Contractor name, address and telephone number.

1.05 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8 1/2-inch x 11 inches, punch sheets for 3-ring binder: Fold larger sheets to fit into binders.
 - 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
 - a. Title of Project.
 - b. Name of Contractor.

- C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.06 TIME OF SUBMITTALS

- A. For equipment or component parts of equipment put into service during progress of construction: Submit documents within ten (10) days after inspection and acceptance.
- B. Otherwise, make submittals within ten (10) days after date of substantial completion, prior to final request for payment.
- C. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing the date of acceptance as the start of the warranty period.

1.07 SUBMITTALS REQUIRED

Submit warranties, bonds, service and maintenance contracts as specified in the respective sections of the Specifications. Additionally, the Contractor shall warrant the entire contract, including all concrete, paving, building, plumbing, HVAC, mechanical and electrical equipment to be free from defects in design and installation for one (1) year from the date of startup. In the event a component fails to perform as specified or is proven defective in service during the warranty period, the Contractor shall repair the defect without cost to the Owner.

END OF SECTION 01740

Division 2 - Site Work

SECTION 02050 - DEMOLITION

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

- A. Demolition work shall be included in the Contract.
- B. Prior to demolition of structures the following procedures shall be accomplished.
 - 1. Owner release of such structure.
 - 2. **All electrical and mechanical services rerouted or shut off outside the area of demolition.**
 - 3. Coordinate sequencing with Subcontractors.
 - 4. Survey and record the condition of existing facilities to remain in place that may be affected by the demolition operations. After demolition operations are completed, survey the conditions again and restore existing facilities to the pre-demolition condition, at no additional cost to the Owner.
- C. Demolition work shall include all items indicated on the Drawings.

1.02 SCHEDULE

- A. Perform demolition and removal work at such a time and in such a manner, so as not to interfere with the Owner's operations, the work of other trades and other Contracts. Follow the Progress Schedule as agreed to and worked out with the Owner.
- B. Coordinate demolition and removal work with the work of other Contractors, so that the new construction work installed before, during and after the work of this Section may commence without undue delay.

1.03 PROTECTION

- A. Do not close or obstruct streets, walks, and other facilities occupied and used by the Owner and the public, without prior written permission from the Owner and local authorities having jurisdiction.
- B. The structural stability of structures adjacent to, or affected by the work of this Contract will be the responsibility of the Contractor. Provide temporary shoring, and bracing where required.

- C. Provide all necessary shielding of existing materials and equipment, which are to remain, within or adjacent to work areas.
- D. Maintain in service and protect from damage the existing utilities that are indicated to remain.

1.04 UTILITIES

Notify all utilities in sufficient time prior to razing operations to permit them to disconnect and remove and/or relocate the respective utility.

1.05 SEWER SEALING

Plug and seal, using concrete, piping as shown on the drawings or as directed by the Engineer.

1.06 SALVAGEABLE MATERIALS

- A. The Owner shall have first right to salvage material.
- B. Salvage material and equipment to be retained by the Owner shall be located as directed by the Engineer.

1.07 DEMOLITION OPERATIONS

- A. Demolition of existing structures shall be conducted to one of the following standards:
 - 1. As shown on the Contract Drawings, or if not detailed on the Contract Drawings,
 - 2. Removed to a minimum of 36 inches below the finished grade, or
 - 3. Removed to 36 inches below the location of a new structure.
- B. Remove existing concrete using an abrasive saw to make initial cuts not less than 2 inches deep, between areas to be removed and areas to remain, providing a smooth, straight joint or cut line. Make cut lines in floor slabs parallel with walls.
- C. If existing abandoned utility lines extend into the area of construction being removed, remove abandoned lines to elevations shown on the drawings, or as directed by the Engineer outside of demolition area and plug permanently with steel cap or concrete.

- D. Adequate drainage of all structures demolished shall be provided by providing openings in the floors and walls of the portion of the structures remaining in place. The Contractor shall notify the Engineer, prior to backfilling the structures remaining in place, in order for him to inspect the drainage provision provided.

- E. Provide all temporary shoring and bracing as required to transfer loads of existing construction to remain from construction being removed. Remove and dispose of temporary support measures when new construction has been installed by other contractors.

END OF SECTION 02050

SECTION 02110 - SITE CLEARING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Clear site within construction limits of plant life and grass.
- B. Remove root system of trees and shrubs.
- C. Remove surface debris.

1.02 REGULATORY REQUIREMENTS

Conform to applicable local codes and ordinances for disposal of debris.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXISTING TREES AND OTHER VEGETATION

- A. The Contractor shall not cut or injure any trees or other vegetation outside right-of-way or easement lines and outside areas to be cleared, as indicated on the Drawings, without written permission from the Engineer. The Contractor shall be responsible for all damage done outside these lines.
- B. The Engineer shall designate which trees are to be removed within permanent and temporary easement lines or right-of-way lines.

3.02 CLEARING

- A. From areas to be cleared, the Contractor shall cut or otherwise remove all trees, brush, and other vegetable matter such as snags, bark and refuse. The ground shall be cleared to the width of the permanent easement or right-of-way unless otherwise directed by the Engineer.
- B. Except where clearing is done by uprooting with machinery, trees, stumps, and stubs to be cleared shall be cut as close to the ground surface as practicable, but no more than 6 inches above the ground surface for small trees and 12 inches for larger trees.

- C. Elm bark shall be either buried at least 1 foot deep or burned in suitable incinerators off site with satisfactory antipollution controls and fire prevention controls, to prevent the spread of Dutch Elm disease and as required by applicable laws.

3.03 GRUBBING

From areas to be grubbed, the Contractor shall remove completely all stumps, remove to a depth of 12 inches all roots larger than 3-inch diameter, and remove to a depth of 6 inches all roots larger than 1/2-inch diameter. Such depths shall be measured from the existing ground surface or the proposed finished grade, whichever is lower.

3.04 STRIPPING OF TOPSOIL

Prior to starting general excavation, strip topsoil to a depth of 6 inches or to depths required by the Engineer. Do not strip topsoil in a muddy condition and avoid mixture of subsoil. Stockpile the stripped topsoil within easement or right-of-way lines for use in finish grading and site restoration. Topsoil stockpiled shall be free from trash, brush, stones over 2 inches in diameter and other extraneous material.

3.05 PROTECTION

- A. Protect plant growth and features remaining as final landscaping.
- B. Protect bench marks and existing work from damage or displacement.
- C. Maintain designated site access for vehicle and pedestrian traffic.

3.06 REMOVAL

- A. All material resulting from clearing and grubbing and not scheduled for reuse shall become the property of the Contractor and shall be suitably disposed of off-site, unless otherwise directed by the Engineer, in accordance with all applicable laws, ordinances, rules and regulations.
- B. Such disposal shall be performed as soon as possible after removal of the material and shall not be left until the final period of cleaning up.

END OF SECTION 02110

SECTION 02150 - SHORING AND BRACING

PART 1 - GENERAL

1.01 SUMMARY

- A. Shore and brace sidewalls in excavations with steel sheet piles with wale systems or soldier piles with timber lagging and tie back system as required to protect existing buildings, utilities, roadways, and improvements.
- B. Maintain shoring and bracing during construction activities, and remove shoring and bracing if practical when construction and filling is complete.
- C. Geotechnical investigation borings, if applicable, were drilled for this project where indicated on the drawings in the report. The geotechnical report was not prepared for purposes of bid development and the accuracy of the report is limited. The Contractor should confer with a geotechnical engineer and/or conduct additional study in the area to obtain the specific type of geotechnical information required for construction and for preparation of bids.

1.02 SUBMITTALS

Provide copies of information on methods of the shoring and bracing system proposed for the work, design basis, calculations where applicable, and copies of shop drawings for inclusion in the project and job-site record files.

1.03 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Shoring and bracing system design shall be prepared and sealed by a registered professional engineer or structural engineer. The system design shall provide the sequence and method of installation and removal. Shoring and bracing system design shall be in accordance with Occupational Safety and Health Administration (OSHA) requirements 29 CFR Section 1926.652.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel Sheet Piles: Heavy-gauge steel sheet.

- B. Soldier Piles: Steel H-beams.
- C. Timber Lagging: Heavy timber. Pressure treated with wood preservative for use below water table for extended time period.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in proper relation with adjacent construction. Coordinate with work of other sections.
- B. Locate shoring and bracing to avoid permanent construction. Anchor and brace to prevent collapse.

END OF SECTION 02150

SECTION 02222 - EXCAVATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Structure excavation.
- B. Shoring excavations.

1.02 RELATED REQUIREMENTS

- A. Section 02221 - Rock Removal.
- B. Section 02223 - Embankments.
- C. Section 02225 - Excavating, Backfilling and Compacting for Utilities.

1.03 PROTECTION

- A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
- B. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- C. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- D. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
- E. Grade excavation top perimeter to prevent surface water run-off into excavation.
- F. Contractor shall provide ample means and devices with which to intercept any water entering the excavation area.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Subsoil: Excavated material, graded free of lumps larger than 12 inches, rocks larger than 12 inches, and debris.

- B. Pea Gravel: Mineral aggregate graded 1/4 inch to 5/8 inch, free of soil, subsoil, clay, shale, or foreign matter.

PART 3 - EXECUTION

3.01 PREPARATION

Identify required lines, levels, contours, and datum.

3.02 EXCAVATION

- A. Excavate subsoil required for structure foundations, construction operations, and other work.
- B. Contractor is responsible to adequately brace open cuts and protect workmen and equipment from cave-in.
- C. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd., measured by volume.
- D. Correct unauthorized excavation at no cost to Owner.
- E. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Engineer.
- F. Stockpile excavated material in area designated on site.

3.03 EXCAVATION FOR STRUCTURES

- A. For structures, excavate to elevations and dimensions indicated, plus ample space for construction operations and inspection of foundations.
- B. Excavate for foundation bearing a minimum of 24 inches below existing grade.
- C. Structure foundations shall bear entirely in original subsoil, entirely on rock, or entirely on compacted earth or granular fill unless otherwise directed by the geotechnical representative inspecting the excavation as required by Section 01400 - Quality Control.
 - 1. Where structures are to be soil-bearing and rock is encountered, undercut rock 24 inches and backfill with compacted earth material.
 - 2. Where structures are to be rock bearing, rock surface shall be inspected to verify that material is bedrock and has sufficient strength to support the structure.

3. Prior to placement of any granular fill, forms, reinforcing steel, or concrete, schedule and provide site visit services by the same firm which provided geotechnical investigations utilized in the structural design of the foundations for the project, as per Section 01400, Quality Control. Said visits shall be for the sole purpose of confirming that the conditions described in the geotechnical report are present over the foundation areas extending beyond the investigational borings.
4. If material unsuitable for foundation (in the opinion of the geotechnical Engineer) is found at or below the grade to which excavation would normally be carried in accordance with the Drawings and/or Specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted, screened gravel, select bank-run gravel, fine aggregate or concrete as directed, in order to provide a suitable bearing for the foundation.
5. Structure foundations shall be installed immediately after excavation is completed, or if this cannot be done, the last 4 to 6 inches of material should not be removed until preparations for installing the foundation are complete. In no case should foundations be installed in excavations which contain water. Any soft, saturated areas in the bottom of excavations shall be removed or stabilized using granular material.
6. Make no excavation to the full depth indicated when freezing temperatures may be expected unless foundations can be installed after the excavation has been completed. Protect the bottom so excavated from frost if foundation installation is delayed.

3.04 REMOVAL OF WATER

- A. The Contractor, at his own expense, shall provide adequate facilities for promptly and continuously removing water from all excavation.
- B. To ensure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) with which to remove promptly and dispose properly of all water entering trenches and other excavations. Such excavation shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged.
- C. All water pumped or drained from the Work shall be disposed of in a suitable manner without undue interference with other work, damage to pavements, other surfaces, or property. Suitable temporary pipes, flumes, or channels shall be provided for water that may flow along or across the site of the Work.
- D. If necessary, the Contractor shall dewater the excavations by means of an efficient drainage wellpoint system which will drain the soil and prevent saturated soil from flowing into the excavation. The wellpoints shall be

designed especially for this type of service. The pumping unit shall be designed for use with the wellpoints, and shall be capable of maintaining a high vacuum and of handling large volumes of air and water at the same time.

- E. The installation of the wellpoints and pump shall be done under the supervision of a competent representative of the manufacturer. The Contractor shall do all special work such as surrounding the wellpoints with sand or gravel or other work which is necessary for the wellpoint system to operate for the successful dewatering of the excavation.

3.05 UNAUTHORIZED EXCAVATION

If the bottom of any excavation is taken out beyond the limits indicated or prescribed, the resulting void shall be backfilled at the Contractor's expense with thoroughly compacted granular material or with 3,000 psi concrete, if the excavation was for a structure, unless otherwise directed by the geotechnical representative inspecting the excavation.

3.06 EXCESS MATERIAL

- A. No excavated materials shall be removed from the site of the work or disposed of by the Contractor except as directed or permitted.
- B. Surplus excavated materials suitable for backfill shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill; shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions. All work shall be as directed or permitted and without additional compensation.
- C. Surplus excavated materials not needed as specified above shall be disposed of by the Contractor, who shall obtain all permits and make all arrangements required.

3.07 EXISTING UTILITIES AND OTHER OBSTRUCTIONS

Prior to the commencement of construction on the project, the Contractor shall contact the utility companies whose lines, above and below ground, may be affected during construction and verify the locations of the utilities as shown on the Contract Drawings. The Contractor shall ascertain from said companies if he will be allowed to displace or alter, by necessity, those lines encountered or replace those lines disturbed by accident during construction, or if the companies themselves are only permitted by policy to perform such work. If the Contractor is permitted to perform such work, he shall leave the lines in as good condition as were originally encountered and complete the Work as quickly as possible. All such lines or underground structures damaged or molested in the construction shall be replaced at the Contractor's expense,

unless in the opinion of the Engineer, such damage was caused through no fault of the Contractor.

3.08 FIELD QUALITY CONTROL

Provide for visual inspection of rock surfaces and foundation sub-grades under provisions of Section 01400.

END OF SECTION 02222

SECTION 02225 - EXCAVATING, BACKFILLING, AND
COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall make excavations in such widths and depths as will give suitable room for below grade vaults, pump stations, etc., laying pipe to the lines, grades and elevations, furnish, place and compact all backfill materials specified herein or denoted on the Drawings. The materials, equipment, labor, etc., required herein are to be considered as part of the requirements and costs for installing the various pipes, structures and other items they are incidental to.

1.02 RELATED WORK

- A. Section 02221 - Rock Removal.
- B. Section 02610 - Water Pipe and Fittings.
- C. Section 02731 - Gravity Sewers.
- D. Section 02732 - Force Mains.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Crushed stone material shall conform with the requirements of the applicable sections of the Kentucky Bureau of Highways Standard Specifications and shall consist of clean, hard, and durable particles or fragments, free from dirt, vegetation or objectionable materials.
- B. Two classes of crushed stone material are used in this Section. The type of material in each class is as follows:
 - 1. Class I - No. 9 Aggregate.
 - 2. Class II - Dense Graded Aggregate (DGA).

PART 3 - EXECUTION

3.01 EXCAVATION OF TRENCHES

- A. Unless otherwise directed by the Engineer, trenches are to be excavated in open cuts.
 - 1. Where pipe is to be laid in gravel bedding or concrete cradle, the trench may be excavated by machinery to, or just below, the designated subgrade, provided that the material remaining at the bottom of the trench is no more than slightly disturbed.
 - 2. Where pipe is to be laid directly on the trench bottom, the lower part of trenches in earth shall not be excavated to subgrade by machinery. However, just before the pipe is to be placed, the last of the material to be excavated shall be removed by means of hand tools to form a flat or shaped bottom, true to grade, so that the pipe will have a uniform and continuous bearing and support on firm and undisturbed material between joints except for limited areas where the use of pipe slings may have disturbed the bottom.
- B. Trenches shall be sufficient width to provide working space on each side of the pipe and to permit proper backfilling around the pipe.
 - 1. The Contractor shall remove only as much of any existing pavement as is necessary for the prosecution of the Work. The pavement shall be cut with pneumatic tools, without extra compensation to the Contractor, to prevent damage to the remaining road surface. Where pavement is removed in large pieces, it shall be disposed of before proceeding with the excavation.
- C. All excavated materials shall be placed a safe distance back from the edge of the trench.
- D. Unless specifically directed otherwise by the Engineer, not more than 500 feet of trench shall be opened ahead of the pipe laying work of any one crew, and not more than 500 feet of open ditch shall be left behind the pipe laying work of any one crew. Watchmen or barricades, lanterns and other such signs and signals as may be necessary to warn the public of the dangers in connection with open trenches, excavations and other obstructions, shall be provided by and at the expense of the Contractor.

- E. When so required, or when directed by the Engineer, only one-half of street crossings and 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 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.
- F. Trench excavation shall include the removal of earth, rock, or other materials encountered in the excavating to the depth and extent shown or indicated on the Drawings.

3.02 WATER PIPE BEDDING

- A. Piping for water mains shall be supported as follows:
 - 1. The trench bottom for water main piping shall be stable, continuous, relatively smooth and free of frozen material, clodded dirt, foreign material and rock or granular material larger than 1/2 inch in diameter. The foundation for water main piping 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. Any uneven areas in the trench bottom shall be shaved-off or filled-in with Class I granular bedding. When the trench is made through rock, the bottom shall be lowered to provide 6 inches of clearance around the pipe. Class I granular bedding shall be used to bring the trench bottom to grade.
- B. After each pipe has been brought to grade, aligned, and placed in final position, earth material for water main piping in areas not subject to vehicular traffic and Class I material for water mains in paved areas, shall be deposited and densified under the pipe haunches and on each side of the pipe up to the spring line of the pipe to prevent lateral displacement and hold the pipe in proper position during subsequent pipe jointing, bedding, and backfilling operations.
- C. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of grade or line, or where backfill materials are of such a fluid nature that such movements of pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective.
- D. Where an unstable (i.e., water, mud, etc.) trench bottom is encountered, stabilization of the trench bottom is required. This is to be accomplished by undercutting the trench depth and replacing to grade with a foundation of crushed stone aggregate.

- E. The depth of the foundation is dependent upon the severity of the trench bottom. The size of stone aggregate used in the foundation will be determined by the condition of the unstable material. Once the trench bottom has been stabilized, the required Class I bedding material can be placed.
- F. It should be noted that no pipe shall be laid on solid or blasted rock.
- G. Pipe bedding as required in Paragraphs A, B, C, and D of this Section is **not** considered a separate pay item.

3.03 WATER PIPE BACKFILLING

A. Initial Backfill:

- 1. This backfill is defined as that material which is placed over the pipe from the spring line to a point 6 inches above the top of the pipe. For water main piping in areas not subject to vehicular traffic, initial backfill material shall be earth material free of rocks, acceptable to the Engineer or with Class I material when a condition exists mentioned in Paragraph A, 3. below. For water main piping in paved areas, initial backfill shall be Class I material.
- 2. Material used, whether earth or Class I, in the initial backfilling is **not** a separate pay item. Payment for the material is included in the unit price per linear foot of water main.
- 3. In areas where large quantities of rock are excavated and the available excavated earth in the immediate vicinity is insufficient for placing the required amount of backfill over the top of the pipe as set forth in Paragraph A.1, the Contractor shall either haul in earth or order Class I material for backfilling over the pipe. Neither the hauling and placement of earth nor the ordering and placement of Class I material to fulfill the backfill requirements set forth herein is considered a separate pay item.

B. Final Backfill:

- 1. There are two cases where the method of final backfilling varies. The various cases and their trench situations are as follows:
 - a. Case I - Areas not subject to vehicular traffic.
 - b. Case II - Paved areas including streets, drives, parking areas, and walks.
- 2. In all cases, walking or working on the completed pipelines, except as may be necessary in backfilling, will not be permitted until the trench has been backfilled to a point 6 inches above the top of the pipe. The method of final backfilling for each of the above cases is as follows:

- a. Case I - The trench shall be backfilled from a point 6 inches above the top of the pipe to a point 8 inches below the surface of the ground with earth material free from large rock (greater than 6 inches in the longest dimension), acceptable to the Engineer. The remainder of the trench shall be backfilled with earth material reasonably free of any rocks.
- b. Case II - The trench shall be backfilled from a point 6 inches above the top of the pipe to a point 12 inches below the existing pavement surface with Class I (No. 9 crushed stone aggregate) material. The backfill shall be mechanically tamped in approximately 6-inch layers to obtain the maximum possible compaction. The remaining backfill shall be as follows:

For gravel surfaces - Class II (dense graded aggregate) material mechanically tamped to maximum possible compaction. The trench may be left with a slight mound if permitted by the Engineer.

For bituminous and concrete surfaces - Bituminous and concrete pavement sections as detailed on the Drawings and as specified for Bituminous Pavement Replacement and Concrete Pavement Replacement.

3. Earth and Class I material used in final backfill is not a separate pay item. Payment shall be included in the price of water main.
 4. Class II material used in final backfill shall be included in the unit price of the pipe.
- C. A sufficient amount of Class II material shall be stockpiled to insure immediate replacement by the Contractor of any settled areas. No extra payment will be made for the filling in of settled or washed areas by the Contractor.
- D. Excavated materials from trenches, in excess of quantity required for trench backfill, shall be disposed of by the Contractor. It shall be the responsibility of the Contractor to obtain location or permits for its disposal, unless specific waste areas have been designated on the Drawings or noted in these Specifications. The cost of disposal of excess excavated materials, as set forth herein, no additional compensation being allowed for hauling or overhaul.

3.04 GRAVITY SEWER AND FORCE MAIN PIPE BEDDING

- A. Piping for gravity sewers and force mains shall be supported as follows: All gravity sewer and force main piping shall be laid on a bed of granular material except when a concrete encasement situation occurs. All pipe bedding material shall be Class I (No. 9 crushed stone aggregate) and shall be placed to a depth of 4 inches in an earth trench and 6 inches in a rock trench. Aggregate bedding

shall be graded to provide for a uniform and continuous support beneath the pipe at all points.

- B. After each pipe has been brought to grade, aligned, and placed in final position, Class I material for gravity sewer piping and earth material for force main piping in areas not subject to vehicular traffic and Class I material for force mains in paved areas, shall be deposited and densified under the pipe haunches and on each side of the pipe up to the spring line of the pipe to prevent lateral displacement and hold the pipe in proper position during subsequent pipe jointing, bedding, and backfilling operations.
- C. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of grade or line, or where backfill materials are of such a fluid nature that such movements of pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective.
- D. Where an unstable (i.e., water, mud, etc.) trench bottom is encountered, stabilization of the trench bottom is required. This is to be accomplished by undercutting the trench depth and replacing to grade with a foundation of crushed stone aggregate.
- E. The depth of the foundation is dependent upon the severity of the trench bottom. The size of stone aggregate used in the foundation will be determined by the condition of the unstable material. Once the trench bottom has been stabilized, the required Class I bedding material can be placed.
- F. It should be noted that no pipe shall be laid on solid or blasted rock.
- G. Pipe bedding, as required in Paragraphs A, B, C, and D of this Section, is **not** considered a separate pay item.

3.05 GRAVITY SEWER AND FORCE MAIN BACKFILL

A. Initial Backfill:

1. This backfill is defined as that material which is placed over the pipe from the spring line to a point 6 inches above the top of the pipe. For gravity sewer piping the material shall be Class I (No. 9 crushed stone aggregate) and may be machine placed without compaction. Uneven places in the backfill shall be leveled by hand. For force main piping in areas not subject to vehicular traffic, initial backfill material shall be earth material free of rocks, acceptable to the Engineer or with Class I material when a condition exists mentioned in Paragraph A, 3. below. For force main piping in paved areas, initial backfill shall be Class I material.

2. Material used, whether earth or Class I, in the initial backfilling is **not** a separate pay item. Payment for the material is included in the unit price per linear foot of gravity sewer or force main.
3. In areas where large quantities of rock are excavated and the available excavated earth in the immediate vicinity is insufficient for placing the required amount of backfill over the top of the pipe as set forth in Paragraph A.1, the Contractor shall either haul in earth or order Class I material for backfilling over the pipe. Neither the hauling and placement of earth nor the ordering and placement of Class I material to fulfill the backfill requirements set forth herein is considered a separate pay item.

B. Final Backfill:

1. There are two cases where the method of final backfilling varies. The various cases and their trench situations are as follows:
 - a. Case I - Areas not subject to vehicular traffic.
 - b. Case II - Paved areas including streets, drives, parking areas, and walks.
2. In all cases, walking or working on the completed pipelines, except as may be necessary in backfilling, will not be permitted until the trench has been backfilled to a point 6 inches above the top of the pipe. The method of final backfilling for each of the above cases is as follows:
 - a. Case I - The trench shall be backfilled from a point 6 inches above the top of the pipe to a point 8 inches below the surface of the ground with earth material free from large rock (greater than 6 inches in the longest dimension), acceptable to the Engineer. The remainder of the trench shall be backfilled with earth material reasonably free of any rocks.
 - b. Case II - The trench shall be backfilled from a point 6 inches above the top of the pipe to a point 12 inches below the existing pavement surface with Class I (No. 9 crushed stone aggregate) material. The backfill shall be mechanically tamped in approximately 6-inch layers to obtain maximum possible compaction. The remaining backfill shall be as follows:

For gravel surfaces - Class II (dense graded aggregate) material mechanically tamped to maximum possible compaction. The trench may be left with a slight mound if permitted by the Engineer.

For bituminous and concrete surfaces - Bituminous and concrete pavement sections as detailed on the Drawings and as specified for

Bituminous Pavement Replacement and Concrete Pavement Replacement.

3. Earth and Class I material used in final backfill is not a separate pay item. Payment shall be included in the price of gravity sewer and force main.
 4. Class II material used in final backfill shall be included in the unit price for gravity sewer and force main.
- C. A sufficient amount of Class II material shall be stockpiled to insure immediate replacement by the Contractor of any settled areas. No extra payment will be made for the filling in of settled or washed areas by the Contractor.
- D. **Excavated materials from trenches, in excess of quantity required for trench backfill, shall be disposed of by the Contractor. It shall be the responsibility of the Contractor to obtain location or permits for its disposal, unless specific waste areas have been designated on the Drawings or noted in these Specifications. The cost of disposal of excess excavated materials, as set forth herein, no additional compensation being allowed for hauling or overhaul.**

3.06 PLACEMENT OF IDENTIFICATION TAPE

- A. Detectable underground marking tape shall be placed over all utility lines. Care shall be taken to insure that the buried marking tape is not broken when installed and shall be Lineguard brand encased aluminum foil, Type III. The identification tape is manufactured by Lineguard, Inc., P.O. Box 426, Wheaton, IL 60187.
- B. The identification tape shall bear the printed identification of the utility line below it, such as "Caution - Buried Below". Tape shall be reverse printed; surface printing will not be acceptable. The tape shall be visible in all types and colors of soil and provide maximum color contrast to the soil. The tape shall meet the APWA color code, and shall be 2 inches in width. Colors are: yellow - gas, green - sewer, red - electric, blue - water, orange - telephone, brown - force main.
- C. The tape shall be the last equipment installed in the trench so as to be first out. The tape shall be buried 4 to 6 inches below top of grade. After trench backfilling, the tape shall be placed in the backfill and allowed to settle into place with the backfill. The tape may be plowed in after final settlement, installed with a tool during the trench backfilling process, unrolled before final restoration or installed in any other way acceptable to the Owner or Engineer.

3.07 PLACEMENT OF LOCATION WIRE

- A. Detectable underground location wire shall be placed above all non-metallic water mains and force mains. Care shall be taken to insure that the buried wire is not broken.
- B. The location wire shall be no smaller than AWG No. 8, soft drawn, 98 percent conductivity copper and insulated with THW insulation.
- C. The location wire shall be continuous from valve box to valve box and shall be terminated (unconnected) with a wire nut and enough "loose" wire to extend 24 inches outside the valve box.

END OF SECTION 02225

SECTION 02371 - AUGER CAST PILES

PART 1 - GENERAL

1.01 SCOPE

This specification includes furnishing all materials, equipment and labor to place auger cast piles of the dimensions, locations and depth shown on the drawings.

1.02 QUALITY ASSURANCE

- A. Auger cast piles shall be placed by a subcontractor specializing in auger cast piles and having at least 10 years successful experience. All supervisors, equipment operators, attendants, helpers, etc., shall be experienced and skilled in their respective jobs. The auger cast piles subcontractor shall furnish records of past successful experience in performing this type of work and comparable in scope to this project.
- B. The granting of approval for the auger cast piles subcontractor shall imply no acceptance to responsibility by the Engineer for the auger cast piles subcontractor to perform the work specified herein.
- C. A soils engineer licensed in the Commonwealth of Kentucky shall be present during the soil extracting and pressure grouting operations. This service will be provided by the Owner.
- D. All work performed under this section shall conform to generally accepted engineering and construction practices and principles and comply with the Kentucky Building Code and other applicable building codes.
- E. The auger cast piles subcontractor, if requested, shall perform a load test on his piles before starting operation. These tests will be performed under the supervision of the Soils Engineer. The piles shall be loaded in increments to at least twice the design capacity and one pile shall sustain this load for at least 24 hours. Tension and lateral tests shall also be performed. All displacements shall be recorded.

1.03 SUBMITTALS

- A. The auger cast piles subcontractor shall submit to the Engineer for approval a description of the materials, to be used, the proposed methods of operation, and records and data to demonstrate that the finished piles will meet, in all respects, the quality, properties and design criteria required by the specifications.

- B. If the piles are longer than 30 times the diameter, the auger cast piles subcontractor must submit a written request for a variance to the Kentucky State Building Official. The request shall state that the installations is under the full-time supervision of a registered Soils Engineer and include a resume of the Soils Engineer. A copy of the request shall be sent to the Owner's Representative.

1.04 JOB CONDITIONS

The auger cast piles subcontractor shall examine existing conditions, including all soil reports, and shall be familiar with all underground piping, wiring, and conduit as described by the Engineer and as shown on the foundation drawings of all areas to receive Auger Cast Piles and shall notify the Engineer of any conditions that may interfere with the proper and timely performance of the work. Beginning work specified in the Section constitutes knowledge and acceptance of existing conditions and responsibility for the influence of encountered conditions on the work in progress and the complete work.

1.05 SUBSTITUTES

- A. The materials, products, equipment and procedures specified in this section establish expected standards for quality, design, procedures, and performance are not intended to restrict competition.
- B. No substitution will be considered unless the Engineer receives a written request from the Bidder at least 10 days prior to the due date for the bids. NO substitutes or alternates will be considered after the contract is awarded.
- C. Each request shall include the name of the materials or equipment being substituted and a complete description of the proposed substitute including drawings, samples, performance, and test data, installation history for similar environments, amount of increase, or decrease in the Contract Price, and any other information necessary for evaluation.

1.06 REFERENCES

References in the specification to codes, specifications, and standard shall be understood to mean the latest edition, including any and all amendments and revision, except where dates or revision are specifically indicated.

1.07 DESIGN CRITERIA

- A. Pile Diameter: 12 inches
- B. Compressive Load Rating: 60 Tons at 28 Days (friction piles); 70 tons at 28 days (end bearing piles).

- C. Pile Spacing: As shown on drawings plus or minus 3", plumb to within 1%.
- D. All grout shall have a minimum 28-day specified compressive strength (fc') of 5000 psi.
- E. The allowable design stress shall not exceed 25% of the 28-day specified compressive strength (fc').

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland cement shall conform to ASTM C 150, Type I.
- B. Admixture shall comply with specification Section 03310.
- C. Water shall be fresh, clean, and free of injurious amounts of sewage, oil, acid, alkali, salts, or organic matter.
- D. Fine aggregate shall conform to ASTM C 33. The sand shall consist of hard, dense, durable, uncoated rock particles and be free from silt, loam, soft or flaky particles, shale, alkali, organic matter, mica, and other deleterious substances. If washed, the washing method shall be such as will not remove desirable fines, and the sand shall subsequently be permitted to drain until the residual-free moisture is reasonably uniform and stable. The sand shall be well-graded from fine to coarse with fineness modulus between 1.40 and 3.40. The fineness modulus is defined as the total divided by 1. Of the cumulative percentage retained on the U.S. Standard Sieve Nos. 16, 30, 50, and 100. A copy of the Sieve Analysis Report shall be submitted to the Engineer.
- E. Reinforcing shall be sizes shown on drawings and conform to ASTM A 615 Grade 60. Rebar assemblies shall include centerline fins to improve symmetry and to prevent the rebar from penetrating the piling wall.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Only approved pumping, continuous mixing and agitating equipment shall be used in the preparation and handling of the mortar. All oil or other rust inhibitors shall be removed from mixing drums and mortar pumps. If ready-mix mortar is used, agitating storage tanks of sufficient size shall be used between the ready-mix truck and the mortar pump to ensure a homogenous mix and continuity on the pumping operations. All material shall be such as

to produce a homogenous mortar of the desired consistency. If there is a lapse in the operation, the mortar shall be recirculated through the pump.

1. If the mix duration is longer than 90 minutes from batch time, grout will be rejected.
- B. The mortar pump shall be provided with a pressure gauge in clear-view of the equipment operator. Accurate records shall be maintained showing the depth to which piles are placed and the quantity of mortar placed. Any unusual conditions encountered during pipe installation shall be noted.
1. Records shall be kept daily and will contain the following information regarding piles placed:
 - a. Number of the pile (location shown on plans).
 - b. Depth of pile (cut off elevation to pile tip).
 - c. Diameter of pile.
 - d. Volume concrete material placed on pile.
 - e. Pressure used in placing pile.
- C. Rate of mortar injection and rate of auger withdrawal from the soil shall be so coordinated as to maintain at all times a positive pressure on the pressure gauge, which will, in turn, indicate the existence of a removing pressure on the bottom of the auger flight. The pressure on the gauge shall be equivalent to the pressure developed by an approximately 10' mortar return around the auger flights during auger withdrawal.
- D. Ahead of the mortar above the injection point shall be carried around the perimeter of the auger flighting at all times during the raising of the auger so that the mortar has a displacing action removing any loose material from the hole. This method of placement shall be used at all times and not be dependent on whether the hole is sufficiently stable to retain its shape without support from the earth-filled auger.
- E. The volume of the mortar pumped shall be at least 30 percent greater than the net volume of the augered hole.
- F. During pressure grouting, the auger shall be withdrawn smoothly and steadily.
- G. In the uplift piles, a single rebar shall be placed in the center of each augered hole and run the full depth of the hole, before beginning pressure grouting. The rebar may be placed after the pile is poured if spacers are attached to keep the bar centered in the shaft.
- H. A steel reinforcing cage shall be inserted in all piles in the upper 15' of each pile while the concrete is still fluid.

- I. Piles closer than 8' center-to-center shall not be placed until the grout in the first pile has cured for a minimum of 24 hours after initial set, unless approved by the Soils Engineer, but in no case until the first pile has cured for 8 hours.
- J. In the event that non-augerable material such as cobbles, boulders, rock ledge, metal, timbers, or debris is encountered and causes refusal or causes the pile to drift from its location, the Engineer shall be notified. The pile shall then be complete in a normal manner and this short pile added to the unit lengths for payment. If required by the Engineer, an additional adjacent pile shall be placed and paid for in accordance with the bid basis for additional footage. Refusal shall be defined as the depth where the penetration of the standard augering equipment is one foot per minute or less.
- K. Pile cut-off shall be accomplished by removing fresh mortar from the top of the pile or by cutting off hardened mortar down to final cut-off point in any rime after initial set has occurred.
- L. Where the pile cut-off is near the surface or above the bottom of the excavation, metal sleeves or casing of the proper diameter and at least 18" in length shall be placed around the pile tops. (Special conditions may require metal sleeves of additional length.
- M. The auger cast piles subcontractor shall remove all spoil material from the work site and deposit material in a designated area on the Owner's property.

3.02 TESTING

The mortar mix shall be tested throughout each 8-hour shift by making 6 sets of 2" cubes. A set of cubes shall consist of 2 cubes to be tested at 7 days, and 2 cubes to be tested at 28 days. Test cubes shall be made and tested in accordance with ASTM C 109, with the exception that the mortar should be restrained from expansion by a top plate. Test samples shall be taken from the auger discharge.

3.03 GUARANTEE

- A. The auger cast piles subcontractor shall accept entire responsibility for the performance of the Auger Cast Piles under the working load. He shall guarantee that he will repair or replace at his expense all structural damage caused by inability of the Auger Cast Piles to support the working loads satisfactorily. Conformance of the Auger Cast Piles Contractor's work with the requirements of the specification will not release him from liability for unsatisfactory performance of the Auger Cast Piles under working loads.
- B. The auger cast piles subcontractor's guarantee shall be covered by Product Liability Insurance with limits satisfactory to the Engineer and place with an

insurance company satisfactory to the Engineer. Certificates of coverage shall be submitted to the Engineer on request.

3.04 LOAD TEST

- A. Perform load tests, if requested, on one production pile in accordance with ASTM D1143.
- B. Test piles shall be the same shape and type as specified for other piling.
- C. Accepted test piles may be used in the work.
- D. Non-conforming piles shall be replaced with additional piles or supplement piles to meet specified requirements.
- E. There will be integrity test performed by others on selected piles. These tests will be performed as described in the geotechnical report and the cost will be borne by the Owner. Cost of replacement piles and additional testing due to failure of test will be at the Contractor's cost.

END OF SECTION 02371

SECTION 02605 - VALVE AND METER VAULTS

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall provide all materials and labor to install a valve and meter vaults as shown on the Drawings and specified herein.

1.02 RELATED WORK

- A. Section 02225 - Excavating, Backfilling, and Compacting for Utilities.
- B. Section 02610 - Water Pipe and Fittings.
- C. Section 02640 - Water Valves and Gates.

PART 2 - PRODUCTS

2.01 VALVE VAULT AT CREEK CROSSING

A. Concrete Manholes - General:

1. Manholes shall conform in shape, size, dimensions, materials, and other respects to the details indicated on the Drawings or bound in the Specifications.
2. All concrete manholes shall have precast reinforced concrete developed bases. No other type of base will be allowed. Invert channels shall be factory constructed when the base is made. Sloping invert channels shall be constructed whenever the difference between the inlet and outlet elevation is 2 feet or less.
3. The concrete manhole walls (barrels and cones) shall be precast concrete sections. The top of the cone shall be built of reinforced concrete adjustment rings to permit adjustment of the frame to meet the finished surface. Minimum strength of the concrete for the precast sections shall be 4,000 psi at the time of shipment.
4. For concrete manholes, the inverts of the developed bases shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent, within the manhole, to the centerlines of adjoining pipelines.
5. For concrete manholes, the cast-iron frames and covers shall be the standard frame and cover as indicated on the Drawings and specified hereinafter in this Section.

B. Precast Concrete Sections:

1. Precast concrete sections and appurtenances shall conform to the ASTM Standard Specifications for Precast Reinforced Concrete Manhole Sections, Designation C478, latest revision, with the following exceptions and additional requirements.
2. The base section shall be monolithic for 4-foot diameter manholes. Manholes with diameter of 5 feet or larger shall have base slab.
3. The wall sections shall be not less than 5 inches thick.
4. Type II cement shall be used except as otherwise permitted.
5. Joints between sections shall be made watertight through the use of rubber O-ring gaskets or rubber profile gaskets such as Forsheda 138. Gaskets shall conform to the ASTM Standard C-443, latest revision. Rope mastic or butyl mastic sealant will not be allowed except as noted in Article 2.01 B.6.
6. Butyl mastic sealant shall be installed between the cone section, any adjusting sections or rings, and casting.

C. Concrete Manhole Frames and Covers:

1. The Contractor shall furnish all cast-iron manhole frames and covers conforming to the details shown on the Drawings, or as hereinbefore specified.
2. The castings shall be of good quality, strong, tough, evengrained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.
3. All castings shall be thoroughly cleaned and subject to a careful hammer inspection.
4. Castings shall be at least Class 25 conforming to the ASTM Standard Specifications for Gray Iron Casting, Designation A48, latest revision.
5. Unless otherwise specified, manhole covers shall be 22-3/4 inches in diameter, weighing not less than 350 pounds per frame and cover. Manhole covers shall set neatly in the rings, with contact edges machined for even bearings and tops flush with ring edge. They shall have sufficient corrugations to prevent slipperiness. The covers shall have two (2) pick holes about 1-1/4 inches wide and 1/2 inches deep with 3/8 inch undercut all around. Covers shall not be perforated. Frames and covers shall be J.R. Hoe and Sons, Mc-350, or approved equal.
6. All covers shall be marked in large letters "WATER" in the center.

- D. Pre-molded Elastomeric-sealed Joints: All holes for pipe connections in concrete barrels and bases shall have a factory-installed flexible rubber gasket to prevent infiltration. The manhole boots shall conform to the latest revision of ASTM-C973. The boots shall be Contour Seal or Kor-N-Seal made by National Pollution Control Systems, Inc., Nashua, NH; A-Lok Manhole Pipe Seal made by A-Lok Corporation, Trenton, NJ; or an approved equal.

2.02 PRV/PSV AND MASTER METER VAULT

- A. General: A pre-cast concrete valve vault shall be furnished and installed in accordance with the details and dimensions as shown on the Plans. Concrete for the vault shall be Type I, 4,500 psi at 28 days, and shall conform to the applicable requirements of ACI 301-72 in all respects. Reinforcement shall conform to the requirements of ASTM A-615, A-616, or A-617. Minimum yield strength of the reinforcement shall be 60,000 psi.
- B. Access Hatch: Access hatch assemblies shall be installed in the top slab of the valve pit at the location shown on the Drawings. Frames and covers shall be fabricated of aluminum. Frame shall be securely mounted over the valves. Covers shall be provided with lifting handle and safety latch to hold the cover in the 90 degrees open position. Locking hasps shall be provided. Covers shall be of the checkered plate design. Access frame and cover shall be sized in accordance with the Drawings. Access frame and cover shall be Model KD-2 as manufactured by the Bilco Company, New Haven, CT, or approved equal.

2.03 MASTER METER

Master meters are specified in Section 02640.

2.04 VALVES

Valves are specified in Section 02640.

2.05 CORPORATION STOP

Corporation stop shall be in accordance with Section 02660.

PART 3 - EXECUTION

3.01 FABRICATION - PRECAST SECTIONS

- A. Manhole sections shall contain manhole steps accurately positioned and embedded in the concrete when the section is cast.

- B. Sections shall be cured in an enclosed curing area and shall attain a strength of 4,000 psi prior to shipment.
- C. No more than two (2) lift holes or inserts may be cast or drilled in each section.
- D. Flat slab tops shall have a minimum thickness of 6 inches and reinforcement in accordance with ASTM C478.
- E. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the precast sections.
- F. Acceptance of the sections will be on the basis of material tests and inspection of the completed product and test cylinders if requested by the Engineer.
- G. Cones shall be precast sections of similar construction.

3.02 SETTING PRECAST MANHOLE SECTIONS

- A. Precast-reinforced concrete manhole sections shall be set so as to be vertical and with sections and steps in true alignment.
- B. Rubber gaskets shall be installed in all manhole joints in accordance with the manufacturer's recommendations.
- C. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose.

3.03 ADJUSTING MANHOLE FRAMES AND COVERS TO GRADE

- A. Unless otherwise shown on the Drawings, the top of the precast concrete eccentric cone of a standard manhole or the top of the flat slab of a shallow manhole shall terminate not less than 4 inches below existing grade in an unpaved non-traffic area (except in a residential yard) and not less than 13 inches below existing grade in a paved or unpaved traffic area and in a residential yard. The frame and lid shall be adjusted to the required final grade as described hereinafter.
- B. Only clean adjusting sections shall be used. Each adjusting section shall be laid in a bead of butyl mastic sealant and shall be thoroughly bonded.

- C. When a manhole is located in an unpaved non-traffic area (other than a residential yard), the frame and cover shall be adjusted to a final elevation of 3 inches to 5 inches above the existing grade at the center of the cover. If field changes have resulted in the installed manhole invert elevation being lower than the invert elevation shown on the Drawings, the adjustment to the required final elevation of 3 inches to 5 inches above existing grade shall be accomplished by the use of precast concrete adjusting rings. If field changes have resulted in the completed manhole invert being higher than the invert shown on the Drawings and the top of the frame and cover being higher than 5 inches above the existing grade, then the Contractor shall substitute, at no additional cost to the Owner, a shorter barrel section on the manhole so that the frame and lid may be adjusted to the proper final elevation through the use of precast concrete adjusting rings.
- D. When a manhole is located in a bituminous, concrete, or crushed stone traffic area, or in a residential yard, the frame and cover shall be adjusted to the grade of the surrounding area by the use of precast concrete rings. The adjusted frame and lid shall conform to the elevation and slope of the surrounding area. If field changes have resulted in the completed manhole invert being higher than the invert shown on the Drawings and the top of the eccentric cone, when used, or the top of the flat shab, when used, being less than the height of the frame and lid below the grade of the surrounding area, then the Contractor shall substitute, at no additional cost to the Owner, a shorter barrel section on the manhole so that the frame and lid may be adjusted to the proper final elevation through the use of precast concrete adjusting rings.
- E. The Contractor shall coordinate elevations of manhole covers in paved streets with the Owner. If resurfacing of the street in which sewers are laid is expected within twelve (12) months, covers shall be set 1-1/2 inches above the existing pavement surface in anticipation of the resurfacing operations.

3.04 ADJUSTING SECTIONS

Only clean adjusting sections shall be used. Each adjusting section shall be laid in a bead butyl mastic sealant and shall be thoroughly bonded.

3.05 SETTING MANHOLE FRAMES AND COVERS

- A. Manhole frames shall be set with the tops conforming to the required elevations set forth hereinbefore. Frames shall be set concentric with the top of the concrete and in a full bead of butyl mastic sealant so that the space between the top of the masonry and the bottom flange of the frame shall be completely watertight.
- B. Only clean adjusting sections shall be used. Each adjusting section shall be laid in a bead butyl mastic sealant and shall be thoroughly bonded.

C. Manhole covers shall be left in place in the frames on completion of other work at the manholes.

END OF SECTION 02605

SECTION 02610 - WATER PIPE AND FITTINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all labor, material, and equipment necessary to install water main piping together with all appurtenances as shown and detailed on the Drawings and specified herein.

1.02 RELATED WORK

- A. Section 02222 - Excavation.
- B. Section 02225 - Excavating, Backfilling and Compacting for Utilities.
- C. Section 02630 - Encasement Pipe.
- D. Section 02640 - Water Valves and Gates.
- E. Section 02675 - Disinfection of Potable Water Pipe.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE (DIP) AND FITTINGS

- A. Ductile iron pipe (DIP) shall conform to ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51 Standard. The pipe shall conform to pressure class 350 minimum unless noted otherwise. All fittings and joints should be capable of accommodating pressure of not less than 250 psi.
- B. Fittings shall be ductile iron in accordance with AWWA C153 and have a body thickness and radii of curvature conforming to ANSI A21.10 or ANSI A21.53 for compact fittings and shall conform to the details and dimensions shown therein. Fittings shall have rubber gasket joints meeting the requirements of AWWA C111. Fittings shall be cement-mortar lined and bituminous coated to conform to the latest revision of ANSI/AWWA standards.
- C. Ductile iron flanged joint pipe shall conform to ANSI/AWWA C115/A 21.15 Standard and have a thickness Class of 53. The pipe shall have a rated working pressure of 250 psi with Class 125 flanges. Gaskets shall be ring gaskets with a thickness of 1/8 inch. Flange bolts shall conform to ANSI B 16.1.

- D. Flanged fittings shall meet all requirements of ANSI/AWWA C110/A21.10 (or A21.53 for compact fittings) and have Class 125 flanges. Fittings shall accommodate a working pressure up to 250 psi and be supplied with all accessories.
- E. Ductile iron mechanical joint fittings shall be in accordance with AWWA C153 and have a body thickness and radii of curvature conforming to ANSI A21.10 (or A21.53 for compact fittings) and have joints in accordance with ANSI/AWWA C111/A21.11. Fittings and joints shall be supplied with all accessories.
- F. Restrained joint pipe and fittings shall be a boltless system equal to "Field-Lok" restraining gaskets or "TRFLEX Joint" as manufactured by US Pipe & Foundry Company.
- G. Ball and socket restrained joint pipe and fittings shall be a boltless system equivalent to USIFLEX manufactured by U.S. Pipe and Foundry Company or FLEX-LOK manufactured by American Pipe Company. Pipe shall have a working pressure rating of 250 psi and have a maximum joint deflection of 15 degrees. Nominal laying lengths shall be in the range of 18-feet 6-inches to 20-feet 6-inches.
- H. All ductile fittings shall be rated at 250 psi water working pressure plus water hammer. Ductile iron fittings shall be ductile cast-iron grade 70-50-05 per ASTM Specification A339-55.
- I. Cement mortar lining and seal coating for pipe and fittings, where applicable shall be in accordance with ANSI/AWWA C104/A21.4. Bituminous outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.
- J. Where indicated, high-density, cross-laminated polyethylene film shall be provided for encasement of ductile iron pipe. The film shall meet the requirements of AWWA C105.
- K. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor, during the bidding phase, shall determine the number of fittings required on the job and include the cost of the fittings and installation in the unit price for pipe.
- L. Ductile iron pipe and fittings shall be as manufactured by U.S. Pipe & Foundry Company, American Cast Iron Pipe Company, or approved equivalent.

2.02 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

- A. Polyvinyl chloride (PVC) pipe for water mains shall be Class 200 (SDR 21) or Class 250 (SDR 17) PVC pressure rated pipe with either twin gasket joints or integral bell joints with rubber O-ring seals. All class 200 pipe shall meet the requirements of SDR 21 and all class 250 pipe shall meet the requirement of SDR 17.
- B. All PVC pipe shall conform to the latest revisions of ASTM D-1784 (PVC Compounds), ASTM D-2241 (PVC Plastic Pipe, SDR), and ASTM D-2672 (Bell-end PVC Pipe). PVC pipe shall have a minimum cell classification of 12454B or 12454C as defined in ASTM D-1784. Rubber gasketed joints shall conform to ASTM D-3139. The gaskets for the PVC pipe joint shall conform to ASTM F-477 and D-1869.
- C. Fittings for all lines 4 inches in diameter or larger shall be ductile iron and in accordance with AWWA C153 and have a body thickness and radii of curvature conforming to ANSI A21.10 or ANSI A21.53 for compact fittings. Cement mortar lining and seal coating shall be in accordance with ANSI/AWWA C104/A21.4. Bituminous outside coating shall be in accordance with ANSI/AWWA C110/A21.10. All fittings shall be rated at 250 psi water working pressure plus water hammer and be ductile cast-iron grade 70-50-05 per ASTM Specification A339.
- D. Fittings for all lines less than 4 inches in diameter shall be PVC gasketed push-on type or socket glue-type manufactured specifically for the pipe class being utilized. All socket-glue type connections shall be joined with PVC solvent cement conforming to ASTM D2564. Product and viscosity shall be as recommended by the pipe and fitting manufacturer to assure compatibility. Solvent cement joints shall be made up in accordance with the requirements of ASTM D2855. Appropriate thrust blocks shall be provided for the fittings.
- E. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor during the bidding phase shall determine the number of fittings required and include the cost of the fittings and installation in the unit price for pipe.
- F. Rubber gasket joints shall provide adequate expansion to allow for a 50 degree change in temperature on one length of pipe. Lubrication for rubber connected couplings shall be water soluble, non-toxic, be non-objectionable in taste and odor and have no deteriorating affect on the PVC or rubber gaskets and shall be as supplied by the pipe manufacturer.
- G. All pipe and couplings shall bear identification markings that will remain legible during normal handling, storage and installation, which have been applied in a manner what will not reduce the strength of the pipe or the coupling or otherwise damage them. Pipe and coupling markings shall include the nominal size and OD base, material code designation, dimension ratio

number, ASTM Pressure Class, ASTM designation number for this standard, manufacturer's name or trademark, seal (mark) of the testing agency that verified the suitability of the pipe material for potable-water service. Each marking shall be applied at intervals of not more than 5 feet for the pipe and shall be marked on each coupling.

2.02 CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE AND FITTINGS

- A. Chlorinated polyvinyl chloride (CPVC) pipe shall be Schedule 80, Type IV, Grade 1, or Class 23447-B, conforming to ASTM D1784 and ASTM F441.
- B. CPVC fittings shall be Schedule 80 conforming to the requirements of ASTM F439 for socket type and ASTM F437 for threaded type.
- C. Joints shall be socket-weld, except where connecting to unions, valves, and equipment with threaded or flanged connections that require future disassembly.
- D. Where required, flanges shall be one piece, molded hub type flat faced flanges, 125-pound standard. Gaskets shall be full-faced 1/8-inch thick, fabricated from viton. When mating flange has a raised face, use flat ring gasket and provide filler gasket between OD of raised face and flange OD to protect CPVC flange from bolting moment. Bolts, nuts and washers for flange connections shall be stainless steel.
- E. All socket-weld connections shall be joined with CPVC solvent cement conforming to ASTM F493. Product and viscosity shall be as recommended by the pipe and fitting manufacturer to assure compatibility.
- F. Solvent cement joints shall be made up in accordance with the requirements of ASTM D2855.
- G. Thread lubricant for threaded fittings shall be teflon tape.

PART 3 - EXECUTION

3.01 LAYING DEPTHS

In general, water mains shall be laid with a minimum cover of 30 inches, except as otherwise indicated on the Drawings.

3.02 SEWER/CONTAMINANT PIPE CROSSING CONCRETE ENCASEMENT

- A. At locations shown on the Drawings, required by the Specifications, or as directed by the Engineer, concrete encasement shall be used when the

clearance between the proposed water pipe and any existing sewer or contaminant carrying pipe is 18 inches or less. Contaminant carrying pipe includes underground petroleum, slurry, food processing, and other pipe as determined by the Engineer.

- B. Whether the proposed water pipe is above or below the existing sewer/contaminant pipe, the concrete shall fully encase the sewer/contaminant pipe and extend to the spring line of the water pipe. Encasement shall extend in each direction along the sewer/contaminant pipe until the encased sewer/contaminant pipe is 10 feet from the proposed water main, measured perpendicular to the water main.
- C. Concrete shall be 3,000 psi and shall be mixed sufficiently wet to permit it to flow between and under the pipes to form a continuous bridge. In tamping the concrete, care shall be taken not to disturb the grade or line of either pipe or damage the joints.
- D. Concrete for this Work is not a separate pay item and will be considered incidental to water pipe installation.

3.03 PIPE LAYING

A. SLIP JOINTED AND HEAT-FUSION WELDED PIPE

- 1. All pipe shall be laid with ends abutting and true to the lines and grades indicated on the plans. Pipe shall be fitted and matched so that when laid in the Work, it will provide a smooth and uniform invert. Supporting of pipe shall be as set out in Section 02225 and in no case shall the supporting of pipe on blocks be permitted.
- 2. Before each piece of pipe is lowered into the trench, it shall be thoroughly swabbed out to insure it being clean. Any piece of pipe or fitting which is known to be defective shall not be laid or placed in the lines. If any defective pipe or fittings shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe. Bevel can be made with hand or power tools.
- 3. The interior of the pipe, as the Work progresses, shall be cleaned of dirt, jointing materials, and superfluous materials of every description. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood plug fitted so as to exclude earth or other material and precautions taken to prevent floatation of pipe by runoff into trench.
- 4. Anchorage of Bends:
 - a. At all tees, plugs, caps and bends of 11-1/4 degrees and over, and at reducers or in fittings where changes in pipe diameter occur,

movement shall be prevented by using suitable harness, thrust blocks or ballast. Thrust blocks shall be as shown on the Drawings, with sufficient volumes of concrete being provided; however, care shall be taken to leave weep holes unobstructed and allow for future tightening of all nearby joints. Unless otherwise directed by the Engineer, thrust blocks shall be placed so that pipe and fitting joints will be accessible for repair.

- b. Bridles, harness or pipe ballasting shall meet with the approval of the Engineer. Steel rods and clamps shall be galvanized or otherwise rust-proofed or painted.
 - c. No extra pay shall be allowed for work on proper anchorage of pipe, fittings or other appurtenances. Such items shall be included in the price bid for the supported item.
5. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has the opportunity to make an inspection of the joints, alignment and grade in the section laid, but such inspection shall not relieve the Contractor of further liability in case of defective joints, misalignment caused by backfilling and other such deficiencies that are noted later.
 6. All joint surfaces shall be cleaned immediately before jointing the pipe. The joint shall be lubricated in accordance with the pipe manufacturer's recommendations. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. All pipe shall be provided with home marks to insure proper gasket seating. Details of gasket installation and joint assembly shall follow the manufacturer's direction for the joint type and material of the pipe. The resulting joints shall be watertight and flexible.

B. SOLVENT WELDED PIPE

1. All rigid plastic pipe shall be cut, made up, and installed in accordance with the pipe manufacturer's recommendations. When installed exposed, the pipe shall be supported or hung in accordance with the manufacturer's recommendations.
2. Containers of solvent cement shall be completely closed except when cement is being applied to pipe components. Should the solvent cement become lumpy or thickened, it shall be discarded, and a new container opened.
3. Schedule 80 threaded adapters shall be used where necessary to connect to a threaded valve or fitting.
4. Only strap wrenches shall be used for tightening threaded plastic joints, and care shall be taken not to overtighten those joints.
5. Solvent welded pipe shall not be laid or installed when the ambient temperature is below 40 degrees F, nor above 90 degrees F when exposed

to direct sunlight. Ends to be joined shall be shielded from direct sunlight prior to and during the laying operation.

6. Provide adequate ventilation when working with pipe joint solvent cement.

3.05 TESTING OF WATER PIPE

- A. The completed work shall comply with the provisions listed herein, or similar requirements which will insure equal or better results. Suitable test plugs, water pump or other equipment and apparatus, and all labor required to properly conduct the tests shall be furnished by the Contractor at no expense to the Owner.
- B. Water main piping shall be pressure tested to 250 percent of the normal system operating pressure or to 100 percent of the rated working pressure of the pipe, whichever is less. At no time shall the test pressure exceed 100 percent of the pipe's rated working pressure. A pipe section shall be accepted if the test pressure does not fall more than 5 psi during the minimum 2-hour test period. The pipe shall be tested for allowable leakage according to AWWA C-600 or C-605, as applicable, concurrently with the pressure test.
- C. Where practicable, pipelines shall be tested between line valves or plugs in lengths of not more than 6,000 feet. Testing shall proceed from the source of water toward the termination of the line. The line shall be tested upon the completion of the first 6,000 feet. After the completion of two (2) consecutive tests without failure, the Contractor, at his option and with the Engineer's approval, may discontinue testing until the system is complete.
- D. All pipe, fittings and other materials found to be defective under test shall be removed and replaced at the Contractor's expense.
- E. 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 high points within the test section, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water.
- F. All piping shall be tested for leakage at a pressure no less than that specified for the pressure test. The leakage shall be defined as the quantity of water that must be supplied to the tested section 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. The leakage shall be less than an allowable amount determined by the following equation:

$$L = \frac{SD (P)^{1/2}}{133,200}$$

Where: L=allowable leakage (gallons/hour)

- S =length of pipe tested, in feet
- D =nominal diameter of pipe (inches)
- P =test pressure (psig)

- G. Should the sections under test fail to meet the requirements, the Contractor shall do all work of locating and repairing the leaks and retesting as the Engineer may require without additional compensation. All visible leaks are to be repaired regardless of the amount of leakage.
- H. If in the judgement of the Engineer, it is impracticable to follow the foregoing procedures for any reason, modifications in the procedures shall be made as required and as acceptable to the Engineer, but in any event, the Contractor shall be responsible for the ultimate tightness of the line within the above test requirements.

3.06 PLACEMENT OF IDENTIFICATION TAPE

The placement of detectable underground marking tape shall be installed over all water mains as specified in Section 02225.

3.07 PLACEMENT OF LOCATION WIRE

The placement of detectable underground location wire shall be installed above all non-metallic water main as specified in Section 02225.

END OF SECTION 02610

SECTION 02733 - AIR PIPING

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all labor, material, and equipment necessary to install air piping together with all appurtenances as shown and detailed on the Drawings and specified herein.

PART 2 - PRODUCTS

2.01A UNLINED STEEL PIPING

- A. Unlined steel piping shall conform to the requirements of ASTM A139, Standard Specification for Electric Fusion (Arc) Welded Steel Pipe (NPS 4 and Over), latest revision.
- B. Fittings for unlined steel piping shall conform to the requirements of ANSI B16.9, Factory Made Wrought Steel Buttwelding Fittings.
- C. The exposed components of air piping shall be provided with flat faced, carbon steel, or alloy Class 125 flanges at points which will allow the component portions of the system to be disassembled into manageable units. Higher pressure rated flanges shall be provided as required to mate with equipment when the equipment flange is of a higher pressure rating than required for piping. Fittings shall have high temperature gaskets of Viton with a minimum thickness of 1/8-inch.

2.01B DUCTILE IRON PIPE (DIP) AND FITTINGS

- A. Ductile iron pipe (DIP) shall conform to ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51 Standard (latest). The pipe shall conform to pressure class 350 unless noted otherwise. All pipe, fittings and joints should be capable of accommodating pressure up to 350 psi. The ductile iron pipe shall be as manufactured by Clow Corporation, U.S. Pipe & Foundry Company, American Cast Iron Pipe Company, or approved equal.
- B. Mechanical joint fittings shall be ductile iron in accordance with AWWA C153 and have a body thickness and radii of curvature conforming to ANSI A21.10 or ANSI A21.53 for compact fittings and shall conform to the details and dimensions shown therein. Fittings shall have EPDM **high temperature gasket joints meeting the latest requirements**. Fittings shall be bituminous coated to conform to the latest revision of ANSI/AWWA standards.

- C. Ductile iron flanged joint pipe shall conform to ANSI/AWWA C115/A 21.15 Standard and have a thickness Class of 53. The pipe shall have a rated working pressure of 350 psi with Class 125 flanges. Gaskets shall be **high temperature gaskets** with a thickness of 1/8 inch consisting of organic fibers (Kevlar) and neoprene binder.
- D. Flanged fittings shall meet all requirements of ANSI/AWWA C110/A21.10 and have Class 125 flanges. Fittings shall accommodate a working pressure up to 250 psi and be supplied with all accessories.
- E. All ductile iron pipe and fittings shall have the manufacturer's outside asphaltic coating and **no interior lining**.
- F. Bituminous outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.
- G. All ductile fittings shall be rated at 250 psi water working pressure plus water hammer. Ductile iron fittings shall be ductile cast-iron grade 70-50-05 per ASTM Specification A339.
- H. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor, during the bidding phase, shall determine the number of fittings required on the job and include the cost of the fittings and installation in the Contract unit price.

2.02 CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE AND FITTINGS

- A. Chlorinated polyvinyl chloride (CPVC) pipe shall be Schedule 80, Type IV, Grade 1, or Class 23447-B, conforming to ASTM D1784 and ASTM F441.
- B. CPVC fittings shall be Schedule 80 conforming to the requirements of ASTM F439 for socket type and ASTM F437 for threaded type.
- C. Joints shall be socket-weld, except where connecting to unions, valves, and equipment with threaded or flanged connections that require future disassembly.
- D. Where required, flanges shall be one piece, molded hub type flat faced flanges, 125-pound standard. Gaskets shall be full-faced 1/8-inch thick, fabricated from viton. When mating flange has a raised face, use flat ring gasket and provide filler gasket between OD of raised face and flange OD to protect CPVC flange from bolting moment. Bolts, nuts and washers for flange connections shall be stainless steel.

- E. All socket-weld connections shall be joined with CPVC solvent cement conforming to ASTM F493. Product and viscosity shall be as recommended by the pipe and fitting manufacturer to assure compatibility.
- F. Thread lubricant for threaded fittings shall be teflon tape.

PART 3 - EXECUTION

3.01 PIPE INSTALLATION, GENERAL

In general, buried pipe lines shall be laid with a minimum cover of 30 inches, except as otherwise indicated on the Drawings. Exposed pipe lines shall be installed as indicated on the Drawings, unless the manufacturer's requirements dictate otherwise.

3.02 AIR PIPING INSTALLATION

A. Welded Steel Pipe:

1. Preparation: Notify ENGINEER at least 2 weeks prior to field fabrication of pipe or fittings. Prior to beginning fabrication, verify size, material, joint types, elevation, and horizontal location of existing pipelines to be connected to new pipelines or new equipment. Verify proper grade and type of welding electrodes are present at site, free of moisture and dampness, and coating is undamaged.
2. Fabrication:
 - a. Join pipe and fittings in accordance with manufacturer's instructions, unless otherwise shown or specified.
 - b. Remove foreign objects prior to assembly and installation.
 - c. For flanged connectors:
 - i. Install perpendicular to pipe centerline. Bolt holes shall straddle vertical centerlines, align with connecting equipment flanges, or as shown on the Drawings.
 - ii. Use torque limiting wrenches to ensure uniform bearing and proper bolt tightness.
 - iii. Raised Face Flanges: Use flat face flange when joining with flat faced ductile or cast iron flange.
 - iv. For installation of exposed piping, piping runs shall be parallel to building or column lines and perpendicular or parallel to floor, unless shown otherwise.
 - v. Piping upstream and downstream of flow measuring devices shall provide straight lengths as required for accurate flow measurement.

- vi. Install piping so that no load or movement in excess of that stipulated by equipment manufacturer will be imposed upon equipment connection; install to allow for contraction and expansion without stressing pipe, joints, or connected equipment.

3. Piping clearance, unless otherwise shown:

- a. Over Walkways and Stairs: Minimum of 7 feet 6 inches, measured from walking surface or stair tread to lowest extremity of piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.
- b. Between Equipment or Equipment Piping and Adjacent Piping: Minimum 3 feet-0 inch(es), measured from equipment extremity and extremity of piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.
- c. From Adjacent Work: Minimum 1 inch from nearest extremity of completed piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.
- d. Do not route piping in front of or to interfere with access ways, ladders, stairs, platforms, walkways, openings, doors, or windows.
- e. Headroom in front of openings, doors, and windows shall not be less than the top of the opening.
- f. Do not route piping over, around, in front of, in back of, or below electrical equipment including controls, panels, switches, terminals, boxes, or other similar electrical work.

5. Perform welding in accordance with Section IX, ASME Boiler and Pressure Vessel Code and ASME B31.1 for Pressure Piping.

- a. Weld Identification: Mark each weld with symbol identifying welder performing the work.
- b. Pipe End Preparation:
 - i. Machine shaping is preferred.
 - ii. Oxygen or Arc Cutting shall be smooth to touch, true, and slag removed by chipping or grinding.
 - iii. Beveled Ends for Butt Welding shall conform to ANSI B16.25.
- c. Surfaces:
 - i. Clean and free of paint, oil, rust, scale, slag, or other material detrimental to welding.

- ii. Thoroughly clean each layer of deposited weld metal, including final pass, prior to deposition of each additional layer of weld metal with a power driven wire brush.
- e. Alignment and Spacing:
 - i. Align ends to be joined within existing commercial tolerances on diameters, wall thicknesses, and out of roundness.
 - ii. Root Opening of Joint: As stated in qualified welding procedure.
 - iii. Minimum Spacing of Circumferential Butt Welds: Minimum four times pipe wall thickness or 1 inch, whichever is greater.
- f. Climatic Conditions:
 - i. Do not perform welding if there is impingement of any rain, snow, sleet, or high wind on the weld area, or if the ambient temperature is below 32 degrees F.
 - ii. **[Stainless Steel and Alloy Piping: If the ambient is less than 32 degrees F, local preheating to a temperature warm to the hand is required.]**
- g. Tack Welds shall be performed by qualified welder using same procedure as for completed weld, made with electrode similar or equivalent to electrode to be used for first weld pass, and not defective. Remove those not meeting requirements prior to commencing welding procedures.
- h. Surface Defects: Chip or grind out those affecting soundness of weld.
 - i. Weld Passes: As required in welding procedure.
 - j. Weld Quality: Free of cracks, incomplete penetration, weld undercutting, excessive weld reinforcement, porosity slag inclusions, and other defects in excess of limits shown in applicable piping code.

6. Pipe Corrosion Protection and Finishing

- a. Notify ENGINEER at least 3 days prior to start of any surface preparation or coating application work.
- b. Provide the following coating and identification systems for Carbon Steel Pipe:
 - i. Exposed: As specified in Section 09900, PAINTING.
 - ii. Submerged or Embedded: Shop coat with coal tar epoxy as specified in Section 09900, PAINTING. If in potable water service, use NSF 61 approved epoxy.

- iii. Piping Identification shall be as specified in Section 09900, PAINTING.

7. Cleaning

- a. Blow Air Piping clean of loose debris prior to making final connections to diffusers or injectors. Blow clean with compressed air at 4,000 fpm; do not flush with water.

B. Slip Jointed Pipe:

1. All pipe shall be laid with ends abutting and true to the lines and grades indicated on the plans. Pipe shall be fitted and matched so that when laid in the Work, it will provide a smooth and uniform invert. Supporting of pipe shall be as set out in Section 02225 and in no case shall the supporting of pipe on blocks be permitted.
2. Before each piece of pipe is lowered into the trench, it shall be thoroughly swabbed out to insure it being clean. Any piece of pipe or fitting which is known to be defective shall not be laid or placed in the lines. If any defective pipe or fittings shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe. Bevel can be made with hand or power tools.
3. The interior of the pipe, as the Work progresses, shall be cleaned of dirt, jointing materials, and superfluous materials of every description. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood plug fitted so as to exclude earth or other material and precautions taken to prevent floatation of pipe by runoff into trench.
4. Anchorage of Bends:
 - a. At all tees, plugs, caps and bends of 11-1/4 degrees and over, and at reducers or in fittings where changes in pipe diameter occur, movement shall be prevented by using suitable harness, thrust blocks or ballast. Thrust blocks shall be as shown on the Drawings, with sufficient volumes of concrete being provided; however, care shall be taken to leave weep holes unobstructed and allow for future tightening of all nearby joints. Unless otherwise directed by the Engineer, thrust blocks shall be placed so that pipe and fitting joints will be accessible for repair.
 - b. Bridles, harness or pipe ballasting shall meet with the approval of the Engineer. Steel rods and clamps shall be galvanized or otherwise rust-proofed or painted.
 - c. No extra pay shall be allowed for work on proper anchorage of pipe, fittings or other appurtenances. Such items shall be included in the price bid for the supported item.

5. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has the opportunity to make an inspection of the joints, alignment and grade in the section laid, but such inspection shall not relieve the Contractor of further liability in case of defective joints, misalignment caused by backfilling and other such deficiencies that are noted later. All joint surfaces shall be cleaned immediately before jointing the pipe. The bell or groove shall be lubricated in accordance with the pipe manufacturer's recommendations. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. All pipe shall be provided with home marks to insure proper gasket seating. Details of gasket installation and joint assembly shall follow the direction of the manufacturer's of the joint material and of the pipe. The resulting joints shall be watertight and flexible.

C. Solvent Welded Pipe:

1. All rigid CPVC pipe shall be cut, made up, and installed in accordance with the pipe manufacturer's recommendations. Where laid in a trench, the plastic pipe shall be laid by snaking it from one side of the trench to the other. When installed exposed, the pipe shall be supported or hung in accordance with the manufacturer's recommendations.
2. Containers of solvent cement shall be completely closed except when cement is being applied to pipe components. Should the solvent cement become lumpy or thickened, it shall be discarded, and a new container opened.
3. Schedule 80 threaded adapters shall be used where necessary to connect to a threaded valve or fitting.
4. Only strap wrenches shall be used for tightening threaded plastic joints, and care shall be taken not to overtighten those joints.
5. Solvent welded pipe shall not be laid or installed when the ambient temperature is below 40 degrees F, nor above 90 degrees F when exposed to direct sunlight. Ends to be joined shall be shielded from direct sunlight prior to and during the laying operation.
6. Provide adequate ventilation when working with pipe joint solvent cement.

3.04 TESTING OF LOW PRESSURE AIR LINES

- A. The completed work shall comply with the provisions listed herein, or similar requirements which will insure equal or better results. Suitable test plugs or caps, air pumps, compressors, or other equipment and apparatus, and all labor required to properly conduct the tests shall be furnished by the Contractor at no expense to the Owner.
- B. Low pressure air tests shall be made using equipment specifically designed and manufactured for the purpose of testing piping using low pressure air.

1. The test shall be made on isolatable sections of pipe after erection or placement of the backfill. The Engineer or his designated representative must be present to witness each satisfactory air test before it will be accepted as fulfilling the requirements of these Specifications.
2. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking. If caps are used, they shall be removable following the testing without damaging the piping.
3. Low pressure air passing through a single control panel, shall be introduced into the sealed line until the internal air pressure the previously specified pressure.
4. At least two minutes shall be allowed for the air pressure to stabilize in the section under test. (Note: Where the piping is exposed to full sunlight, the testing should be conducted in the very early morning, or in darkness.) After the stabilization period, the low-pressure air supply hose shall be quickly disconnected from control panel. The time required in minutes for the pressure in the section under test to decrease by 1 psig shall not be less than that shown in the following table:

Pipe in Diameter in Inches	Minutes
4 or less	2.0
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.5
21	10.0
24	11.5
30 & larger	13.5

5. When the air piping section to be tested contains more than one size of pipe, the minimum allowable time shall be based on the largest diameter pipe in the section, and shall be the time shown in the table reduced by 0.5 minutes.
- C. Should the sections under test fail to meet the requirements, the Contractor shall do all work locating and repairing the leaks and retesting as the Engineer may require without additional compensation.
- D. If in the judgement of the Engineer, it is impracticable to follow the foregoing procedures for any reason, modifications in the procedures shall be made as required and as acceptable to the Engineer, but in any event, the Contractor shall be responsible for the ultimate tightness of the line within the above test requirements.

END OF SECTION 02733